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David Avison Janice Sipior
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Communications in Computer and Information Science 73

Technology Enhanced Learning

Quality of Teaching and Educational Reform

First International Conference, TECH-EDUCATION 2010
Athens, Greece, May 2010
Proceedings

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Preface

It is a great pleasure to share with you the Springer CCIS proceedings of the First International Conference on Reforming Education, Quality of Teaching and Technology-Enhanced Learning: Learning Technologies, Quality of Education, Educational Systems, Evaluation, Pedagogies—TECH-EDUCATION 2010, Which was a part of the World Summit on the Knowledge Society Conference Series.

TECH-EDUCATION 2010 was a bold effort aiming to foster a debate on the global need in our times to invest in education. The topics of the conference dealt with six general pillars:

Track 1. Quality of Education—A new Vision
Track 2. Technology-Enhanced Learning—Learning Technologies—Personalization-E-learning
Track 3. Educational Strategies
Track 4. Collaborative/ Constructive/ Pedagogical/ Didactical Approaches
Track 5. Formal/ Informal/ and Life–Long Learning Perspectives
Track 6. Contribution of Education to Sustainable Development

Within this general context the Program Committee of the conference invited contributions that fall in to the following list of topics.

Track 1: Quality of the Education—A new Vision

- Teaching Methodologies and Case Studies
- Reforms in Degrees
- The European Educational Space
- Academic Curricula Designs
- Quality of Teaching and Learning
- Quality and Academic Assessment
- The School / University of the Future
- Challenges for Higher Education in the 21st Century
- New Managerial Models for Education
- Financing the New Model for Education of the 21st Century
- The Quality Milestones for Education of the 21st Century
- Evaluation in Academia
- The Role of Teachers
- International Collaborations for Joint Programs/Degrees
- Industry–Academia Synergies
- Research Laboratories Management
- Diffusion of Scientific Research to Society
- Innovative Models of Scientific Excellence in Education

- Cross-Continental Educational—Cultural Coalitions
- Business Education Innovation Centers
- New Models of Human Development
- Integrating Social Needs in Educational Programs
- Interactive Collaboration Spaces
- Open Source and Its Role in Education of the 21st Century
- Research Transfer to University Teaching
- The Role of Innovation in the School University of the Future
- The Economics of Education
- Models for Training of Teachers

Track 2. Technology—Enhanced Learning—Learning Technologies—Personalization-Elearning

Technology-Enhanced Learning: Applied ICTs for Effective Learning
Technology-Enhanced Learning: An Emerging Episteme

- The technology-enhanced learning domain: philosophical routes, demonstration of various communities, success stories, lessons learned
- Technology-enhanced learning key issues: effective strategies, learning models and theories
- Deployment of ICTs in education, policy issues of TEL, integration issues, extensibility, interoperability

Technology-Enhanced Learning: The Theories

- Pedagogical theories and models of TEL
- Constructivist approaches to TEL
- Collaborative/context-aware/personalized TEL approaches
- Communities of learners and TEL

Technology-Enhanced Learning: The Technologies

- Web 2.0 and TEL
- Semantic Web and TEL
- Adaptive and personalized hypermedia for TEL
- Metadata and content standards and TEL
- Free and open source software for TEL
- Ubiquitous and pervasive technologies for TEL
- Intelligent agents for TEL
- Learning management systems
- Emerging technologies
- Grid technologies for learning

Technology-Enhanced Learning: The Practices

- TEL practices in different educational/learning contexts
- Surveys of TEL adoption in education
- Future of TEL

Technology-Enhanced Learning: The Applications in Domains

- TEL Tools/Emerging Technologies and New-Generation TEL
- Challenges for the Future; Specification of Government Policies for the Promotion of TEL in Education
- Roadmaps for the Future
- Personalization of Learning Content Delivery
- Digital Libraries of Educational Content
- Open Educational Resources
- Collaborative Learning, Learning Communities, and Knowledge and Learning Networking
- Applications of Mobile Technologies and Wireless Networks
- Assistive Technology
- Semantic Web and Web 2.0 for Education
- Connectivism and Constructivism in Education
- Surveys for the Adoption of ICTs in Education
- Micro-content—Educational Mashups
- Tagging and Annotation of Learning Content
- Metadata and Semantics for Learning Content

Track 3. Strategies for Education of the 21st Century

- Educational Policies for the New Era of Education
- Global Collaboration in Education
- Education for the Disabled and the Excluded
- Design of Educational Curricula
- Virtual and Corporate Universities
- Intellectual Capital Management in Education
- Innovation Management in Education
- Total Quality Management in Education
- New Learning Technologies Management in Education
- Reengineering the Educational Structures
- Educational Social Networks, the Power of Micro-content and Personalized Learning Paths
- Governance of Education
- Global Educational Visions

Track 4. Collaborative, Constructivist, Pedagogical, Teaching Approaches
- Collaborative Learning
- Learning Communities
- Knowledge and Learning Networking
- Connectivism and Constructivism in Education
- Learning Paths
- Social Networks Research
- Social Software
- Collaborative Platforms
- Personalization and Adaptation
- Usability Studies
- Context Awareness
- Community Computing/Community Informatics
- Social Informatics
- Participatory/Cooperative Design
- Participatory Action Research (PAR) Methods
- Ubiquity and Pervasiveness
- Emotional Intelligence
- Interaction Design in Education

Track 5. Formal, Informal, Professional, Corporate and Life-Long Learning Perspectives

- Workplace Learning Strategies
- Innovative Professional Learning Models/Methods
- Adults Education and Life-Long Learning for the Knowledge Society
- Advanced Learning Technologies for Life-Long Learning
- Management Strategies for Life Long Learning and Adult Education
- Life-Long Learning: Revisiting Adult Education with ICTs
- Adult Education and Life-Long Learning in the Knowledge Society: Effective Strategies – How to Do It.
- Informal Learning Perspectives

Track 6. The Contribution of Education to Sustainable Development

- Education and Social Evolution
- Education and Sustainable Development
- Education and Learning as a Response to the Social and Economic Crisis

Springer's "*Communications in Computer and Information Science*," Volume 73, summarizes 100 articles that were selected after a double-blind review process from 194 submissions, contributed by 450 co-authors.

I would like to thank the more than 280 co-authors, from 35 countries, for their submissions, as well as the Program Committee members and the colleagues at the American College of Greece for the great support they offered in the organization of the event on the Agia Paraskevi Campus.

We were honored to have the support and encouragement of the editors-in-chief of many international peer-reviewed academic journals who agreed to run special issues with the best papers presented at our conference.

A great thank you also to Alfred Hofmann, Springer, and his staff for the excellent support in all the phases of the publication of CCIS Volume 73 proceedings development.

Our warmest appreciation, respect and thank you to the President of the American College of Greece, David G. Horner, and to Lila Mordochae, Associate Dean, School of Business Administration, The American College of Greece, for their support and critical contribution to the success of TECH-EDUCATION 2010. A great thank you also to the Head of the CIS Department of The American College of Greece, Jenny Vagianou, and to all the members of the CIS Society for their efforts to make this event an unforgetable experience for all the participants.

Last but not least my THANK you to the staff and members of the Open Research Society, for their great efforts in all the phases of the summit organization and the joint vision to promote a better world for all based on knowledge and learning.

We need a better world. We contribute with our sound voices to the agenda, policies and actions. We invite you to join your voice with ours and all together to shape a new deal for our world: Education for a Better World is our motto.

I looking forward to seeing you at the second event of the series, for which you can find more information at: http://www.reform-education.org

With 30 special issues already agreed for TECH-EDUCATION 2011, and 6 main tracks, we want to ask for your involvement and we would be happy to see you joining us.

THANK YOU – Efharisto Poli!!

March 2010 Miltiadis D. Lytras

Organization

TECH-EDUCATION 2010, was organized by the International Scientific Council for the Reforming of Education, Quality of Teaching and Technology-Enhanced Learning, and supported by the Open Research Society, NGO, http://www.open-knowledge-society.org and the International Journal of the Knowledge Society Research, http://www.igi-global.com/ijksr

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Miltiadis D. Lytras

President, Open Research Society, NGO

Miltiadis D. Lytras is the President and Founder of the Open Research Society, NGO. His research focuses on the Semantic Web, knowledge management and e-learning, with more than 100 publications in these areas. He has co-edited / co-edits, 25 special issues in international journals (e.g., *IEEE Transactions on Knowledge and Data Engineering, IEEE Internet Computing, IEEE Transactions on Education, Computers in Human Behaviour, Interactive Learning Environments, Journal of Knowledge Management, Journal of Computer Assisted Learning,* etc.) and has authored/(co-)edited 25 books (e.g., *Open Source for Knowledge and Learning Management, Ubiquitous and Pervasive Knowledge Management, Intelligent Learning Infrastructures for Knowledge-Intensive Organizations, Semantic Web-Based Information Systems, China Information Technology Hanbook, Real-World Applications of Semantic Web and Ontologies, Web 2.0: The Business Model,* etc.) . He is the founder and officer of the Semantic Web and Information Systems Special Interest Group in the Association for Information Systems (http://www.sigsemis.org). He serves as the Co-Editor-in-Chief of 12 international journals (e.g., *International Journal of Knowledge and Learning, International Journal of Technology-Enhanced Learning, International Journal on Social and Humanistic Computing, International Journal on Semantic Web and Information Systems, International Journal on Digital Culture and Electronic Tourism, International Journal of Electronic Democracy, International Journal of Electronic Banking, International Journal of Electronic Trade* etc.) while he is associate editor or editorial board member in seven more.

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Walter Leal Filho has a first class degree in biology and a doctorate in environmental science (PhD), having also completed a post-doctorate programme on environmental communication. He also has a higher doctorate (Dr. rer.nat habil.) in environmental information (DSc), a DPhil in sustainable development and holds the titles of Doctor of Letters (DL) and Doctor of Literature (DLitt) commensurate with his scientific performance and outputs translated in over 250 publications among books, book chapters and scientific papers. Leal Filho is Director of the Research and Transfer Centre "Applications of Life Sciences" at the Hamburg University of Applied Sciences, http://www.haw-hamburg.de/9769.0.html?&L=2 and teaches on environmental information, education, communication and management issues at various European universities. He is a honorary professor at the A I Open University, University of Blageovgrad, University of Rezekne, University of Applied Sciences Zittau-Görlitz and a visiting professor at various other universities. He has over 20 years of research experience on all aspects of environmental information and education and has a particular interest in the connections between environmental management, sustainability, climate and human behavior.

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Uden is Program Committee member for many international conferences and workshops. She is on the editorial board of several international journals including Journal of Internet Technology, International *Journal of Web Based Communities, International Journal of Web Information Systems, Business Process Management Journal and International Journal of Mobile Learning and Organisation.* She is editor of the *International Journal of Web Engineering and Technology* (IJWET) and the *International Journal of Learning Technology* (IJLT), published by Inderscience, UK.

Uden is also visiting professor to universities in Australia, China, Finland, Italy, Malaysia, Slovenia, Spain, South Africa and Taiwan. She has been keynote speaker at several international conferences. On the international front, she collaborates widely with colleagues worldwide. She is head of the Knowledge Management in Organisation (KMO) group involving universities from Finland, Slovenia and Taiwan. She was conference chair for the KMO2007 conference in Italy and also for KMO2008 in Finland.

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Sara Cervai is Aggregate Professor of Work and Organizational Psychology. For more than ten years she has held courses in work psychology and since five years also in social psychology, working with the faculties of political sciences, education and medicine. Research activities are developed in the areas of: quality of education, service quality, TQM, leadership, creativity and innovation, stereotypes and prejudices, organizational culture. She is member of the Human Resources Management staff of the University of Trieste. She was also visiting professor in Switzerland and Slovenia. Together with her research group (Psiqu) she planned and managed several European–funded projects about quality in Education. She is editor with professor Tauno Kekale (Vaasa Univ.) of the *Journal of Workplace Learning* (Emerald Pbl). Further information at www.psiq.eu/

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Moodle 2.0: Shifting from a Learning Toolkit to a Open Learning Platform

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Abstract. Learning Management Systems (LMS) have reached a plateau of maturity in features, application to teaching practices and wide adoption by learning institutions. But the Web 2.0 carries new kinds of tools, services and ways of using the web; personally and socially. Some educators and learners have started to advocate for a new approach to frame one's learning sources, from the LMS course space towards Personal Learning Environments (PLE). But PLE's are characterized by its absence of structure, just what is provided by open standards and mashup techniques. Based on 5 years of participative observation research, this article explains the changes in architecture performed on the second version of Moodle, why did these changes happen and what should be the next steps so Moodle can shift from being a learning tool to a true open learning platform.

Keywords: Education, LMS, E-learning, Web 2.0, PLE, Online Learning, Interoperability, Free Open Source Software.

1 A Bit of Moodle's History, Aims and Philosophy

On 2001 Martin Dougiamas, a PhD Student of the Curtin University of Technology started a research project which intended to create a community of developers, teachers and students around a new free open source tool for creating online courses. This software was called the Modular Object-Oriented Dynamic Learning Environment (Moodle[1]). The community of Moodle users would interact via a web site at http://moodle.org contributing to make evolve the Moodle software. Moodle was oriented towards "capturing" a wide range of interactive pedagogical techniques (based on a referent of social constructionism) with the aim of making these techniques easier for teachers to apply to their own courses. Moodle license was GPL from start, which made it free to use and modify, providing that any derivative software is also free, allowing the greatest possible opportunity that it would be used, experimented with, adapted and improved by the community according to their own experiences and reflections. [1][2]

[1] Originally the first "M" stand for "Martin's" and got changed in the way.

M.D. Lytras et al. (Eds.): TECH-EDUCATION 2010, CCIS 73, pp. 1–10, 2010.

1.1 Moodle's Philosophy

Social constructionism is a sociological theory of knowledge developed by Peter L. Berger and Thomas Luckmann [3]. Applied to education implies that learning is particularly effective when the subject builds (constructs) something for others to experience. And when this task of development takes place within a social group that is constructing things for one another (the society, maybe the group itself), the whole group is collaboratively creating a small culture of shared artifacts with shared meanings. When one is immersed within a culture like this, one is learning all the time about how to be a part of that culture, on many levels, and creating knowledge. Maybe that's what this book is really about.

Within this paradigm contents are not in the centre of the education. Contents are just another tool and do not deserve more importance than that. What really matters is the interaction teacher – student (or expert-apprentice), and the interaction of students.

Social constructionism stands for an activity based learning, and not a content based learning. LMS software like Moodle allows this kind of learning approach and yet keeps a place to enable the use of Learning Objects, SCORM and other standards.[4]

Dougiamas wanted to identify the extent to which Moodle could support epistemologies of online educational practice, particularly those related to social constructionism, and to identify how the community who use the software adapt and improve it according to their own developing epistemologies. It is intended that the results will be useful to those involved in higher education online as well as developers involved in Free Libre Open Source Software (FLOSS).

1.2 Moodle's Success

But as Dougiamas [1] says "Unfortunately the subject of my thesis, Moodle, became popular beyond my wildest dreams and I've been somewhat preoccupied with it to the detriment of my final thesis-writing year.". Because of Moodle's success Dougiamas has not been able to finish his PhD research, but has created a successful FLOSS project and gathered a huge community around it.

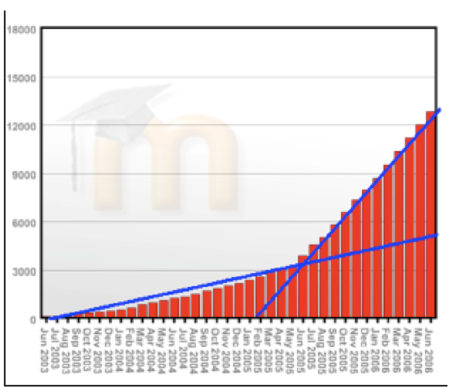

Fig. 1. Moodle registered sites growth from http://moodle.org/stats

Fig 1. shows how the number of installed Moodle servers grew very fast. At the end 2009 Moodle is the most used Free Open Source LMS worldwide, with more than 45.000 validated registered servers, and over 30.000.000 students in 208 countries. The Moodle community (http://moodle.org) has more than 850.000 registered users.

2 Moodle Evolution: Stability versus Innovation

Collaborating and sharing within a social group of learners is the basis of the pedagogical principles in which Dougiamas based the original design of Moodle. This design, and a deep reflection on how to empower the creation of an online community [2][4] and benefit from the enthusiasm of developers within the Moodle.org community, explain the success of Moodle adoption (among new LMS users and switchers from other preexisting products). But at some point Dougiamas, who leads the Moodle.org community as a benevolent dictator, had to start thinking carefully the adoption of new features and code into the Moodle standard distribution.

2.1 The New Wiki of the Emperor

Wikis are one of the most popular tools for online collaboration used in education, and today almost every LMS implements some kind of wiki engine. Since the version 1.4 (2004) Moodle has an activity module. This module was an adaption of Erfurtwiki (http://erfurtwiki.sourceforge.net/) contributed to the Moodle codebase by a developer that did not stay in the community to maintain the code. Soon was obvious that the Wiki module distributed with Moodle had many flaws in the design, and had many bugs that where not fixed because no developer in the community wanted to.

Within the scope of a participative observation research [5] on 2005 the authors of this article released a third part wiki activity module for Moodle called DFWiki. The DFWiki module was the result of a research and development process very similar to the first version of Moodle. It was not the adaption of a Wiki engine to a LMS, it was designed to support a number of concrete educational innovation practices that where being conducted at the Technical University of Catalonia (UPC). The authors conducted experiences with 500 students in 3 different courses and groups during 3 semesters [6].

First MediaWiki (http://wikimedia.org) was used as wiki engine, and became clear the educational power of the Wikis, but also the need of a Wiki engine that supported the academic structures (courses, groups, roles) and permissions. After a survey Moodle 1.4 with the standard Wiki engine was used on the next semester. the results showed that Moodle was a very suitable platform, but the wiki engine had many design flaws that presented barriers that prevented the students to collaborate like they did with Mediawiki. Then DFWiki was developed and open sourced.

Some relevant aspects of DFWiki design:

- Multiple Markup parser. The creator of a wiki page can decide if she wants to use wiki markup (mediawiki format, creole) or to use Moodle's WYSIWYG,
- The teacher can place Widgets (in Moodle's epistemology are called Blocks) with information about the wiki content in the page layout: An Index tree of

the pages, a page list ordered alphabetically, information about the navigation of the current page, orphaned pages, pages where the user has participated, last pages updated, search, orphaned pages etc.

- Evaluation and grading tools.

Since its release DFWiki (and the later versions named NWiki) had been a candidate to be incorporated into the standard distribution of Moodle. But due to many reasons it has not happened until Moodle 2.0 (4 versions later) that the UPC team has been asked, after a vote within the community, to develop a new wiki module based on DFWiki features.

2.2 Moodle's Focus on Reliance, Freeze Features

During the period from 2006 to 2009 (versions 1.6 to 1.9) the team Moodle core developers and funding partners focussed in issues like stability, group and roles support, gradebook, multiple database engine support and security. While the community of third part developers committed to "contrib", the Moodle.org code repository not official branch, a large number of activity modules, integrations, blocks etc. the main branch of Moodle did not incorporate new activity modules. The main challenge for Moodle was to become a reliable LMS suitable for the requirements of large institutions, able to compete with proprietary LMS vendors in terms of features, quality and cost of ownership.

The case of DFWiki is one of the few exceptions among the hundreds of contributions to the Moodle codebase that have not got into the official distribution. The growth of Moodle as a product and its impact, required higher standards of quality and proven commitment to the community (for later maintenance) before new modules where allowed in.

3 Opening Up the Walled Garden of the LMS

LMS are widespread. The learning institutions provide to the teachers and learners a set of online learning tools embedded into the LMS by default. The LMS is also used as a channel to gather other services like access to portfolios and content repositories. But outside of the LMS there are also plenty of online tools that can be useful sources of information, ways of collaborating and sharing: Search, News, Maps, Documents and Spreadsheets, Public forums, Calendar, Translation, Images, Videos, Microblogging. Social networks, Bookmarking, Wave, Online Games, 3d Virtual worlds...

All these services are already being used for educational purposes, but only by advanced users. And usually the usage of these online tools is not integrated within the scope of what we could refer as "virtual classroom". Because is happening outside of the radar of the learning institutions and sometimes even the teacher.

3.1 Online Learning Outside the LMS?

Let's consider this -not so fictional- scenario: a subgroup of students of a class are be using tools like Instant Messaging, Wikis, Wave or participating in a Social Networking site, while and sometimes for doing homework. The students engaged in the usage of all these online tools might get better grades or not - some studies say they most likely will -, but they will also learn important skills and competences on taking advantage of information technologies to access, share information and collaborate with others to do so. But their teacher may not know about it, because all the information (feedback) he/she receives is what appears on the LMS's course's logs, and all the tools he/she is aware are the ones bundled in the LMS. Sometimes this kind of behavior is empowered by the teacher.

So, instead of using the LMS many teachers and learners are using their Personal Learning Environments [7] mashing up [8] countless Web 2.0 services. This may be a threat to the role of LMS in education in the future. At least shows that LMS are not part of todays new wave of innovation in learning.

In words of Dougiamas (2009) [9] “Moodle was approaching the end of its life cycle as a Walled garden product. Moodle was ahead of the game in 2001, but has been passed by many of the developments on the Internet since its inception. When Moodle was first conceptualized things like WordPress MU, Ning, Flickr, Delicious and Wikipedia did not exist. Moodle needed to reinvent itself.”

This need for change has also been pointed out by Dr. Charles Severance [10] founder of Sakai (http://sakaiproject.org) another popular FLOSS LMS. “the current ecosystem of LMS are all mature enough that the majority of faculties and student users are generally satisfied regardless of which system chosen”. Severance wonders if nowadays predominant LMS are waiting like dinosaurs to become extinct by a meteor strike, in form of disruptive learning innovation practices that do not fit inside the bounds of the current crop of LMS.

Its our opinion that right now the requirements for a LMS are not about having a wide set of internal features and tools, like a swiss knife, but about being a platform that can hold and mash up external tools and services. And most of these services and tools have not been invented yet. Any set of tools will be obsolete in a few years. So the ability to integrate is paramount.

3.2 The Upcoming Moodle: Moodle 2.0

The authors of this article proposed in 2008 to Dougiamas a way to transform Moodle into a service enabled LMS, providing a first architecture approach and the will and resources to work on the refactoring process that has taken 16 months. This proposal was based on the research and development experience conducted during the Campus project [11][12] (http://campus.cat) that adapted Moodle 1.8 to provide interoperability complying with the MIT’s Open Knowledge Iniciative (OKI) Open Service Interface Definitions (http://okiproject.org), an important work on defining interoperability for learning tools.

Moodle 2.0 is, among other major new features, the result of a refactoring of the code, changing the internal architecture to allow interoperability with other systems and tools. According to Dougiamas [9] “The repository and portfolio APIs in combination with the Web Services layer will allow Moodle to become much more a platform than an application. Moodle will keep its relevance or will become relevant again (depending on your viewpoint on the state of educational technology). I am already imagining the Moodle App Store.”

Thanks to the Webservices in Moodle 2.0 is going to provide comprehensive, secure and stable way to access the Moodle APIs. This will make easy for developers to integrate the LMS with other platforms and services, in a way that system administrators will even allow in their servers. The developments using these APIs will survive Moodle future upgrades, due to the compromise to keep these APIs stable.

But, the Webservices API does not provide a way to integrate external tools inside Moodle.

3.3 IMS LTI a Interoperability Standard Designed to Mash Up Online Tools for Learning Purposes

Some authors [8] propose and design Widget aggregators as a way to ensemble an institutional PLE (iPLE). But widgets are not designed as learning tools, they are general purpose. The IMS Global Learning Consortium is working on a standard called IMS Learning Tools (IMS LTI) Interoperability, another initiative from IMS towards interoperability.

The basic idea underneath IMS LTI is that the LMS implements a proxy tool that provides an endpoint for an externally hosted tool and makes it appear as if the externally hosted tool is running within the LMS. In a sense this is kind of like a smart tool that can host lots of different content. The proxy tool provides the externally hosted with information about the individual, course, tool placement, and role within the course. In a sense the IMS LTI allows a single-sign-on conducted behind the scenes and allows the tool to run seamlessly within the LMS framework [10]. BasicLTI can be used to host content and online services from external servers, and bridges can be easily set up to embed widgets and other standard ways of mashup inside BasicLTI consumers, such as Moodle's.

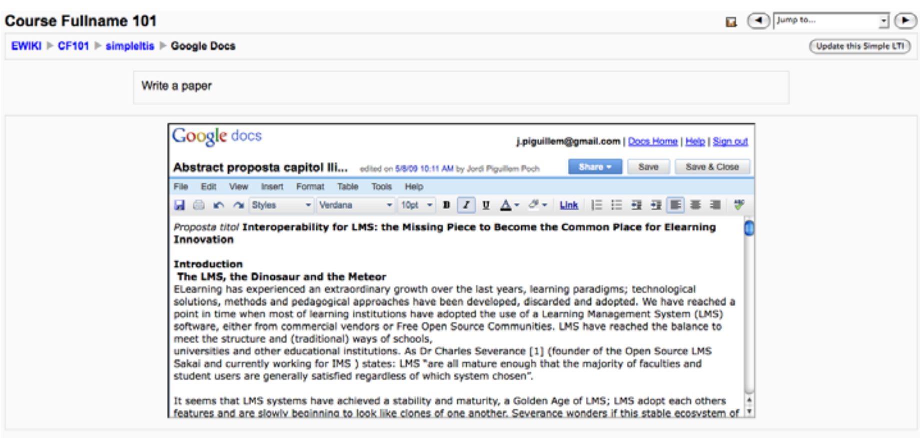

Fig. 2. Moodle and Google Docs integration using SimpleLTI

As proof of concept, Jordi Piguillem during his Google Summer of Code 2008 (http://code.google.com/soc/2008/) developed a Google App Engine application that allows a Google Docs document to be embedded in his SimpleLTI consumer for Moodle (http://code.google.com/p/basiclti4moodle) an early version of LTI. This project, co-directed by Charles Severance and Marc Alier, was awarded with the best interoperability innovation at IMS Learning Impact 2009 (http://www.imsglobal.org/learningimpact2009/lia2009winners.html).

Working with Dr Charles Severance (in charge of the IMS LTI definition process) the authors have developed a Moodle activity module that behaves according to the last specification of LTI released by IMS: BasicLTI [11]. This module is waiting to be reviewed for inclusion in Moodle 2.0.

Dr. Severance leads the standard development as a Bottom Up process, bringuing together every major vendor of LMS to create a common solution with reference implementations, and iterating the process. Assuring that LTI will become an official Standard and a De-Facto Standard as well. An open standard from its very brith.

The IMS LTI module for Moodle will be specially useful for teachers that have learned to master Moodle but don't feel comfortable already using new kinds of tools and including them usage into their learners toolkit.

3.4 The Way in: How to Make Moodle More Receptive to External Tools?

After all the backstage wiring included in Moodle 2.0, the next challenge is to look outside Moodle for interesting tools, contents and services; and then for each of these we need to:

- consider the learning use cases that could facilitate, including insights on how to evaluate the activities.
- figure out how to integrate it in the ecosystem of Moodle
- analyze possible ways it may be introduced toto Moodle's teachers and learners
- determine what kinds of feedback could be useful for the teacher and institutions.

Depending on these tasks - and also security, privacy and legal issues - we foresee the following technical approaches could be used.

- Weak and simple tool integrations via widgets - but this is already possible and there is no feedback to the LMS nor integration with scope of the course.
- Strong Tool Integration IMS LTI already discussed in the previous section. A general purpose LTI Moodle Module is paramount, but if we want to achieve ease of use and to give a Moodle like sense to the tool we should develop specific activities to do the binding.
- Native version of tools, via proxy activities for tools accessible via webservices (some exist already, blocks encapsulating search engines, feed syndication to flickr, wikipedia etc). In the case of Google Wave, we are already working on a Robot to bind Wave and a Moodle Activity Module. http://code.google.com/p/moodlewave
- Single sign on solutions need to be in place. There is already an ongoing project to integrate Moodle and Google Apps (http://code.google.com/p/moodle-google) with interesting code from MoodleRooms. Even Microsoft released months ago some open source code to integrate Moodle and MS. Exchange.
- Moodle new crop of plug-ins interfaces in key subsystems like repositories and portfolios allows also a very interesting way in.
- New ideas need to come.

3.5 Way Out. From Moodle to the Outside World

We have been considering the need for Moodle to become a platform able to aggregate external tools but openness works two ways. The authors proposed a webservices architecture that transforms Moodle also in services that can be consumed outside in different forms.

Moodbile (http://code.google.org/p/moodbile) is a project started by María José Casañ in her PhD research. Whose goals are to create a FLOSS software stack that consumes the Moodle Webservices (verifying the usefulness, completeness and reliability of the API provided) and offers an HTML 5.0 client of Moodle designed to be experienced in a mobile device like an Andoid device or an iPhone. Moodbile is intended to implement additional services like caching and synchronization, or content scaling and accessibility adaptation (conducted by Miguel Angel Conde at University of Salamanca, Spain).

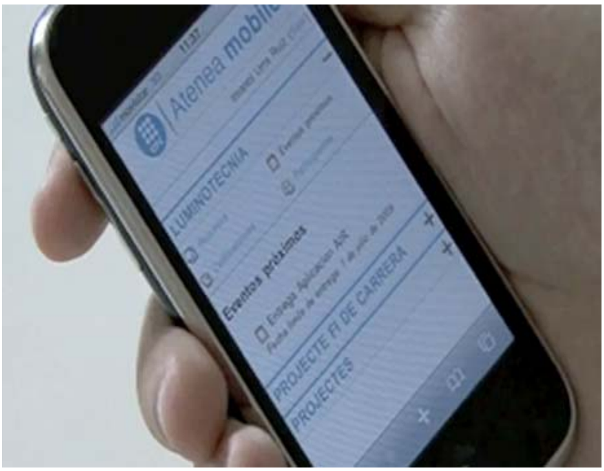

Fig. 3. Moodbile client running on an iPhone

Parts of the software stack of Moodbile can be used for other purposes, like to feed a widget pack of services that would get Moodle's tools inside any PLE we want to build or imagine.

One of the main issues adressed in the Moodbile project is the consideration that mobile client and widgets need to use a cached copy of the information of the LMS. This makes sense for two reasons: (1) the overhead of workload on the LMS servers, already saturated in most institutions (wich makes special sense in the case of widgets embeded in pages that are constantly being reloaded), and (2) the optimization of wireless data traffic that keeps on being slow and expensive in most places.

That's why Moodbile adresses that definition of a special webservices – independent of the Webservices protocolol (SOAP, REST, XML-RPC, JSON) – that allows data synchronization between the data on the LMS (Moodle) and the data that the mobile client knows. This feature is implemented in the API design and is featured as an extension within the new Moodle 2.0 architecture.

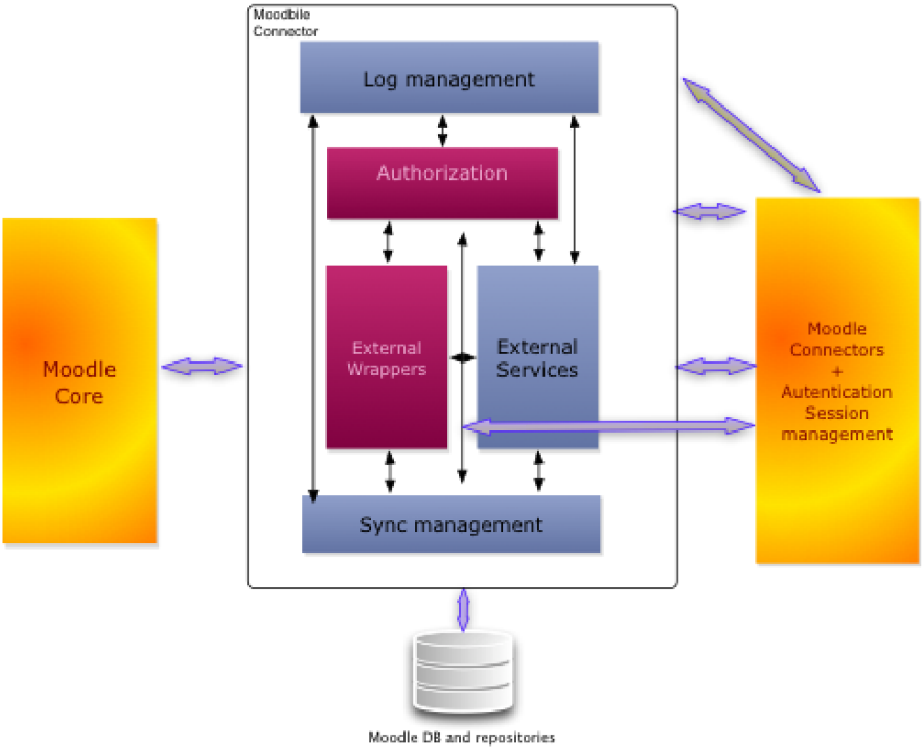

Fig. 4. Moodbile archiecture supports sync management

The Moodbile project is proof that the Moodle 2.0 can become a platform able to grow beyond its walls.

4 Conclusions and Further Work

On 2008 Moodle reached the point of maturity with the version 1.9. Its evolution is not in the way of implementing more features and services, but about becoming a platform. The lead developers of Moodle have begun to make it happen. But the actual work has been done at a low level. At the code and API level. And maybe the users will not be able to notice it when Moodle 2.0 is out at first.

Moodle 2.0 has put the house in order, so now new developments and integrations can come and expand de range of features. Now we do know how to embed external tools inside Moodle. That was the “easy” part.

Now our future work consists on active research on how to build these mashups inside the Moodle course. To design the best possible interfaces and the user experience to make mashups painless to the majority of teachers and learners. To conduct experiences and gather information on success and failures stories, and provide to the community of teachers with strategies to integrate the new tools and services inside their classes.

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Technology Enhanced Learning for People with Intellectual Disabilities and Cerebral Paralysis: The MAS Platform

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Abstract. Education for students with disabilities now takes place in a wide range of settings, thus, including a wider range of assistive tools. As a result of this, one of the most interesting application domains of technology enhanced learning is related to the adoption of learning technologies and designs for people with disabilities. Following this unstoppable trend, this paper presents MAS, a software platform aimed to help people with severe intellectual disabilities and cerebral paralysis in their learning processes. MAS, as a technology enhanced learning platform, provides several tools that supports learning and monitoring for people with special needs, including adaptative games, data processing and monitoring tools. Installed in a special needs education institution in Madrid, Spain, MAS provides special educators with a tool that improved students education processes.

Keywords: assistive technology, adaptive toys, handicapped persons, special needs, assistive technologies.

1 Introduction

Training and support methods for people with intellectual disabilities are generally very staff intensive and thus quite expensive to the supporting agency [1]. Providing quality educational programs to students with profound disabilities presents a tremendous challenge [2]. Computer technology offers promising new approaches to reducing the dependence of people with mental retardation on others [1]. Though studies reveal [3] that it is how teachers adapt and utilize the technology that makes a difference and not the technology itself, technology offers new horizons for both educators and learners.

Several studies (e.g. [4], [5]) reveal that students with serious developmental disabilities frequently fail to develop speech and language skills. Assistive technology, including switches, alternative and augmentative communication (AAC) devices, and environmental controls, provides an alternative means for students to access their environments, exert control, express themselves, and learn simple tasks [6]. AAC

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refers to a compilation of methods and technology designed to supplement spoken communication for people with limited speech or language skills [7].

In the field of technology, some studies have indicated that children with developmental disabilities can learn pointing [8], [9]. However, people with severe disabilities generally have important difficulties to work with mouse devices [10]. Sometimes, special education teachers have difficulties to teach using mouses [11]. New tools need to be applied in such cases: assistive technology. It is proved that providing a variety of stimuli has been identified as a key component in teaching switch technology [12]. However, limited budgets may restrict the purchase of several reinforcing devices [13]. On the other hand, according to [1] one of the greatest advantages of using computer technology and multimedia for training is the ability to customize the training to meet the needs of the person.

A variety of commercially developed computer software programs are available to teach cause and effect via a single switch and switch interface [13]. The challenge to provide novelty is further compounded when children with severe and profound disabilities exhibit little or no interest in commercially available toys [13].

This paper describes MAS, a software system to reinforce the learning process of people with cerebral palsy and cognitive disabilities through the use of interactive games and diverse devices in one unique solution. MAS is easy to use for both end users and intermediate users, is highly configurable and contemplates and provides tools to deal with some of the disabilities that, additionally, this group of people has usually, as coordination and movement difficulty, visual and hearing impairments. MAS is based in the fact reported by several authors (e.g [14], [15]) that effective reinforcers must be presented to the student in order to attract him or her to the tool. In order to do so, MAS is designed to fully configurable in its games, being able to include particularized multimedia clips or photos for each student.

The remainder of the paper is organized as follows. Section 2 outlines relevant literature in the area about the field of study. In Section 3, the architecture for the MAS approach is presented along with the description of the implementation of the architecture. Conclusions and future work are discussed in Section 4.

2 Background

Computer technology offers promising new approaches to reducing the dependence and improve the development of people with disabilities [1]. Siegel [16] pointed out that technology would not cure intellectual disability or even fully compensate for the difficulties encountered by persons with intellectual disabilities, but, information and communication technology can, however, improve their abilities to better integrate, changing also the way they learn [17], and improving the lives of persons with disabilities [18] and facilitating participation in society [19].

According to [20], assistive technology devices to aid persons with disabilities can be technological (vibrating pager, Palmtop, PC) or nontechnological (picture prompts, activity schedules). Focusing on technological devices, Briant and Briant [21] pointed out that “For people without disabilities, technology makes things easier, for people with disabilities technology makes things possible”.

Due the importance of assistive technology for people with disabilities, this research area has been summarized in many works. In [22] there is a review of the relevant literature regarding assistive technology as an instructional tool to assist college students with language disabilities, in [13] authors complete a literature review in the field of daily tasks, [3] provides an updated list of various types of assistive technology is provided of different kind of disabilities, and [23] presents a U.S. national survey of the use of assistive technology by adults with mental retardation.

There are several cases of successful use of assistive technology in children and teenagers education in fields like: Dyslexia [24], Autism [25] or Visual Impairments [26] to cite but a few. Finally, in the field of people with intellectual disabilities, there are various works that deals with technologies such as palmtop computers [27], [28], video technologies [29], [30] or high-tech AAC (see [7] for a full and recent review), to cite the more relevant ones.

MAS, following the philosophy of an adaptative toy, it is designed to be an assistive technology that supports the development of people with intellectual disabilities and cerebral paralysis.

3 MAS: Technology Enhanced Learning for Children with Severe Intellectual Disabilities and Cerebral Paralysis

There are many educational support software tools designed for young adults and children. However, these systems are in many cases difficult to use for children with intellectual disabilities, who, in many cases present also other kind of disabilities: impaired vision, hearing disabilities, etc. Moreover, each of these children presents one or many disabilities at specific grade levels. In this scenario, commercial software that is usually based on generalization is not a valid approach for people with disabilities that need fully configurable platforms, able to be adapted to their particular needs. MAS is a platform designed to support educational activities with a special target: people with intellectual disabilities and cerebral paralysis.

3.1 Overview Architecture

MAS is designed as an aggregation of three main modules as depicted in Figure 1. These modules are: user management module, that allows to do the maintenance of users and their disabilities; games management module, that allow maintenance games (create, configure, personalize); and games zone, the module that allow play games and perform activities.

Through User Management module, administrators can define and maintain particularities about students. This allows administrators to define disabilities, grades of disabilities and displays and inputs applicable (sweeps) for a given user. The final aim is to define the set of games and aids to be configured for the user.

Games management module is the one responsible of the matching between children needs and activities available. This feature is very important since some people with cerebral paralysis have difficulty to recognize pictures or photographs, and they need specific images to interact with the application. Educators must be aware that certain users can get a fright if listen certain sounds and to prevent this, using this

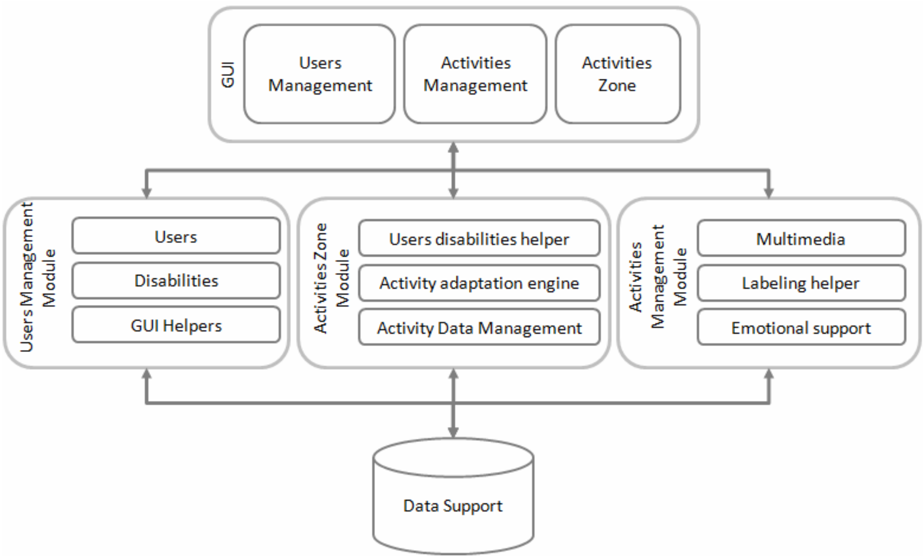

Fig. 1. MAS Architecture

module is crucial to adapt the stimulus to users. Using this module, educators can adapt images, videos and sounds to children's activities in a fully configurable way.

Games zone is the one dedicated to play games. These games will be shown adapted to user's disabilities in order to let user interact with the game using specific inputs. Thus, this module reads personal configuration set up to provide the specific version of each game, bearing in mind user's disabilities, and specifics multimedia resources. This module is designed to serve also as a learning support system. To do so, the system automatically stores the time consumed by the user, the number of right and wrong answers, timestamp, the user, and many other data. This is a very important feature because it allows instructors check users' progress.

3.2 Implementation Issues

The implementation of the architecture as a whole has been based on Microsoft .NET Framework 3.5 SP1 using C#. Microsoft .NET provides a framework in which designing easy to use graphic user interfaces can be done in a quick and efficient way, and also a possibility to include eXtensible Application Markup Language (XAML) XML-based interface definitions for Windows Presentation Foundation (WPF) applications.

For the liaison between the business logical and the presentation layer, it is based on the Model-View-Controller design pattern, where the GUI layer corresponds with the view, the business logic layer corresponds with the controller, and the persistence layer corresponds with the model. The proof of the concept implementation includes Microsoft Access as desktop database management system.

3.3 Games

MAS prototype is able to deal with four kind of games:

- Cause-effect games: This kind of games presents an initial window displaying a video, playing an audio file, or showing an image. This multimedia resource will remain in the window until the user press mouse button (or performs a similar action via any equivalent device). When the system detects the action, a new window will be shown presenting other multimedia resource and waits until user performs new action.
- Sequence of images games. In this case, a sequence of images, videos or sounds is presented. This sequence helps users to get familiar with the elements that can be found in other games. There are two possibilities of interaction with the user: automatic transitions and transitions driven by user interaction.
- Image selection games: This kind of games is based in test games. Administrator writes questions using images, sounds and videos. Once the question is presented, user selects one or more images from a list: at least one of them is correct. If the user's response is correct, then he or she will receive reward, in the form of a video, audio or image.
- Ordering games: These games are based on questions, but in this case, the task is to arrange answers following a given criteria. One more time, if user's answers are correct, then user gets a prize, in the form of a video, audio or image.

It's important to point out that, due to the design of MAS, this tool can support new games and artifacts by configuration, without issuing a new version of the tool.

4 Conclusions and Future Work

In this paper MAS, a fully customizable platform to support the development of people with intellectual disabilities is presented. MAS is based on the use adaptive games and effective reinforcers (photos, multimedia clips, sounds, etc) to attract the student to the tool. The feedback of its implementation gives promising results. MAS was installed in a special needs education institution in Madrid, Spain, MAS provides special educators with a tool that, according to their comments and feedback, improved students education processes.

Future works should be centered on extending MAS to the internet. Although the design of specific tools for the internet is still a challenge, this global network brings also opportunities to MAS. This new feature will bring the possibility to collect information from all over the world, bringing also the chance to compare results, learning processes, teaching styles and cultural differences.

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Student Blogging: Implications for Learning in a Virtual Text-Based Environment

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Abstract. Realising the potential for web-based communication in learning and teaching is challenging for educators. The purpose of this paper is to report students' attitudes and perception of active learning when using an unrestricted blog in an academic context. It will examine if an unrestricted blog can be used to support reflective and critical discussion leading to the construction of knowledge whether. Unrestricted in this context refers to autonomous individual and group activity undertaken in an unstructured online environment. It will attempt provide an insight into what students make of working at the intersection between academic and online environments. Data was collected using an online survey with questions focused on student perceptions of the type, frequency and effectiveness of their strategy use. Analysis of the resulting material was conducted using Bloom's revised taxonomy to determine whether student strategy was useful in supporting the construction of knowledge. Our research indicates that students need to suitably prepare themselves or be prepared by others to make the most effective use of their prior familiarity with this form of communication technology (which is usually informal) in order to constructing knowledge in an academic context. Thus we conclude that effective learning will only emerge from considered pedagogical design, informed by the student experience and perspective.

Keywords: word, Blogging, virtual learning, cognitive investment, constructing knowledge, text based communication, higher education.

1 Introduction

The traditional notion of space and time in which learning and teaching takes place is being redefined partly as a result of the use of new technology (Tinio 2003). Web 2.0 technologies, sometimes collectively known as the Social Web, are a significant part of this milieu. They have had a dramatic impact on the lifestyles of the current generation of students entering higher education and are already widely incorporated into teaching and learning. Questions have been raised about whether academics are sufficiently adept in their use (Georgina & Olson, 2008; Selwyn, 2007) to be able to provide what some believe could be richer and more pertinent educational experiences as a result of

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Blogs provide an environment that potentially supports an active process of thinking and learning (Goh, Dexter, & Murphy, 2007). They allow interactivity and, through the expression and discussion of individual ideas, a forum for learning (Williams & Jacobs, 2004). They can provide a record of conversation and evidence of collaboration that can be used by group members as a basis for thoughtful dialogue (Hanlin-Rowney, et al., 2006) allowing the development of common meaning to be constructed from multiple perspectives (Marshall, 1995).

The central question examined was whether an unrestricted blog space supported reflective and critical discussion leading to the construction of knowledge. An unrestricted blog is one where students are tasked as a group to independently solve a problem through online interaction. It is unrestricted in the sense that there is no input or oversight by a teacher during the discussion process, nor are students given a structure, such as being allocation of roles or provided with writing frames. They are responsible for deciding when, how and what they will interact in the blog environment. In other words, the participants are required to become active learners, engaging behaviourally and cognitively through an online discussion to describe, organise and process information. Of course, even within an unrestricted blog there are still definite boundaries provided by the student's knowledge and perceptions of the task, context, peers and teacher expectations. Nonetheless, we drew upon the idea of 'unrestricted' in order to construct a learning environment where students were able to personally construct meaning rather than being herded or constrained (Jonassen, Davidson, Collins, Campbell, & Haag, 1995). Our role was limited to observing and formally describing how the students made sense of working in this context. This method was chosen deliberately because the apparent absence of formalised structure mimics to a certain extent how students engage with messaging and networking sites. This allowed us to explore how experience of virtual personal and group space, with its linguistic shorthand and associations with leisure and informality, supports academic exchange which requires precision and decision making based on evidence.

2 Methodology

A case study approach, as described by Yin (2003), was employed to generate quantitative and qualitative material for analysis. The case study involved a cohort of approximately two hundred students from La Trobe University in Australia. The students were in the second semester of their first year of a four year primary teaching degree. The students were asked to work in small groups to explore an education related theme using a blog as their principal means of interaction. While face to face contact was allowed for an initial discussion, to set up the blog and to prepare any final submission, the majority of the work was expected to be done using the blog. Through it students were required to: discuss and debate the issue being scrutinised; determine cognitive strategies; work as a group with minimal input from lecturer; and make a group decision about any final conclusions or solutions. Data collection and analysis was based on the cognitive process dimension based on the revised version of Bloom's taxonomy (Krathwohl, 2002). Constructing knowledge assumes the use of complex, or higher order, cognitive strategies including analysis, evaluation and creativity (Anderson, et al., 2001). This is in line with established practice (Schrire, 2006). Table 1 outlines the categories used for the transcript analysis and to prompt students during the self-reporting of posts.

Table 1. Categories for transcript analysis and student self-reporting (Based on Bloom's revised taxonomy)

Category	Examples
Remembering	Making a post with a personal opinion or idea
Understanding	Asking clarifying questions
Applying	Extrapolating the group's posts against the task requirements to see if the group is working effectively
Analysing	Finding coherence in the group's posts Distinguish between relevant and irrelevant material, important and less important ideas
Evaluating	Judging the potential effectiveness of an idea Making the decision about which idea is best
Creating	Coming up with alternative ideas or solutions Designing and constructing the final product

Data was collected through an online self-report questionnaire conducted after the task was completed. The questionnaire gathered self-reported information on student familiarity with technology, the cognitive strategies used and their effectiveness and some measure of engagement with the task. While student self reports cannot capture the ongoing fine grain detail of cognitive processes, they do indicate student propensity for strategy use (Pintrich, 2004).

3 Findings

The student participants were asked about their level of access to the internet and usage of Web 2.0 technology. Overall, students indicated a high level of internet access either at University (98.9%, n = 181) or at their current place of residence (90.6%).

Students were generally not regular users of Wiki's (10.1% overall gave a positive response to the statement "I use a Wiki regularly", n = 179) and Podcasts (10.6%). Students were more regular users of Social Networks (86.6%) or You Tube (62.6%) sites.

Students were not regular users of a blog (37.4%), implying that the majority of students were not familiar with the use of blogging as a communication media prior to the task being implemented.

Table 2, below, shows five statements about student effort, interest, involvement and perceptions of challenge and anxiety associated with the blogging task. In terms of rank order, students perceived that the task was interesting and required a significant investment of time and effort, although it did not induce a high level of anxiety.

Table 2. Mean scores for question 'Indicate your level of agreement with each statement'

Statement	Mean score (n = 179)
I invested significant time and effort in this task	4.26
This task was interesting	4.23
Overall I was deeply involved in learning	4.16
This task was challenging	3.89
This task made me anxious	2.59

Note 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree or disagree, 4 = Agree, 5 = Strongly agree

Table 3, below, shows the transcript analysis and mean scores for student perceptions of the frequency and effectiveness of their use of cognitive strategies. The tables are organised using a revised Bloom's taxonomy, cognitive process dimension.

Table 3. Summary of transcript analysis and student perceptions

Analytical post category	Transcript analysis		Student perceptions	
	Zero Count[a] (%)	Post Frequency[b] (%)	Post Frequency[c]	Effectiveness[d]
Remembering	10.5	11	3.69	3.85
Understanding	0	25.1	3.65	3.74
Applying	63.2	2.9	2.99	3.47
Analysing	5.3	35.6	3.54	3.73
Evaluating	15.8	10.3	2.5	2.79
Creating	5.3	15.1	3.32	3.61

Notes

a Based on analysis of a sample of nineteen blog transcripts, the percentage of transcripts with no posts from this category

b Based on analysis of a sample of nineteen blog transcripts and 582 posts, the percentage of post in this category

c Mean scores for question 'How frequently did you post …?' 1 = Never, 2 = Rarely, 3 = Occasionally, 4 = Frequently, 5 = Very Frequently (n = 179)

d Mean scores for question 'How effective do you think your post was about …?' 1 = Extremely poor, 2 = Below average, 3 = Average, 4 = Above average, 5 = Excellent (n = 179)

The category of 'evaluating' is used as an example to describe the data. In the context of blogging, evaluating refers to checking the group's ideas against the education literature, critically examining the final product by looking for inconsistencies and fallacies, judging the potential effectiveness of an idea, and making a decision about which idea is best. 15.8% of the transcripts examined had no posts related to this category. Postings that could be categorised as evaluating were only 10.3% of the 582 posts examined. Evaluating was perceived by students as the least frequently used post, and those posts that were made were perceived as being below average to average in terms of effectiveness. This indicates that students were not adept at making judgements or being critical of other group member's posts. The student perception columns show the most frequently used blogging strategies employed by students were attempting to explain a post in detail and posting a personal opinion or idea. The least frequently used strategies were coming up with alternative ideas, constructing a visual representation to show how the group's ideas might work, and making a criticism of another group member's idea. Students generally regarded the effectiveness of their posts as average to above average. The ranking of the students' perceptions of effectiveness generally follow the same pattern as frequency. For example, the most often used strategies have the highest effectiveness ranking. The least frequently used strategy of making a criticism of another group member's idea was the lowest ranked both in terms of frequency of use and effectiveness. It can be seen that the most frequent postings are in the categories that call for less complex cognitive processes. Posting an idea or explanation are less complex processes than making a criticism, connecting ideas to learning theory, or seeking alternative ideas from other sources. The data shows there was a tendency, although not significant, for students to use less complex processes to complete the task requirements. Students were asked an open-ended question about the problems they had experienced when blogging. Four themes were identified during the analysis and the coding shown in Table 4.

Table 4. Student perceptions of problems when blogging

Themes	% (n = 159)
Writing posts was slower and more confusing than face-to-face communication	19.4
Timing issues; waiting for others to respond to posting, simultaneous multiple postings	17.0
Unable to access or use features of blog, internet problems, uncertainty about how to use blog	15.8
Some group members did not participate, or under-performed	14.5

Note. 33% of students indicated they encountered no problems during this task.

Students indicated concerns about continuity and clarity while communicating and discussing ideas in a blog. Although blogging could replicate the interactivity of a face to face discussion, it only became conversational if the group members were able to respond to each other's posts within a reasonable time period. These timing problems meant that the conversation within the blog environment was out of sequence, leading to a perception of confusion. This confusion was also related to the notion that it was difficult to clearly communicate an idea or indeed to explain, analyse, justify and apply the meaning of an idea solely in writing. They perceived it to be an inefficient method of getting an idea across. An academic conversation, indeed nay form of face to face conversation with all its nuances can be multifaceted and encompass many levels of understanding very quickly. Students found blogging could not replace this immediacy.

The following selection of student responses illustrates these points:

- It takes a lot of fiddling around, rather than just sitting down with your peers and talking about your ideas. (Student 23)
- Hard to clearly express ideas and understand others (Student 48)
- Well it's not a real conversation (Student 73)
- It's hard to show excitement and enthusiasm in a blog post (Student 101)
- You can't be as honest or open about things over blogs (Student 107)

Two general solutions were used to resolve blogging problems. First, several groups used alternative methods to discuss and complete the task. These included email, phone, Face book and face-to-face meetings. Secondly, some groups used other communication methods, including email and texting, to ensure that all group members were aware when and how the blog was to be used. Students were asked an open-ended question about the advantages they perceived in blogging. Four themes were identified during the analysis and the coding shown in Table 5.

Table 5. Student perceptions of advantages of blogging

Themes	% (n = 171)
Flexibility, allowing contributions to be made at any time and from any space	46.8
A visual process of description, clarification and discussion of ideas over time	21.6
Technology was easy to access and use	18.1
Provided a record of discussion that could act as a reminder of task progress and show contribution of each group member	13.5

Students perceived that the flexibility of the blog allowed them to communicate and work on the task from any location and at any time. This was particularly important for those students who either lived off-campus or who had employment and family issues that limited their availability for face-to-face meetings. Students also appreciated the ease of use of the blog, some describing it as an interesting educational tool. Students also perceived the blog as a visual record of the thoughts and discussion of the group. A student could contribute in a thoughtful way, and these ideas could then be considered and discussed by other group members. The process of writing down ideas also forced students to become more precise in the way they wrote about their ideas.

The following selection of student responses illustrates these points:

- The thoughts of group members are made clear and precise (Student 12)
- A great way to show a conversation and communication between group members (Student 35)
- Blogs force you into writing your ideas and encourages feedback (Student 55)
- Writing our ideas down gave me a much better understanding of learning theories (Student 66)
- You get to think in-depth about your response (Student 91)

4 Discussion

Blogs allow students, at any time and from almost anywhere, to think about, post, reflect, analyse and evaluate ideas (Mimirinis & Bhattacharya, 2007; Wu, 2003). In this case, these advantages were appreciated by the students, although we argue that the full potential of the blog was not achieved. While the collaborative process was purposeful in the sense the students found the task interesting and invested effort, the task's purpose of critically constructing knowledge required a greater use of higher order strategies including evaluating and creating.

If the students had been in locations which were remote from each other then the number of alternative solutions they could employ to enrich (or in some cases circumvent) the blogging experience may be severely reduced. They could not readily meet in person to tease out meaning or develop understanding or even help wit the maturation of the group. In a sense this gets to the heart of one of the main issues. The benefits of using this form of communication to stay in touch, to arrange meetings or to discuss the latest news, whatever it might be, are apparent to what could be termed as the first truly digital generation, but less so in an academic context unless genuine need can be demonstrated. The connection between Web 2.0 in social use and '…in learning is as yet only dimly perceived by students, and only a little more clearly by staff' (Melville, 2009) There is also a certain inertia that results from traditional notions of what it is like to be at University. The view that personal contact through the tutorial system and meetings with peers are what characterises the experience may be deeply ingrained and difficult to overcome. This may be based largely what they have been told by others and how they were taught in school.

The students tended to post personal opinions, but struggled to collaboratively analyse or evaluate these opinions in order to construct knowledge. This is consistent with Thomas' (2002) finding that it is difficult to have a written online conversation that is both academic and interactive. Thomas argues that while there may be attempts at online discussion, there is frequently no coherent structure between the posts, and a lack of real collaborative knowledge construction. There are several possible explanations for this variation in cognitive investment. In particular, students may have felt overwhelmed when using a process where they are required to make autonomous choices about effort or lack the knowledge and skills for effective participation (Ploetzner, Bodemer, & Neudert, 2008). Further, there is perhaps an assumption on behalf of academics that because students are familiar with online communication they can also use these technologies for academic purposes. For blogs to achieve their potential in terms of the critical construction of knowledge, educators need to explicitly structure the learning experience to match the student context including the appropriate use of the technology; and prepare students to engage in and manage and interpret multiple online conversations.

There are undoubtedly a number of different approaches and strategies to achieve the desired outcome in online contexts, some of which can legitimately developed by the students themselves. In this case students were able to exert some control over how the task is completed because the environment in which they're working was not heavily regulated. Whilst this offered the opportunity to be creative the lack of structure can also be problematic when combined with a poor motivation and/or experience. Educators need to provide support and scaffolding during the early phases of the task to overcome this issue. They must also be mindful that support can also stifle intellectual growth because if it is too structured and fails to recognise the contribution an individual makes to his or her own development. Students must be allowed to explore different strategies and construct their own meaning. They must have scope for making choices. While it is important to provide students with a framework to support the development of knowledge processes there is a need to balance providing structure with a working space for students to explore emerging meanings without explicit teacher direction.

5 Conclusions

Publishing space, including blogs, have great potential to utilise and further develop communication skills, creativity, leadership, technological proficiency and provide opportunities for multiple forms of active learning, collaboration and partnership providing they are used appropriately (Garrison & Vaughan, 2008). We contend that effective e-learning will emerge from considered pedagogical design, informed by the student experience and perspective. It is clear that context and the point of application are equally important as the desired learning outcome.

Learning is complex and dynamic and ‘imagining technology’ as Melville (2009) refers to it, not only presents users with conceptual and logistical challenges, it requires them to redefine their understanding of time and space in relationship to their work. We agree with Salmon (2005) and Westbrook (2006) that truly meaningful learning will only result in this context if a considered and appropriate pedagogical design that addresses some of the difficulties identified in our exploration of the subject is adopted. Protocols need to be established which guide users when and how to engage with the technology, particularly in relationship to the frequency and nature of their contributions. Addressing the vexed issue of writing which represents evolving thoughts at both an individual and collective level is also paramount. There is already an inbuilt conflict between the language used in other social networks and the language required in this context to develop understanding and refine thinking. Clearly participants in this type of activity need demonstration, persuasion and room to experiment before being launched into the main event. Instructional design can influence the level of student engagement. To ignore these factors invites failure.

While higher education teachers have readily embraced Web 2.0 technologies it is students who have to make sense of and construct a means of using the technology effectively. Perhaps in our rush to use them we have made too many assumptions about their attitudes and experiences. This work provides encouragement to continue using these technologies but raises enough issues for us to pause for thought. Melville (2009) suggests that tacking this means ensuring that students possess the

> "…skills and understanding to search, authenticate and critically evaluate material from the range of appropriate sources, and attribute it as necessary. Allied to this is providing for the development of web-awareness so that students operate as informed users of web-based services, able to avoid unintended consequences. For staff, the requirement is to maintain the currency of skills in the face of the development of web-based information sources" (p. 7)

The limitations of this study need to be taken into account. The analytical framework was a useful sensitising construct that allowed the basic categorisation of student strategy use in the blog environment. However, the researchers remained mindful throughout of the limitations of any taxonomy (For example see Chan, Tsui, Chan, & Hong, 2002). For example, this framework is underpinned by the notion that there is an effective and relatively concrete process that can be used as a basis for examining blogging transcripts for levels of behavioural and cognitive strategy use in order to construct knowledge. It focuses on the students' actions rather than any deep analysis of the level of thinking apparent in the outcome. There is also a tendency to consider the act of making a post a relatively artificial process. By artificial we mean a form of exchange that can be technically analysed without consideration of the multi-dimensionality, immediacy, subtly and nuances of face to face communication. However, despite this pitfall our analytical framework does provide a reference point for further research, particularly in-depth case studies of how students are negotiating the use of online media in higher education.

Biographical notes

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Confidence-Based Learning in Investment Analysis

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Abstract. The aim of this study is to determine the effectiveness of using multiple choice tests in subjects related to the administration and business management. To this end we used a multiple-choice test with specific questions to verify the extent of knowledge gained and the confidence and trust in the answers. The tests were performed in a group of 200 students at the bachelor's degree in Business Administration and Management. The analysis made have been implemented in one subject of the scope of investment analysis and measured the level of knowledge gained and the degree of trust and security in the responses at two different times of the course. The measurements have been taken into account different levels of difficulty in the questions asked and the time spent by students to complete the test. The results confirm that students are generally able to obtain more knowledge along the way and get increases in the degree of trust and confidence in the answers. It is confirmed as the difficulty level of the questions set a priori by the heads of the subjects are related to levels of security and confidence in the answers. It is estimated that the improvement in the skills learned is viewed favourably by businesses and are especially important for job placement of students.

Keywords: Knowledge, test, trust, confidence, skills, administration and business management, investment analysis.

1 Introduction

The number of students attending higher education institutions has more than doubled in Europe during the last twenty-five years. The resulting flow of graduates on the labour market may justify the doubts expressed about these young people's career prospects, given the present economic and social trends [4]. One of the central issues in higher learning today is the certification of knowledge by universities. In addition to the core mission of knowledge production and transmission, the University must respond to changing education and training needs occasioned by the knowledge economy and society, among which are: increased scientific and technical education, and the need for cross-curricular competencies and lifelong learning opportunities [8]. This paper aims to deepen the study of the concept and measurement of knowledge, especially in this type of knowledge that is acquired in order to get more training.

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This training usually takes place by definition in professional training schools. Technical or professional knowledge is acquired through different means and is not an objective of this study to determine the sources through which knowledge can be transmitted to facilitate learning. The aim of this work is to test a system to assess the specific knowledge to be transmitted to achieve a minimum requirement, while at the same time introduce a system of quality assessment, based on the concept of confidence of knowledge. In this sense, test an evaluation system to determine the degree of utilization of a subject related to investment analysis in accordance with the two parameters mentioned, ie. the level of knowledge gained in a particular field and the level expressed confidence about the answers. It is important to note that despite the efforts made so far, has not yet been possible to find a comprehensive and effective system that allows students to assess themselves at the beginning and end of a training process so that measurable manner can be shown the progress achieved in each of the aspects evaluated. This could be one of the possible outcomes of this project as well its contrasting by the faculty at the university level.

1.1 Definition and Assessment of Knowledge

We start from the classical definition of knowledge as justified true belief. Usually talking about a real and true answer is difficult and complex. so it has replaced the concept of true by "right" somehow to suggest that such knowledge is recognized among the group that is grouped so it is ready to establishing rules on a particular subject area. Usually experienced teachers are able to recognize when a student masters the subject, if studied as agreed, or if they can adequately reflect on the concepts seen in class, the degree of understanding of different readings, the use of vocabulary appropriate specialist, and so on. All these perceptions, together with the tone of voice used, the degree of security in the responses gives the teacher sufficient evidence on the level of knowledge a student possesses. The term professional is used here according with the International Standard classification of occupations (ISCO):"Professionals increase the existing stock of knowledge, apply scientific or artistic concepts and theories, teach about the foregoing in a systematic manner, or engage in any combination of these three activities" [6].Regarding to Finance and Administration, Department managers plan, direct and coordinate the internal administration or financial operations of the enterprise or organization, under the broad guidance of the directors and chief executives, and in consultation with managers of other departments or sections. In this sense, Cuando se trata de evaluar el conocimiento nos encontramos con un reto fenomenal como es el de establecer las reglas por las que hay que premiar determinado tipo de conocimiento y penalizar otras, teniendo en cuenta los dos parámetros expresados anteriormente: el nivel de conocimiento mediante su aproximación para la corrección de la respuesta, y el nivel de confianza mostrado.PrPppppoiuoiuiouioejfjkdjfkjdInjjjkdkdkdkdwe have a phenomenal challenge as is to establish the rules by which we must reward certain kinds of knowledge and penalize others, taking into account the two parameters previously expressed: the level of knowledge through its approximation to the correct answer and the confidence level showed. To be useful to a person, the knowledge must not only be acquired, but also retained or remembered [5]. In professional life there are many occasions when it is necessary to demonstrate not only that they have some knowledge but it is necessary to implement them, share them with others, colleagues, subordinates, bosses, etc. ...,. Elements as interaction, cooperation, credibility, confidence and commitment are recognized in the literature as elements that strengthen the relationship between the organization and consumers, making them more stable with time [9]. In all these cases the degree of assurance on the statements and responses manifested as one of the attributes most valued by managers and professionals affiliated companies.In today's multiple-choice tests if an incorrect answer is selected, then it is interpreted simply to mean that the person does not know the answer, i.e. is uninformed. This inference is misleading. Specifically, the person may be extremely sure that the incorrect answer which he/she selected is correct and, thus, may be misinformed– which is much worse than being uninformed [5]. The aim of this work focuses on linking the assessment of learning outcomes from a mixed perspective. Making use of a multiple choice questionnaire will assess the degree of acquired expertise combined with the confidence placed by people who answer the questionnaire. Confidence-based learning has been used extensively in some specific knowledge areas as for example Gardner-Medwin and Gahan [3], but as we know it hasn't been studied in areas related with financial concepts.

2 Research Design

In general, we distinguish between two types of tests: tests training (formative assessment) and evaluative tests (summative assessment). Regarding summative assessment, Confidence-based marking places a premium on careful thinking and on checks that can help tie together different facets of knowledge. Thereby, it encourages deeper understanding and learning [1].However, in this article and following the work of Gardner-Medwin, A. [2] [3] from the standpoint of learning the evidence seems most effective when they are voluntary and have no impact in terms of academic note, so it is filled in completely voluntary (formative assessment) on the part of students and the commitment by part of the academic direction of not being used to impose a different note, and that the only purpose was purely scientific. The final version of the test contains 20 questions with response alternatives where one and only one was correct. While it is possible that the correct answer would be: "above all" or "none of the above" In addition and with each of the questions the student should answer the degree of confidence in the response. The questions were contained in four blocks of homogeneous content. Each block contained five questions, two of which corresponded to level 1 (basic), two questions corresponded to level 2 (intermediate level) and one question to level 3 (advanced). In total, therefore, the breakdown by level of difficulty of the 20 questions was: 8 questions of level 1, 8, and Level 2 questions 4 questions at level 3. Los cuestionarios están vinculados al área de conocimiento del análisis de inversiones, la cual forma parte del plan de estudios de la carrera de Administración y Dirección de Empresas (ADE).The questionnaires are linked to the knowledge area of investment analysis, which is part of the curriculum of the Administration and Management degree. El perfil del estudiante estándar en esta titulación es una persona que trabaja, de edad superior a 30 años y con responsabilidades familiares.The student profile in this qualification standard is a working person, over the age of 30 years and with family responsibilities. No se han tenido en cuenta en el estudio variables de género, si bien en estudios como el de Koivula et al.

Were not taken into account in the study variables of gender, although studies such as Koivula et al. (2001) se han encontrado diferencias en las respuestas dadas en función del género.[7]found differences in the responses by gender. En este estudio hemos considerado el tratamiento de los datos de forma global. In this study we considered the processing of data in aggregate form. TheAunque el uso que se ha realizado de esta prueba en principio está diseñado para evaluar el trabajo realizado durante un período determinado, en lo que vendría ser un trabajo valorativo de curso o semestre.TheT test was designed to evaluate the work done during the whole course. Existen varios usos alternativos que se muestran como más eficaces desde el punto de vista del aprendizajeUn aspecto importante del cuestionario es que se distribuyó en dos momentos del tiempo diferentes: al principio y al final de curso.An important aspect of the questionnaire is that it was distributed in two different time moments: at the beginning and at the end of the course. El primer cuestionario fue cumplimentado antes de realizar ningún tipo de actividad académica. The first questionnaire was completed before performing any academic activity. El segundo cuestionario, que contenía exactamente las mismas preguntas fue cumplimentado al final de curso coincidiendo con el período habitual de exámenes. The second questionnaire, which contained exactly the same questions, was completed at the end of the year coinciding with the usual period of examinations. En ninguno de los dos momentos se realizó ningún feedback sobre el resultado del primer ni del segundo ejercicio ni tampoco se realizaron comentarios sobre los contenidos de las preguntas ni la posible puntuación de los ejercicios realizados.The TdklkldkdThere was zero feedback on the outcome of both questionnaires, and there weren't any comments on the contents of the questions and the possible score of the exercises performed. Open University of Catalonia es una universidad virtual por lo que se optó por distribuir el test mediante formulario electrónico, lo cual aseguró la inexistencia de errores en la transcripción de los datos.Open University of Catalonia is a virtual university so we decided to distribute the test through electronic form, which assured the absence of errors in transcribing data. Al mismo tiempo, se incluyeron anotaciones automáticas sobre el tiempo destinado por cada estudiante a la cumplimentación del test asignado. At the same time, automatic annotations were included on the time spent by each student on completing the assigned test. Consideramos que el uso del test electrónico puede suponer una ventaja para su realización. We believe that the use of electronic test can be an advantage for its realization. Además se corresponde con el uso diario y habitual de las tecnologías en las organizaciones. Also corresponds to the daily and habitual use of technology in organizations. With the widespread use of ITs, global or virtual teams have become a reality. Some authors analysing the ability and willingness to cooperate, suggests that ITs increase teamwork integration in two ways, firstly facilitating and speeding knowledge transfer, both tacit and explicit and secondly, reinforcing the levels of trust and confidence that normally develop in face to face meetings.With the widespread use of ITs, global or virtual teams have become a reality. Some authors, analyzing the ability and willingness to cooperate, suggest that ITs increase teamwork integration in two ways, firstly facilitating and speeding knowledge transfer, both tacit and explicit and secondly, reinforcing the levels of trust and confidence that normally develop in face to face meetings(Serradell-Lopez et al., 2009). [9]. From a total of 606 students, 101 respondents filled out the first questionnaire, and 67 students filled the second. Producing a response rate of 16,7 % and 11 % respectively. Los objetivos de la investigación planteados y que se analizan en el siguiente apartado son:The objectives of the research proposed and discussed in the following paragraph are:

1. Is there a difference in the degree of confidence in the responses in the two periods?
2. Does it match the degree of difficulty of the questions provided by teachers with lower levels of confidence in the answers?
3. Is it related to the time spent fulfilling in the test with the level of confidence in the answers?

3 Data and Analysis

As stated earlier, each question in the questionnaire included another question about the degree of security and confidence in the response variable using a Likert-type scale, with five values, on which the value 1 indicated “Extremely unsure”, 2: “Very unsure”, 3: “Somewhat sure”, 4: “Sure”, and 5: “Extremely sure”. To verify the above proposals has proceeded to a data analysis using the t test for equality of means.

3.1 Analysis of the Degree of Confidence in the Answers in the Two Periods

The table 1 shows the main descriptive statistics of the analysis. The security expressed in the responses of period 1 equals 2,94, being the period 2 of 3,63. Furthermore, this difference shows up as significant. Increased confidence in the response between the two periods is 23, 47%. This increase is explained by the normal monitoring of the course by students.

Table 1. Mean, standard deviation and T-test results of the degree of confidence in the answers

	Period	N	Mean	Std. Deviation	t-value	p-value
Confidence	Per. 1	101	36,0891	15,26637		
	Per. 2	67	66,4925	13,36365		
T-test					-13,271	0,000 < ,05

3.2 Analysis of Levels of Difficulty

This section analyzes the responses according to the level of difficulty a priori established by the faculty. The results show that the difficulty of the questions selected by the teacher adapts to the difficulty level set. The higher the difficulty the greater the uncertainty expected in the response. Furthermore, decreases by security levels. The security level used corresponds to the average of each level.

The ANOVA analysis performed shows significant differences between the averages of the three levels.

Table 2. Mean and standard deviation of confidence between levels

Confidence	Period	N	Mean	Std. Deviation	Minimum	Maximum
Level 1	Per. 1	101	2,0532	,86482	,25	4,25
	Per. 2	67	3,5243	,72111	1,88	5,00
	Total	168	2,6399	1,08411	,25	5,00
Level 2	Per.1	101	1,8119	,78235	,38	3,75
	Per.2	67	3,2351	,73711	1,75	4,75
	Total	168	2,3795	1,03430	,38	4,75
Level 3	Per.1	101	1,2921	,88746	,00	4,00
	Per.2	67	3,1045	,86509	,00	5,00
	Total	168	2,0149	1,24886	,00	5,00

Table 3. Anova test of confidence between levels

		Sum of Squares	df	Mean Square	F	Sig.
Level 1	Between Groups	87,163	1	87,163	132,608	,000<0,05
	Within Groups	109,112	166	,657		
	Total	196,275	167			
Level 2	Between Groups	81,586	1	81,586	139,525	,000<0,05
	Within Groups	97,067	166	,585		
	Total	178,653	167			
Level 3	Between Groups	132,310	1	132,310	171,386	,000
	Within Groups	128,152	166	,772		
	Total	260,463	167			

3.3 Analysis of the Time Differences between the Two Periods

Under the assumption that all the time spent has been devoted to reflection, the time dedicated to the second period, when the course was ended is higher than in the first period (16 minutes 49 seconds against 16 minutes 4 seconds). However, the differences between time periods are shown as not significant at the 0.05 confidence level.

Table 4. Mean, standard deviation and T-test results of time differences

	Period	N	Mean	Std. Deviation	t-value	p-value
Time (seconds)	Per. 1	101	964,7228	506,56329		
	Per. 2	67	1099,0597	586,07875		
T-test					-1,580	P=0,116>0,05

4 Summary and Conclusions

In this paper we have tried to verify changes in the degree of confidence in the response of a group of students at the Bachelor's degree in Business Administration and Management of the UOC. It has highlighted the importance of evaluate adequately the knowledge gained by students and the need to provide this knowledge-based guidelines on confidence and trust, and most cherished values the company at present. On this basis, we have designed a questionnaire with 20 questions and 4 possible answers, the student respondents who voluntarily participated in the work, applied to the area of investment analysis. These results allow us to state that the degree of confidence in the response increases dramatically at the end of the period (from 1,8 to 3,33, representing an increase of 85%). Since this, difference clearly significant. In terms of confidence level used (a variable Likert 5 positions) the value would be located near 1,8 to a value less than "Very unsure" as that 3,3 would be located in "Somewhat sure". In a second step, we proceeded to analyze the three different levels of difficulty of the questions. From the data, we can say that the greater the difficulty a priori established by teachers, the lower the level of confidence achieved. At level 1 (basic), confidence average goes from 2 to 3,5 (an increase of 75%), at level 2 (intermediate), the average goes from 1,8 to 3,2 (increase of 50 %), whereas at level 3 (advanced), the average goes from 1,3 to 3,1 (one 138.5% increase). The use of difficulty levels shows that the perception of teachers is consistent with the results, and also presents a potential for the development of new educational elements based on the degree of difficulty of the subjects studied. Finally, we proceeded to analyze the time spent thinking to complete the questionnaire, by analysis of means. The result shows that it has been used a little more time to answer the second questionnaire than the first, although the difference is not significant from a statistical standpoint. We believe that de difference is due the accumulated knowledge stock owned by the student at the end of the course, and the needing of reflection that should be evaluated before making decisions.We consider that the approach used is interesting and with high value in the area of management and business administration. Different variants may arise in the future as the binding and its use for academic assessment.

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Language Teaching across the Digital Divide

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Abstract. This paper is an exploration of the reflexive relationships between language teaching, social justice and online networking. The overlapping objectives among these three pursuits are considered in the argument for the use of videoconferencing technology in virtual language classrooms for the purpose of revitalizing fossilized languages (in diasporic communities) and endangered languages (in aboriginal communities). The virtual classroom allows for a levelling of the playing field in that the absence of a shared physical space can potentially reduce the weight of cultural and linguistic hegemony. The capacity of the internet to overcome challenges of time and distance means that language speakers and learners in disparate locations can meet in real time to ensure a language's survival.

Keywords: Second language instruction, CALL, Virtual Classrooms, Language Loss.

1 Introduction: Language Attrition and the Power Struggle

There is no shortage of research demonstrating that when two cultures make contact through either migration or expansionism, there will be rapid mother-tongue shift to the dominant language especially when there are assimilationist policies or socio-economic incentives in place to discourage the use of the minority language (Paulston, 1994; Garcia and Diaz, 1992; Conklin & Lourie, 1983). While researchers have identified some factors which help to slow down the process of language shift, the mother tongues of diasporic and aboriginal communities around the world are in jeopardy of being replaced by the language of the dominant culture in each context (L2).

The relationship between power and the status of a language was expressed most concisely by Yiddish linguist Max Weinreich when he described a language as "a dialect with an army and a navy"[1]. This description aptly encompasses the process by which one linguistic variety becomes the official or standard language within a nation, as well as the process by which indigenous languages are essentialized and rendered invisible save for their exotic appeal as names of cities, regions or bodies of water. The army and navy serve as modern day metaphors for the might a language wields when it is the one in which education, commerce, governance, law and health care are

[1] Not all scholars attribute the coining of this phrase to Weinreich. While various other names have been proposed, such as Joshua Fishman, there remains no clear originator of this popular and oft-quoted saying.

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conducted. As Heller (1987) explains, membership in a group entitles one to participate in social networks and have access to roles and resources controlled by that group. Such membership, more often than not, requires native-like linguistic and cultural proficiency. Skutnabb-Kangas (2002) describes language as "the DNA of culture", and Bruner (1990) argues that the power of a culture's account of itself to shape human mental functioning and human lives to its requirements should not be underestimated.

2 Computer Assisted Language Learning: A Brief History

Most of the early CALL research such as that of Freed (1971) and Chapelle & Jamieson (1986) focussed on the benefits of computer based language courseware (such as PLATO or PUNCT) and appeared to indicate that students were unsatisfied with the minimal amount of control or autonomy they had within the courseware (which consisted at that time of grammar, punctuation and vocabulary drills.).

Kern and Warschauer (2000) describe the second generation of CALL (the 1980s and 1990s) as a move towards a constructivist perspective with the development of CD-ROM technology and commercially available software that allowed the learner to move about in a simulated environment with video, sound, graphics and text.

With globalization came the awareness of the potential of simulated environments for teaching target language proficiency to low skilled workers in the tourism industry (waiters and taxi drivers working at tourist spots popular with Western travellers) or in out-sourced labour (corporate America's use of call centres in developing nations). E-Client was one program that sought to fill the niche.

The new millennium and the creation of Web 2.0 introduced the shift away from the learner's interaction with the computer to the learner's interaction with teachers and other learners via computer based networks. Social networking, chat rooms, learning management systems, podcasts, webinars and videoconferencing paved the way for online synchronous language teaching or synchronous Network Based Language Teaching (NBLT), as Warschauer and Kern (2000) refer to it.

Social networking sites and videoconferencing applications enabled would-be language learners to set up their own cyber interactions with native speakers on their own terms, for their own reasons and at their convenience. Innovative programs such as LingQ began to emerge which offered hybrid experiences for the language learner, whereby they could study online lessons on their own time and then interact with a personal tutor using free internet telephony. A quick browse of Facebook groups demonstrates the extent to which individuals are initiating reciprocal language learning and teaching communities through applications such as Skype.

For many, videoconferencing technology has come to be seen as the next logical step in language teaching and learning since its real-time two-way video and audio transmissions allow for learning communities to interact in a synchronous environment while continuing to make use of asynchronous teacher-student communication via e-mail or group discussion board postings, if desired. Recently CALL literature has been heralding the imminent pedagogical paradigm shift which will follow the arrival of videoconferencing technology in language classrooms. Nonetheless, there has been a dearth of contributions to the discourse with respect to best practices. Wilcox suggests that "[t]he stigma of videoconferencing is that, throughout its history, next year has always been the year it was going to 'really take off'" (O'Dowd, nda).

3 Language Education and Social Justice

Language planning or engineering is the term used in the discourse to describe an organized movement whose goal it is to counter the deleterious effects of policy with respect to a given language's status, modernization, and conservation (Baker, 2001). This effort is typically rooted in a sense of urgency regarding a given language's viability. According to Baker, more than half of the world's languages are no longer being transmitted to the children of that linguistic community (p. 50). Highly coordinated and well funded efforts to revitalize an endangered language have taken place in various countries: Wales (Welsh), Ireland (Gaelic), the Basque and Catalonia regions within Spain and France (Basque and Catalan), Peru and Bolivia (Quechua), New Zealand (Maori) and Israel (Hebrew) to name a few.

The painful legacy of native residential schools which operated in Canada, Australia, and the U.S. for over a hundred years remains all-too-visible in many tragic forms. The schools were set up to 'kill the Indian in the child" by separating children from their parents in order to 'civilize' them, convert them to Christianity and replace their mother tongues with English (de Leeuw, 2009).

Scholars interested in addressing these linguistic 'crimes against humanity' (Skutnabb-Kangas, 2009, p.55) have conducted research which has informed government and educational policy world-wide (Haugen, 1987; Fishman 1991; Wong Fillmore, 1991; Cummins, 1994; Skutnabb-Kangas 1999; Baker 2001; Osborn, 2006). Their efforts are visible in the form of sign laws, official recognition of minority languages, immersion education, heritage language classes, and mother tongue as medium-of-instruction concessions. Their efforts are affirmed in UNESCO's 1996 Universal Declaration of Linguistic Rights whereby individuals are guaranteed the right to use their own languages in private and in public (Article 3-1), and host countries are prevented from forcing or inducing the replacement of original cultural characteristics with those of the host society (Article 4-2).

4 The Internet and Social Justice

Equitable access to information and communication technologies (ICTs) for developing nations was declared a priority by the United Nations in 1997 (UN Administrative Committee on Coordination, 1997). Some researchers have even suggested that a link exists between networked communication and democracy (Kedzie, 1997). At the 2003 *World Summit on the Information Society* (WSIS, 2003) held in Geneva, world leaders from 175 different nations drafted a declaration of principles which included the recognition of the power of ICT to address social inequities, oppression, environmental concerns and human suffering.

In the private sector, corporate social responsibility (CSR) initiatives have made use of the internet for a number of important causes. Industries such as transportation, finance, communication, technology and natural resources are just some of the sources of funding for online projects intended to level the playing field for disadvantaged groups.

Samasource, a non-profit organization is the 'fair trade' leader in labour outsourcing. It accomplishes its mission to reduce poverty in low-income communities around the world by subcontracting dignified, technology-based work for a fair price to women, youth and refugees whom the organization trains at no charge.

Fire and Ice, a social responsibility initiative of Elluminate, has been behind many international partnerships between communities in developed and developing nations. The unique capacity of ICT to "reduce many traditional obstacles, especially those of time and distance, for the first time in history makes it possible to use the potential of these technologies for the benefit of millions of people in all corners of the world" (WSIS, 2003, Principle 8).

5 Online Language Learning and Social Justice

Early studies of the use of videoconferencing in language classrooms may have discouraged instructors and scholars from exploring its potential as a means of lifting language learning from the assimilationist and marketplace paradigms. Early focus on limited visual feedback, transmission delays and lack of shared workspace (Zähner, Fauverge and Wong, 2000), kept the discourse rooted in technological limitations, and left issues of social justice unexplored. In recent years, many of these and other earlier challenges have been addressed (at least in part) through more sophisticated virtual learning environments such as those in Elluminate and Adobe Connect. Improvements, such as the ability to 'raise one's hand' by clicking on an icon, provide the instructor and other students with a visual indication of who is in line to speak. The chat feature can serve as a means of providing simultaneous feedback while a classmate is speaking. Emoticon buttons such as a happy face, applauding hands or a thumbs-up also work well for simultaneously communicating with the speaker in the absence of body language and verbal cues. Whiteboards, note-taking pods and polls allow for collaboration within the whole class or in smaller break-out rooms.

A skilled language instructor can easily establish a learning community which replicates many of the key dynamics that exist in a face-to-face classroom. Knowledge is constructed and communicated via whiteboards, break out rooms, file sharing and even desktop sharing. Indeed the online virtual classroom has all the advantages of a traditional classroom as well as many more that are unique to this medium. Thus there is little if anything to discourage teachers, linguists, educational researchers and policy makers from accessing the synchronous virtual language classroom to prevent globalization from diverting our attention away from language shift and loss.

6 Conclusion

In this paper, I have argued for the use of synchronous learning management systems to protect against the individual and collective loss of a language through shift or extermination. The use of videoconferencing to revitalize a fossilized language in diasporic communities or an endangered language in aboriginal communities is the obvious solution to the challenge of connecting people across time and distance. It represents, to those of us interested in social justice, a fitting use of modern technology to protect the primordial knowledge embedded in language.

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EduSynergy: A Simulation-Based Change Management Experience for Higher Education Institutions

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Abstract. Although higher educational institutions are increasingly faced with demands for deep changes and innovations, they have a very distinctive culture which makes rapid change difficult. In order to address this challenge, we have developed and validated a new multimedia, team-based simulation, EduSynergy, which provides a rich, realistic experience of a change management project in a university setting, including individual behaviours, group dynamics and cultural factors. Feedback from 375 workshop participants indicates that the simulation is realistic, and 90% believe that it contributes to their understanding of change management more effectively than a lecture.

Keywords: change management, game, higher education, learning; simulation, university, validation.

1 Introduction

Organizations operating in the educational and academic arena are increasingly faced with various demands for deep changes and innovations of different types; for example, the adoption of new learning and knowledge diffusion approaches which take advantage of technological developments like the Web, or the capability to re-orient their services in an increasingly competitive, demanding and fast changing market. However, fostering change and enhancing collaborative behaviour in any organization is a challenging task. Although the ability to successfully manage change should be a core organizational competency, several studies indicate that more than 70% of large organizational change projects fail [1][2]. Compared to the corporate world, higher educational institutions have a very distinctive culture which makes rapid change even more difficult. For instance, university professors are trained to be independent thinkers, are used to significant autonomy, and might expect to be consulted on matters related to the effective governance of their institution [3][4]. In addition, such organizations are not just made up of teachers and researchers, but also management staff, support staff, students and a variety of external stakeholders. This coexistence of diverse discipline-specific subcultures with their own values, beliefs, aspirations, specialized languages and skills can make it very difficult for people to understand, trust and collaborate with each other [5][6].

In order to address this challenge, we focused our research on developing a rich, realistic experience of a change management project in a university setting in order to

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help individuals become aware of their own beliefs, and limitations, concerning change. This has resulted in a new multimedia, team-based simulation, EduSynergy, which models the dynamics of change in higher educational institutions, including individual behaviours, group dynamics and cultural factors.

2 Value of Simulation-Based Change Management Experiences

EduSynergy is based on an existing computer simulation, EIS, which provides intensive and productive learning experiences related to the dynamics of change in a company [7][8][9]. EIS simulation dynamics are based on published research in orga nizational dynamics [10][11][12][13][14]. In the EIS simulation, participants working in small groups have 6 months of simulated time to convince members of an acquired company's management team to adopt the corporation's Executive Information System (EIS). Participants can interact with these virtual characters and learn by trying out, and receiving immediate feedback, on 18 different managerial actions such as face-to-face meetings, pilot tests and covert lobbying. Each action uses up a set amount of simulated time.

The EIS learning experience was designed to stimulate collaborative learning and knowledge exchange [15][16][13]. Participants work in small teams of 4-6 players. Thus participants not only have to decide what tactics they would like to use on characters in the simulation, they also have to attempt to convince members of their team to follow their advice. Teams seem to provide a very good setting for games as they regroup different users with different experiences and approaches to a given problem. This generates debate and discussion making everyone even more engaged in the game scenario. The educational experience is enriched by group discussions before, during and after the simulation experience [16]. The EIS simulation has been deployed successfully in management schools and universities, as well as private and public organizations world-wide, for over ten years.

3 Overview of the Simulation's Dynamics

Over the years, a number of models and insights from the literature on change management, as well as psychology and social psychology, organizational behaviour and social network analysis, have been integrated into our EIS-based simulations in order to (i) reflect specific organizational dynamics to increase the realism of the individual or collective behaviour displayed by the simulated agents, and (ii) provide the basis for a rich, theory-based discussion of the players' teams experience during the debriefing sessions following each simulation run.

Change at the individual character level in the simulation is modelled by a progressive evolution of attitudes towards adoption based on Roger's adoption and diffusion studies [17]. Targeted management team characters in the simulation progress through four stages of adoption: aware, interested, trying, and adopter. Each character can move incrementally from awareness to adoption, or can move backwards towards awareness depending on internal or external factors in the simulation. During discussions this can be related to Conner and Patterson's work on building commitment to organizational change [18]. A particularly important transition is the one between the interest and trial phases where targeted individuals need to be willing and able to start experimenting with the new change. During debriefing sessions, this transition can be linked to the "Knowing-Doing Gap" of Pfeffer and Sutton [11].

The simulation also teaches the importance of considering that this adoption process takes place differently in different people as a function of their unique individual characteristics (e.g. history, personality), and their initial attitude towards change. The first aspect is modelled by the diversity of the management team character profiles. The simulated characters are given various stereotypical personalities to increase the possibility that players will recognize themselves or their collaborators. Each character also has an inter-personal communication preference; some individuals prefer face-to-face meetings, while others prefer email. The initial attitude towards change of the characters is based on the innovation adoption curve of Rogers [17]: innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%). The degree of difficulty in moving a character through the different stages of the change management process is inspired by the typical BDI (Beliefs-Desires-Intentions) architecture as described by Rao and Georgeff [19].

Increasing players' awareness of social networks is another goal of the simulation. Social influence or contagion models [20][21][22][23] and power networks [24] assume that opinions and attitudes of actors in a social system only partially depend on individual characteristics but are also shaped by social influence. This is modelled in the simulation by networks determined by a subset of characters, a formality level, an internal influence pattern matrix, and an updating frequency (i.e. how often the network is used to update individual's attitudes). The importance of the dominant opinion of the network on individuals not belonging to the network is also modelled. The tipping point concept [25] has also been incorporated into the simulation and can be discussed during the debriefing sessions. Pivotal roles have been given to five management team characters. These characters play the role of "mavens", "salesmen" and "connectors" in Gladwell's terminology, and determine in large part the optimal diffusion dynamics and the system's reaction to players' actions; for example, some actions are not successful unless these five characters have already been convinced to adopt. Thus, the importance of gathering information about individuals and informal networks early in the change implementation process is particularly important in the simulation and leads to an interesting discussion.

The culture of the simulated organization is also based on theoretical models which can be a basis for class discussion. Dynamics related to participative management [26] and distributive justice [27][28][29] are also included. Both of these factors have a significant influence when players use strong-arm or covert tactics, which typically generate long-lasting negative reactions in the majority of characters. Usually at least one group of players discovers this during the game, making for a lively discussion about the underlying theories. In addition, other tactics have been modelled to trigger the discussion of specific issues related to pedagogical objectives and external events have been added to the simulation to trigger discussion on specific points such as facing budget problems, allocating too little or too much time to the initial strategy-building phase, reacting to time pressure from headquarters, or what happens when key individuals suddenly leave the company during the implementation process.

These theoretical concepts have guided the development of the simulation [30][31] and have resulted in the following core learning objectives which can be directly related to the simulation's impact dynamics:

- Organizational change is a long-term process, not an event (success requires the right interventions on the right people at the right time).
- Individuals react differently to change (intervention, individual diversity).
- Resistance to change is to be expected (individual diversity).
- The importance of formal and informal social networks (formal structure, informal networks).
- Organizational culture is important (cultural aspects).
- The change process is subject to unexpected events (unplanned events).

4 Simulation Adaptation

EIS was adapted for deployment in Higher Education contexts by modifying the mission, the characters, the formal and informal relationship networks, the culture, the interventions, and the unplanned events to reflect specific features of change dynamics in academia. We named this adaptation EduSynergy.

The EduSynergy mission. The mission can be briefly summarized as follows: Humfeld University wants to implement a university-wide quality assurance system called AcadQual. The implementation process has successfully evolved so far, apart from one exception. Humfeld University's Graduate School of Management (GSM), a successful and highly renowned business school, is reluctant to adopt the new system. The president of Humfeld University has now selected a number of faculty members and high-level administrative personnel (i.e. your group) to undertake a challenging mission: persuade the Dean as well as the academic and administrative staff of GSM to adopt the new quality assurance system within the next six months.

The characters. The 24 simulated characters represent various stereotypical personalities found in academia to increase the possibility that players will recognize themselves or their collaborators. Profile descriptions provide hints about the individual's history, motives, habits and opinions. These profiles are only available if players choose to spend some of their simulated time getting them.

The relationship networks. Formal relationships among characters can be seen in an organizational chart. However, in order to gather information about informal social networks players must spend some of their simulated time. Informal social networks include people who meet regularly at bridge club, tennis club, local political events, or who are members of various academic committees.

The culture. Universities have a very distinctive culture compared to the corporate sector. Permanence, rather than change readiness, appears to be one key characteristic. According to Kerr [32], universities are among the few organizations which have remained pretty much unchanged since medieval times. Other key characteristics are participation and shared governance [4], autonomy [3], and the diversity and coexistence of discipline-specific subcultures [5]. This cultural dimension leads to a high degree of change resistance [33][34]. The University culture is modelled in the simulation by a preference for direct interventions such as face-to-face meetings, social protocols which include the necessity to persist meeting and reporting back to key individuals in spite of their rejecting attitude, and a general dislike of taking orders or covert interventions.

In addition, the intellectual skills and attitudes of academics make them sceptical of emotion-charged sermons exhorting change and warning of grim consequences if they don't [35]. The not-invented-here syndrome also appears to be especially relevant in higher education where academic staff are often perceived as unwilling to adopt new teaching methods, learning approaches, and material developed elsewhere [33]. Therefore character feedback during the simulation has been fine-tuned to express the way higher educational organizations might express different forms of resistance.

Interventions and unplanned events. The interventions found in EIS have been adapted for the academic environment and include a dinner event, information about committee membership, writing an article in the internal magazine, the "sandwich" (inciting interested individuals to go over their unconvinced superior's head directly to the Dean), electronic mail (general and selective), organize special course, hold special school management meeting, brown bag lunch, face-to-face meeting, see who takes short breaks together, send a memorandum, organize a pilot test, present in regular weekly management meeting, distribute questionnaire, invite external speaker, observe who meets outside work, neutralize resistors, set up task force, post on bulletin board, and one-legged interview (trigger "unplanned" brief encounter with top person to talk informally about project progress.). Each intervention uses up between 1 and 5 days of simulated time. Three external events have been included in the simulation to make teams aware that good and bad things they hadn't planned on can happen at any moment during a change management project, like receiving an email with useful information, finding out that some people are meeting informally and spreading negative feelings about the project, or that other stakeholders are pursuing a parallel agenda and employing their own tactics.

5 Validation

Two criteria have guided the progressive fine-tuning of all the simulation components and the dynamics generated when the players intervene in the model scenario:

1. maximizing realism/believability, and
2. maximizing the value of the experience in terms of triggering as many new insights as possible in each individual player.

To validate the realism and learning value of EduSynergy, 375 deans, professors and administrative support personnel were surveyed after they had played the simulation. The survey asked the participants' opinion about fifteen different statements using a seven point Likert scale. Six statements concerned the contribution of EduSynergy to the understanding of change management, seven statements asked their opinion about the realism of the simulation, and two statements asked for their overall assessment of the simulation's value as a training tool. Participants were also invited to provide comments about their overall assessment. A majority of participants agreed (i.e. gave a score great than or equal to 5) with every statement. The simulation scores highest in improving the participants' understanding of the impact of the different change tactics which can be used during a change process as well as their understanding of the importance of formal and informal relationship networks.

"It could correspond to a real situation above all when it refers to links between committees and "key" people".

"The complex mix of individuals was great – also, assessing the right time to go with specific messages!"

The lowest level of agreement is found for the two items about the role and impact of cultural factors in the simulation. This indicates that further modifications to the simulation and/or debriefing could be focused on this area. Some participants also shared these impressions of their workshop experience.

"The initial frustration of "getting nowhere" was very realistic and important. The danger of ruining everything with one false move was also apparent! Compared to a lecture, this was infinitely better: practice in a "safe" environment!"

"Many of the outcomes in the simulation do reflect events I have experienced".

"The strong point is that you actually feel the emotions accompanying the process."

"It is highly effective but must be used in association with lectures".

Overall, the results show that EduSynergy is realistic and reflects well the change dynamics in higher education contexts. The EduSynergy simulation is considered by 90% of the participants to be more effective than a lecture.

6 Conclusions

Fostering change and enhancing collaborative behaviour in any organization is a challenging task. Compared to the corporate world, higher educational institutions have a very distinctive culture which makes rapid change even more difficult. This is why we decided to develop and validate a rich, realistic change management experience in a university setting. This has resulted in a new multimedia, team-based simulation, EduSynergy, which models the dynamics of change in higher educational institutions, including individual behaviours, group dynamics and cultural factors. We are currently continuing our research to identify needs and carry out the background research necessary to adapt the EIS simulation to help teach change management in a variety of different contexts. In addition to EduSynergy, EIS adaptations exist for different industries such as health care, different company contexts such as a family run firm (FAME), and different cultures, such as China (LingHe) and the Middle East (GulfCom).

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The Study of Educative Network Organizations in the City of Barcelona, Spain: The Nou Barris District

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Abstract. The research is focused on the description of the inside organization of educative networks (ENs) and the aspects that allowed their growth and success in the city of Barcelona (Spain). The ENs emerged over the last ten years in Catalonia, Spain, as a new way of facing the social and educative action in the territory. These educative proposals are based on the connection between the different educative institutions in the community, to tackle social and education challenges in cooperation through a common project. The intent of ENs is to create synergies between cooperating organizations, and to coordinate community action so as to avoid the overlaps that cause parallel work. Along these years and in spite of the difficulties found, the study shows how these educative structures take advantage of the context possibilities to improve educative impact and develop a new vision of organizing and conceiving education.

Keywords: educative networks, cooperation, educative organization, territory, synergies.

1 Introduction

The general investigation is developed by the PSITIC[1] research group & funded by the Municipal Education Institute of Barcelona (IMEB). This article shows the results and the future research outlets of the first stage of the research in progress.

Actually, sociology illustrates a new period as a result of the complex interaction between technologies, economics, politics, and culture. The social analysis presents a highly systemic and interdependent context, characterized by the importance of connections for social organization [1] and the fluidity of its structures [2].

The General System Theory [3] and Complexity introduced by Morin [4] show an approach to a contextualized education, with a significant role played by the connections and interactions with the community environment, in order to build an educative community project. They present an educative action as a complex activity that involves diverse actors and subjects. They also introduce the artificiality of the isolated

[1] PSITIC is a research group in Social Pedagogy and Informational and Communication Technologies, in Ramon Llull University, Barcelona (Spain). More information is available at our website: http://recerca.blanquerna.url.edu/psitic/

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study of disciplines, opening a door for a transversal education, constructed at the same time by different societal areas. Certainly, our environment points to a holistic concept of education, that goes beyond the space of the community, and beyond its time: an education that takes place everywhere and at every time.

In the actual Spanish context we find new formal and informal actors with a high educative influence: the media, with several restrictions in children's hours of programming; informal extracurricular activities; sport clubs; churches' educational projects; libraries, with lecture and scripture programs; families' associations; ludotheques, children's playing centers that provide toys and games to stimulate creative thinking; medical programs, such as drug prevention, sexual health or dental health; social services; pedagogical advising community teams; linguistic and social cohesion teams; educational community services; the police department, with such educational projects as road safety and surfing the Internet safely; and others.

Educational networking (EN) is shown as an adequate methodological response to attempt such complex educational challenges as school success, school absenteeism, equity, excellence, school-to-work transition, life-long learning, citizen education, and others. We see EN as an alternative organizational model to hierarchical organization charts, capable of equity in institutional integration, and united by a common objective; first, to share needs analysis and projects; and second, to coordinate the action in a comprehensive way [5]. So, ENs are formal associations that have EN as an action method. Our research group, PSITIC, has defined 6 principles that form the base of this work and all ENs content: *Proximity*, working for real territory needs; *Transversality*, as a cross holistic vision of the actions through all institutions; *Horizontality*, as a flat macro-organization with equal decisionmaking power; *Co-responsibility*, where all institutions assume their roles and recognize an asymmetric responsibility [6]; *Interdependency*, with cooperation as a condition of success; & *Proactivity and Projection*, showing the importance of strategic programming.

EN has become a relevant practice in the development of education in the city of Barcelona. This fact creates a political debate over which is the role of education and social policies organizations, and which is the role of administration. Far away from the improvements in educational results, EN is contributing as well to the strength of citizen participation, educative institutions' cooperation and coexistence, by generating social capital in the city. Halpern [7] locates institutional cooperation, citizen participation, and social networks as social capital indicators. As well, Halpern establishes education as a clue in social capital construction, and points out the importance of cooperation between families, school and communities.

Nevertheless, EN is in a praxis construction process, and it becomes necessary to clarify the clue components that characterize its organization. By now, ENs are conceived as complex practices, with some organizational fragilities, and some questions arise over consequences provoked by: the coexistence of different ENs in a territory; their informal and spontaneous characters; their resource overlaps; effects in public education policies; outcomes deriving from different professionals; & the real impact of common actions in the territory.

This article is focused on the approach of the EN organization in the Nou Barris district of Barcelona, going deep into the weaknesses and strengths of its development, and in the principles and variables that constitute EN evolution. Also, this research's first stage intends to validate an analysis methodology for the educative networks study, in order to apply it to the entire city.

2 Methodology and Proceedings

The global research has a 4-year timeframe. The first stage is developing and assessing the EN analysis methodology in Nou Barris district, between January 2009 & January 2010; & the second stage, in which the present methodology is planned to be replicated in the other 9 districts (3 per year). Nou Barris has been chosen for this first part because it contains highly relevant EN practices, with several years of experience. Nou Barris is located in the northeast of the city of Barcelona, with a population of 170.000, & has one of the lowest general rents in the city.

Concretely, the study examines the approach of 10 ENs consolidated in the territory and recognized by the city administration: the Social Educative Commission, in Roquetes neighborhood; the Social Educative Commission, in Trinitat Nova neighborhood; the Social Educative Community Plan in Verdum neighborhood; the 0-18 Nou Barris formal education Net; the 0-33 Education Net; the Coordinate Families Nou Barris Association; the "Neighborhood time, educative shared time" program; the Educative context plan, in Canyelles & Roquetes neighborhood; the Children Commission in the north zone; & the Youth Commission in the north zone.

To respond to the research objectives, we have planned 3 descriptive instruments that have been assessed by 2 relevant PHDs[2] in Ramon Llull University, and also have a pilot character to lead in this stage as an assessment and validation. The three instruments are constructed by PSITIC and are based on the EN theoretical principles, developed in variables and indicators. From this background, each instrument has the objective of obtaining information about the context reality of EN, and the accomplishment grade of the 6 principles.

The first instrument is a 60-minute semi-structured interview between a researcher and one actor of each EN that has a leading role in the net organization. The interview is composed of 3 parts: a description part, where we ask for descriptive information about the history and components in their net; an organization part, where we go deep into the principles analysis; & an opinion part, where they expose their vision about the opportunities and weaknesses of EN. The second instrument is a questionnaire, administrated to each actor that participates in every EN studied, in order to triangulate the information. The questionnaire has 20 items, 3 with an opening response, and it is administrated in a soft online format through email. Finally, the third instrument is 2 focus groups: one with the 3 education directors in the district and the research team, in order to check and complete the field work planning; & one with the 10 leading actors interviewed and the research team, to check and complete the pre-final results & conclusions.

The participating sample is composed of the 10 interviews with the leading actors of all the ENs studied; 37 questionnaire answers representing 50% of the possible actors; & 2 recorded focus group of about a 90-minute time-frame. The data has been analyzed by the research team with the informatics support of ATLAS.TI 6.0.

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[2] Dr. Tomàs Andrés Blanch & Dr. Miquel Àngel Prats Fernàndez.

3 Results

The information analysis shows some significant categories of strengths and weaknesses that the EN face in their organization of the cooperative work, the objectives achievement, and their sustainability. Table 1 contains the categories arranged in order of importance.

Table 1. Strengths and weaknesses of the EN in Nou Barris district, Barcelona

Strengths	Weaknesses
- Higher power of the actions - Pertinence feeling and community identity - Suspicion breaking - Promotes participation - Professional enrichment through cooperation	- Voluntary character - Different professional rhythms - Low political recognition - Temporary teachers - Temporary school directors - Different engagement levels - The collaboration fact

The totality of the organizations studied find that EN contribute to a collective higher power and impact of the educative actions, rather than individual and parallel practices. Almost all of the ENs affirmed that EN improves community identity in professionals and also in citizens, at the same time that it breaks down suspicion between institutions, creating confidence. A remarkable consensus exists in the ENs confirmation that EN promotes citizen participation. Finally, half of the ENs think that one of the main EN strengths is the professional enrichment achieved by working with other institutions in the community with the same problems.

All of the ENs understand that volunteer participation in EN is a weakness that causes instability in the net organization. They also remark upon the difficulties of working with different professionals, such as psychologists, teachers, social educators, pedagogists, sociologists, and others. Half of the ENs affirm that temporary teachers and directors in the public schools cause several difficulties in the sustainability of the projects.

The results concerning the theoretical principles analysis show that the EN totality responds to the Proximity principle. From Transversality, we ascertain that all of the ENs have common objectives, but only a minority create a cross program. In the Horizontality principle, we affirm that half of the ENs have a structured schedule with defined functions. From Co-responsibility we find that professionals admitted and showed their shared commitment. In Interdependency, we confirm that most of the ENs consider others essential; & in Proactivity and Projection we find that all created a work plan, but only a minority of the plans had an strategic vision.

4 Conclusions and Research Outlets

Analyzing the first stage results, we have detected 2 weakness levels that affect EN sustainability. The first level of temporary teachers, temporary school directors, & low political recognition, are considered as context difficulties, and directly affect the second level of voluntary character, different professional rhythms, different engagement levels, & cooperative work. The city government should attempt improvements at the first level. A necessary initial step is to recognize and reinforce these macro-organizations, participating & empowering their cooperation. In the near future, we will go in-depth and define what the government role has to be in EN in order to overcome educative challenges.

At this point of the process, we advance to an emotional dimension that modifies the EN quality, relating EN strengths to the different EN theoretical principles. Therefore, an EN organization that goes in-depth into Co-responsibility is committed with the EN sense. This commitment allows an in-depth approach to Interdependency, making possible the engagement and confidence between institutions. Finally, this situation permits a chance to go in-depth in Proactivity and Projection, developing an EN strategic organization method that creates a connected feeling to the net, and contributes to a community identity based on participation. It is also important for EN perception to enrich the research of EN graduation process.

We confirm our suspicions that concerning Transversality, EN principles become difficult for professionals, because they involve a deep cultural change. The near-future study of this principle is a challenge and a true research outlet in EN understanding. In addition, it is necessary to examine the approach to how some ENs think and plan through a cross-institution & holistic vision of needs and actions, setting the citizen in the middle.

Finally, it becomes necessary to investigate some questions about EN. For example, why are ENs created? What do ENs have to do to succeed? What educational benefits do ENs achieve? Lastly, what is the impact of the EN in the territory's social capital?

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Experimenting Design and Implementation of an Educational Services Management System Based on ISO/IEC 20000 Standard

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Abstract. European higher education organizations are encouraged to implement quality management practices. Existing quality standards and frameworks do not capitalize an important set of best practices addressing educational services delivery. The ISO/IEC 20000 standard, elaborated from IT service management issues, is widening its field of application and may represent an interesting alternative. A specific approach is needed to apprehend the particular nature of educational services, consider the systemic cooperating roles of educational system and learning system, and define ISO/IEC 20000 vocabulary and concepts adapted to the domain. ISO/IEC 20000 may provide an answer to European Standard Guideline compliance and improve educational services management. The current experimentation is expected to cast light on the complexity, practicality and effectiveness of the use of ISO/IEC 20000 in a first field of "non IT" services.

Keywords: Quality, Quality Assurance, Service Management, Management Systems, ISO 9001, ISO/IEC 20000, ESG.

1 Education Providers Are Encouraged to Implement Quality Management; The Existing Standards and Frameworks Focus More on Upstream Phases Than on Educational Services Delivery

In December, 2005 at Bergen, the European ministers adopted the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG)[1] proposed by the European Network for Quality Assurance in Higher Education (ENQA). The guidelines address three domains: internal quality assurance of higher education, external quality assurance of higher education and external quality assurance agencies.

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Educational service providers are given freedom to decide how they implement their internal quality management system and define detailed procedures to apply the standards. Numerous higher education organizations[2, 3] chose to build a quality management systems based on the ISO 9001 standard[4] (Quality Management Systems – Requirements), a standard extensively used in the service industries.

ESG FOR EXTERNAL QUALITY ASSURANCE AGENCIES	WHAT ABOUT ISO 9001? Product = Assessment activities
3.2 OFFICIAL STATUS	It doesn't mention legal aspects
3.3 ACTIVITIES - evaluation, review, audit, assessment, accreditation	7. Product realization
3.4 RESOURCES - human and financial	6. Resources management (not financial)
3.5 MISSION STATEMENT: goals, objectives, policy, management plan	5. Management responsibility: Q policy, Q objectives, Q management system
3.6 INDEPENDENCE	It doesn't mention legal aspects
3.7 EXTERNAL QUALITY ASSURANCE CRITERIA AND PROCESSES	4. Quality management system: processes, criteria, methods, improvements
3.8 ACCOUNTABILITY PROCEDURES: policy, experts, sub-contractors, feedback	5.3 Quality Policy 7.4 Purchased (evaluate and select suppliers) 8. Measurement, analysis and improvement

Fig. 1. ESG EQA and ISO 9001 comparison by AQU Catalunya

ISO 9001 requirements have been defined for use in all kind of organizations, whatever their types, sizes and products (or services) offered, and are necessarily quite abstract and generic. Therefore, ISO 9001 does not provide a specific set of best practices directly usable for educational service management, and the quality management system needs to be specifically built for each organization.

In 2003 and 2007, an ISO International Workshop Agreement (IWA)[5] has been published in order to provide guidance for the application of ISO 9001 in education, and assure the overall effectiveness of the education organization's quality management system and the delivery and continual improvement of its educational service to the learner. Recommended processes address educational design, curriculum development, education delivery and assessment of learning. A list of processes carried out typically in educational organizations is given in an informative annex.

In 2009, the ISO/IEC JTC1/SC36[1] subcommittee published ISO/IEC 19796-1[5] as a basic framework for quality development in organizations within the field of learning, education, and training (LET).

---

[1] Joint Technical Committee established by ISO and IEC (International Electrotechnical Commission), Subcommittee 36, Information technology for learning, education and training.

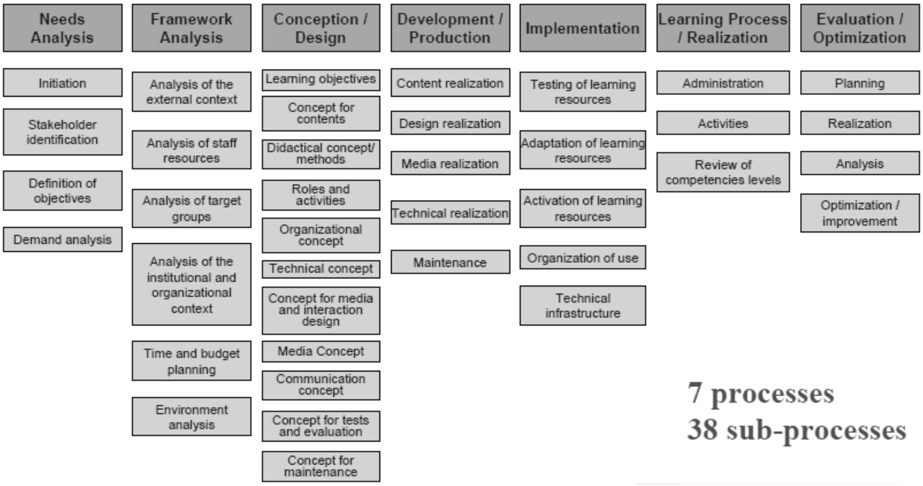

Fig. 2. ISO 19796-1 Process Model

This framework extends existing quality approaches by giving a guideline to address specific aspects of Learning, Education and Training. However, a very strong emphasis is placed on the upstream phases (5/7 processes, 31/38 sub processes). Educational Service Delivery (the “Run” phase) is addressed by “Administration” and “Activities”, within “Learning Process / Realization”.

An interesting parallel can be done with Information Technology domains : before the emergence of ITIL, frameworks or methods were mainly focused on upstream phases – Analysis, Design, Build, Test, Implement - with software programming techniques, data modeling, information system development, architecture design, project management...

2 ISO/IEC 20000 Is a Management System Standard Addressing IT Services, Widening Its Scope to “non IT” Service Management

Published in December 2005, ISO/IEC 20000-1[7] promotes the adoption of an integrated process approach to effectively deliver managed services to meet the business and customer requirements. ISO/IEC 20000 is a standard based on ITIL, offering a body of knowledge capitalizing Information Technology Service Management best practices since the end of eighties. However, since its publication, several service professionals from different disciplines have become interested in wider interpretations of ISO/IEC 20000 which might add value to “non IT” service management. Specific research is done by ISO/IEC JTC1/SC7 /WG25 on ISO/IEC 20000-6 “Alternatives Scopes for Certification”. ISO/IEC 20000 seems to be broad enough to offer an effective framework for control and continuous improvement of service delivery.

Processes and requirements appear to be applicable, useful, and adding value by a better consideration and satisfaction of customers service needs.

ISO/IEC 20000 defines a set of processes guiding the implementation of the management system.

In the latest draft version of its development[8], ISO/IEC 20000 is defined as promoting « the adoption of an integrated process approach when establishing, implementing, operating, monitoring, measuring, reviewing and improving a Service Management System (SMS) to design and deliver services which meet business needs and customer requirements. »

However, in order to extrapolate the recommended process approach and the associated practices to "non IT" services, applicability, effectiveness and efficiency of the standard needs to be carefully experimented and reviewed. Despite numerous requests, Certification Bodies do not today allow ISO/IEC 20000 certification audits for a scope of "non IT" service management. The coming version of the standard and the contents of ISO/IEC 20000-6 will probably play an important role in their decision. However, Certification Bodies have already began to widen slightly the range of services certified with the standard, from "services supported by information systems and infrastructures" to "services relying on Information Technology", which is a bit different. For instance, with such an interpretation, it might be possible to certify management systems of educational services which are offered remotely by means of information and communication technologies. In fact, such services use information technologies so extensively that the providers will be more likely to consider an ISO 20000-1 auditing without feeling they are risking too much.

3 Applying ISO/IEC 20000 to Educational Services Requires a First Step of Guidance Formalization

As it has been done with IWA and ISO 9001, the very complex domain of Educational services needs to be profoundly analysed against the new "Service approach" of Quality Management in order to adapt definitions, and determine applicability, effectiveness and efficiency of the standard to the domain. First, a good definition of Educational Services is very important. Learners are not simple service consumers[9], they must be considered as learning systems, acting for their own transformation, cooperatively with the Educational System. Considering relationships between these two acting systems facilitates the identification of different activities to be planned and executed by the learning system, in order to receive and take benefits of services provided. Two set of processes may be considered for the learning system, one for decision activities (orientation, planning...) and one for active transformation activities (course participation, personal work, culture development...). Services provided by the Educational System may at least distinguish "Contents" Services and "Coaching" Services (the way you coach the learning system so that you give him the best chance to transform itself successfully), and "Validation" Services. Considering cooperative systems may help to define specific metrics applying to each system, with a relative common goal of success. Note considering that the "client" of a service provider takes benefits of playing an active role is largely developed in the eSCM[2] model, which may represent a very interesting advice. Another particularity of the domain is the fact that higher educational service providers validate the "Learner's successfully transformation", implying somehow that they certify the final result of their own service delivery[9]. In addition, by introducing new concepts, new definitions and new processes, ISO/IEC 20000 raises new questions which need to be answered. For instance, it is necessary to understand and define what "an incident" is in this context. The ISO/IEC 20000 definition is "an event which is not part of the standard operation of a service and which causes or may cause an interruption to, or a reduction in, the quality of that service). In Educational services Management System, an incident may occur due to the absence of a teacher, a failure of one of the resources or of the organisation...

Considering the whole scope of ISO/IEC 20000 requirements, it appears useful to formalize a specific guidance for educational services as a first step of implementation.

4 ISO/IEC 20000 Standard Is Compliant with European Standard Guidelines and May Provide Useful Guidance for Educational Services Management

ISO/IEC 20000 requirements are compliant with European Standard Guidelines:

European Standard for Internal Quality Assurance	ISO/IEC 20000 :2005 paragraphs addressing ESG topics
1.1 Policy and procedures for quality assurance	3. Requirements for a management system 4.1 Plan service management
1.2 Approval, monitoring and periodic review of programs and awards : formal mechanisms for the approval, periodic review and monitoring of their programs and awards	5. Planning and implementing new or changed services 9.2 Change management
1.3 Assessment of students : students are assessed using published criteria, regulations and procedures which are applied consistently	6.1 Management of service levels
1.4 Quality assurance of teaching staff: means to ensure the quality and competence of their teachers. External reviews and reporting.	3.3 Competence, awareness and training 4.3 Monitoring, measuring and reviewing
1.5 Learning resources and student support: adequate and appropriate resources for each programme offered	6.5 Capacity management
1.6 Information systems :guarantee to collect, analyse and use informations necessary for the effective management	9.1 Configuration management (CMDB) Interactions between all processes and CMDB
1.7 Public information : regularly published, open to public, up to date, impartial and objective, quantitative and qualitative, on the programmes and awards	6.2 Service reporting 7.2 Business relationship management

[2] eSourcing Capability Model, developed by Carnegie Mellon's University Information Technology Qualification Service Center (ITSqc).

ISO/IEC 20000:2005 (current version) helps to answers important questions of educational service delivery management. For example, the service continuity and availability management (6.3) defines its objective to be to ensure that service continuity and availability are in place in all circumstances. Needs must be identified and plans for continuity and availability drawn up and reviewed at least once a year. The information security management (6.6) should be designed according to a management policy and monitored. A schedule of changes should be shared by all relevant parties (change management process, 9.2)...

Supported by SOGETI Quality Management skills, the current experience with “Grenoble Ecole de Management” and “Université de Nice” to design an implement an educational service management system based upon ISO/IEC 20000 should refine the initial theoretical work and reveal benefits and limitations of the use of the standard. As the theoretical work apparently indicates that the standard is applicable, actual case study is eagerly awaited to confirm the practicality, effectiveness and efficiency of the standard in different fields than those it had been initially developed for.

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Having Your Own Automatic Judge: EEWS

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Abstract. In this poster we present the way to install any personal computer under linux, a shareware software developed by the University of Valladolid, into the frame of the European project EduJudge. It will facilitate the knowing and use of automated judging, probably the most powerful method to develop the programming skills of the students.

Keywords: automatic judge, evaluation engine, web services.

1 Introduction

EEWS stands for "Evaluation Engine Web Services". It is a UNIX system service (a so called daemon) that evaluates the submissions received by the Learning Management System (LMS) and returns a verdict on the proposed solution and some feedback. Most of the data returned is produced according to the requirements made by the Learning Object (LO) for which the submission was made. Being a system service it has no Graphical User Interface (GUI) on its own, but an external multiplatform utility is provided for configuration and monitoring, called EEWSGUI. All the interaction between EEWS, the LMS and GUI is done using SOAP-based protocols, allowing the detachment and substitution of any of the modules easily.

2 Software Requirements

As EEWS is distributed in source code form; it must be compiled prior to install it into the system. The libraries required for this process are listed in Table 1.

Table 1. Libraries required for installing EEWS

Software Package	Version	URL
Qt Toolkit	>=4.5.3	http://qt.nokia.com
gSOAP	>=2.7.12	http://gsoap2.sourceforge.net
libqxt	>=0.5.0	http://libqxt.org/
QuaZip	>=0.2.3	http://quazip.sourceforge.net/
QtService	>=2.6	http://qt.nokia.com
sqlite (or mysql)	>=3.0.0	http://www.sqlite.org
mysql (or sqlite)	>=5.0.0	http://www.mysql.org

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You must follow the installation instruction of each package. But keep in mind that it is very likely that your Linux or UNIX distribution already provides some or all of these packages, so it is important to check it before getting into downloading and installing madness.

3 Downloading and Preparing the Source Code

Once your system is ready to proceed with the EEWS installation, you must download the source code from the EduJudge website.

After downloading, you probably obtained a file with the name `eews-x.x.tar.bz2`, where `x.x` is the downloaded version. Put that file in a temporary directory and unpack it with the following command:

```
$ tar xvf eews-x.x.tar.bz2
```

A directory containing the source code will be created with the name `eews-x.x`. Position yourself inside that directory and go to the next section.

4 Compiling

Once you are located in the source code root directory, execute the following command:

```
$ qmake
```

The Qt Toolkit can generate the `Makefiles` for your system. Once the files generation has finished, execute the following command:

```
$ make
```

It will start the compilation process. This stage will take a few minutes to complete. After the wait, the software will be ready for installation. It is very important that the next step is done with superuser privileges. You can have that privileges either login into your system as "root" or using a tool like sudo. Then, as superuser, execute:

```
# make install
```

The EEWS will be installed in default system locations.

5 Initial Configuration

Altough every EEWS parameter can be configured using the GUI tool, an initial configuration is needed. The `config` file is located at `/etc/qt4/eews/eews.conf`. You must edit this file using your favourite editor to set the initial parameters. A `config` file example is:

```
[%General]

PluginDir=/usr/share/eews/plugins
SvcPort=8080
AdmPort=8090
AdminEmail=your@email.here
Owner=Your organization here
DBDriver=sqlitec
DBHost=localhost
DBPort=99
DBName=/var/edujudge/eews.sql
DBPrefix=eews_
DBUsername=username
DBPassword=password
loCacheSize=512
loCacheExp=86400
loCacheDir=/var/edujudge/cache
WorkDir=/var/edujudge/tmp
CQSlots=5
JQSlots=5

[ICPC]

Autoload=0

[CAL]

Autoload=1
```

There is no actual need of completing all the configuration items at this point. You can set just a few of them and finish the process using the GUI tool at a later time. The "must have" options are:

- `PluginDir`: The directory where evaluation plugins reside. Usually it will be `/usr/share/eews/plugins`.
- `SvcPort`: The TCP port where the public side (i.e. the evaluation web-services) will be waiting connections.
- `AdmPort`: The TCP port where the administration webservices will be waiting connections.
- The optional parameters are:
- `AdminEmail`: The e-mail of the server administrator. It is a free text field so you can put here what you feel is best, although a validation of the e-mail is done.
- `Owner`: Just a reference to the organization that is running the server.
- `DBDriver`: The driver to access the database. Valid values are `sqlite` (recommended) and `mysql`.
- `DBHost`: The hostname or IP address where the database is running. Only relevant if you are using `mysql`.

- `DBPort`: The TCP port of the database. Only relevant if you are using `mysql`.
- `DBName`: The name of the database. If you are using `sqlite`, it is the filename where the data will be stored.
- `DBPrefix`: The prefix of the tables in the database.
- `DBUsername`: The username for accessing the database. Only relevant if you are using `mysql`.
- `DBPassword`: The password for the username in the previous item. Only relevant if you are using `mysql`.
- `loCacheSize`: The size in megabytes assigned to the LO cache.
- `loCacheExp`: The expiration in seconds of the objects stored in the cache.
- `loCacheDir`: The directory to store the LO cache objects.
- `WorkDir`: The temporary directory where the evaluation process will happen.
- `CQSlots`: The number of simultaneous running processes allowed in the "Compile Queue".
- `JQSlots`: The same but for the "Judge Queue".

The last two parameters are plugin specific and must be set using the GUI tool.

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Mii School: New 3D Technologies Applied in Education to Detect Drug Abuses and Bullying in Adolescents

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Abstract. *Mii School* is a 3D school simulator developed with Blender and used by psychology researchers for the detection of drugs abuses, bullying and mental disorders in adolescents. The school simulator created is an interactive video game where the players, in this case the students, have to choose, along 17 scenes simulated, the options that better define their personalities. In this paper we present a technical characteristics description and the first results obtained in a real school.

1 Introduction: Virtual Reality in Education

The enormous development that new technologies, such as virtual reality, have experienced in the last years has allowed the emergence of a growing number of studies focusing on applying these technologies in the educational environment.

In this sense the use of learning models through virtual reality programs has several advantages over traditional methods of teaching, such as the possibility of multimodal learning or the facilitation of the skills transference processes learned from one context to another (Freitas & Neumann, 2009). Thus, as some authors indicate, the learning process using virtual reality takes place in a more practical and less limited form than in traditional texts based approaches. Hence particular importance is the use of video games for performance improvement in the learning process, since they add several advantages to this process, as sometimes has been studied in psychology research. Specifically, a study by Kim, Park and Baek (in press) proves that video games, used in conjunction with certain meta-cognitive strategies, produce an improvement not only in academic learning, but also game itself performance.

In turn, virtual environments that recreate school contexts have been developed for different purposes, such as virtual classes recreation in order to assess and rehabilitate attention deficits in young people (Rizzo et al. 2001) or the called virtual schools which are presented as useful learning tools in the education field, because they give enormous benefits using virtual environments for teaching, such as improving skills and academic results or expanding education access. However there is little research related to the study of these virtual schools (Barbour & Reeves, 2009).

On the other hand, there are few studies focused on the application of virtual reality to the field of students mental disorders assessment or treatment in the educational environment. There is a software called *FearNot!* oriented to treat bullying behaviours inside a school context. This program recreates, through 3D simulation, violent situations in school environment with the objective of consequences learning of these

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behaviours and thus the student deletes these types of behaviour in school (Zoll, Enz, Schaub, Aylett & Paiva, 2006). In addition, another researches have study the treatment of anxiety in exams and school phobia through the recreation of the significant situations in which these problems appear by means of virtual reality (Gutiérrez-Maldonado, Alsina-Jurnet, Carvallo-Becíu, Letosa-Porta y Magallón-Neri, 2007).

In this paper we present a new virtual reality tool called *Mii School*, a 3D school simulator developed with Blender (Hess 2007) and used by psychology researchers for the detection of drugs abuses, bullying and mental disorders in adolescents. The school simulator created is an interactive video game where the players, in this case the students, have to choose the options that better define their personalities along 17 scenes simulated. Different quality versions of Mii School have really been created, so the execution of the program can be adapted to the technical characteristics of each specific computer as closely as possible. So if Mii School is executed on a latest-generation PC, it can use the highest-quality version to enjoy better viewing (XGA 1024x768 resolution). However, if the graphic card can not reproduce this visual quality with sufficient fluency, other lower-quality versions can be executed (SVGA 800x600 or VGA 640x480 resolutions).

In section 2 we describe the different scenes represented in Mii School, and later in section 3 we explain the Mii School development process. In section 4 we present the satisfaction results obtained after applying this tool to several students, and we finally show the future works in section 5.

2 Scenes Description of Mii School

During the execution of Mii School the student watches a total of 17 interwoven scenes studying different aspects of his behavior related to bullying, drug addiction, family life, capacity for attention in class and integration in social groups.

Fig. 1. Screenshots of bullying and drugs scenes in Mii School

There are a total of 5 scenes that study bullying. In some of them, the student is bullied by his schoolmates and in others he becomes the bully, in this way bullying can be studied from several perspectives. Some concrete cases are also studied, for example, the reaction of the student to the explicit violence of a physical aggression in the schoolyard to see if he is mediator or violent. For each bullying scene, the student can select one of a series of choices that always follow a general pattern: feeling indifferent to the bullies, protesting to them, responding ironically, running away in fear, facing up to them or feeling ashamed.

The student's relationship with his parents is also studied in three scenes: one scene checks the father's behavior, another one the mother's attitude and a third scene both behavior . In the first two scenes, the student gets home much later than the hour agreed upon and checks whether the father or the mother scold him, threaten him or, on the contrary, are indifferent to his undisciplined behavior. In the third scene, the student gets home after school and feels anxious because he has problems with his studies and the simulation checks whether his parents become involved in his problems or are indifferent to them.

During the 6 drug addiction scenes, the drug offered becomes gradually more dangerous. In the first scene, the student is tempted by his schoolmates to smoke in the school playground. In the second scene, he is invited to drink alcohol while eating a pizza at a friend's house. Afterwards, he is offered a joint of marihuana in a park. In the last two scenes, the risk is upped further when his friends offer him much more dangerous drugs, such as cocaine or ecstasy (MDMA). The choices that the student can choose in the drug addiction scenes also follow a general scheme: usually use, refuse to try the drug, advice friends to stop taking it, use occasionally or leave because he feels uncomfortable.

There are other scenes where personality-related problems and the student's mood, attention in class, beliefs and integration in social groups are checked. The following table shows the most important metrics in the 17 Mii School simulated scenes.

Table 1. Some interesting metrics of Mii School simulated scenes

SCENE	*THEME*	*STAGE*	*DURATION*	*NºPEOPLE*	*NºCAMERAS*	*NºOPTIONS*
1	Bullying	Courtyard	1:36 s	4	6	6
2	Drugs (tobacco)	Courtyard	1:12 s	3	5	5
3	Bullying	Classroom	1:09 s	6	4	6
4	Drugs (alcohol)	Home	1:09 s	2	4	5
5	Attention in class	Classroom	51 s	5	3	5
6	Social integration	Courtyard	42 s	5	4	4
7	Bullying	Courtyard	54 s	5	3	6
8	Drugs (marihuana)	Park	1:12 s	4	4	5
9	Drugs (cocaine)	Home	1:06 s	2	3	5
10	Relation with father	Home	1:03 s	2	5	4
11	Relation with mother	Home	1:03 s	2	5	4
12	Relation with parents	Home	1:03 s	3	6	4
13	Drugs (general)	Park	42 s	3	4	4
14	Bullying	Courtyard	1:15 s	2	5	9
15	Drugs (ecstasy)	Park	1:06 s	2	4	5
16	Bullying	Courtyard	1:21 s	4	6	6
17	Beliefs	Various	39 s	12	8	8

As may be observed in the table, the number of choices that can be made by the user usually coincides in the scenes that share the same theme.

3 Mii School Development Methodology

We have chosen Blender as Mii School development tool because this software incorporates all the functionality needed: 3d design, advance illumination and texturing, characters animation, blender game engine, programming with Python, etc. Besides, Blender has got the most important property of a most wanted software: it is open source. Mii School development process with Blender was divided into five different stages: 3D design, texturing/illumination, animation, Python programming and Blender Game Engine configuration.

3.1 3D Design

During this first stage, the 3D meshes were created with Blender to represent the virtual scenarios and characters that appear in the scenes (Roosendaal and Selleri, 2005). The Mii School simulation takes place into different scenarios: the school playground, the classroom, the main character's home, a park... Nevertheless, each scenario is divided in several zones (for example, the home has several rooms, the playground has an area with benches, another for sports, etc.) so each zone is used for a different scene and the user does not get the impression that the scenarios are repeated.

A total of 30 characters were designed in Blender: several male and female students of different races and social conditions, the teacher who is teaching in the classroom, the student's parents, etc. All of the Mii School 3D models were created using basic and advanced design techniques included in Blender: extrude, split, merge, etc. and finally, smoothing filters were applied for smoother surfaces without overly increasing the number of polygons (*set smooth option*).

3.2 Texturing/Illumination

Texturing was also done during this first stage using UV mapping techniques and Blender materials editors, applying good quality images to the 3D models to increase realism of the scenes and characters.

For proper illumination of the scenes, a sun type global lighting illuminates above the main student, on whom the simulation action always focuses, so that the objects and characters around him are always properly illuminated. Some spotlights were also used to increase illumination of certain places.

3.3 Animation

Once the 3D models were designed, we proceeded to the animation stage by first creating skeletons associated with the 3D characters meshes, and then capturing bones movement using a series of intermediate poses with the aid of a technique called *inverse kinematics* (Hess 2008).

Characters animations were divided into two large groups: body and facial ones. Body animations affects the character's whole body. We implemented several types of body animation in which the characters perform some action: walking, sitting, hitting, threatening, fighting, smoking, drinking, etc.

In order to increase the expressiveness and realism of facial animations, the number of polygons and level of detail have been increased noticeably in eyes and lips, areas that most influence the facial gestures. So if one character is threatening another in a certain scene, his face expresses aggressiveness, or if on the contrary a character feels threatened, his face shows fear.

3.4 Python Programming

When the characters were created and the corresponding animations implemented, we went to the coding stage using the Python programming language (Sherrod 2008). Over 6.000 source code lines have been implemented in Python to simulate the action of the 17 scenes. This source code is the Mii School *kernel*, it specifies all the details necessary to compose the scenes, and this kernel also captures all of the information provided by the student.

The source code specifies aspects such as which characters intervene in each of the scenes or which scene is going to be developed at this moment. In order to achieve a better performance during program execution, along the simulation of a scene only the characters and objects that are going to be viewed by the camera are shown, and the rest are hidden.

The source code that we have programmed in Python follows the instructions of a *deterministic finite automata* to find out in what state of simulation Mii School is at any given time and to set up the escene: activate the corresponding camera, the body animation and facial expressions of the character who is speaking at the moment, etc. The following text shows part of the source code for the first scene in Mii School. In this code it is specified the person speaking in this moment, his basic body animation, the facial expression (mouth and eyebrows), the active camera and the dialogue that is visualized on the screen. Finally, the complete scene is activated by sending all of the data to the Blender Game Engine.

```
...
elif STATE==6:
        CHARACTER="baddie01"
        BASIC ="bodyHandsHips"
        MOUTH ="mouthNormal"
        EYEBROWS ="eyebrowsNormal"
        CAMERA="cameraCharacter01"
        TEXT = " We want to play handball, but we have not a ball ...”
        activateScene(CHARACTER, BASIC, MOUTH, EYEBROWNS, CAMERA, TEXT)
…
```

Fig. 2. Part of Python source code in Mii School

3.5 Blender Game Engine

The Mii School kernel is interpreted by the Blender Game Engine. In order to simulate Mii School, the Blender Game Engine not only executes the Python source code that we have developed, but also takes into account a series of *events* associated with the dynamic objects in the scenes, especially characters (both their 3D mesh and the skeleton) and cameras (with their corresponding dialogue box, which also has associated events). Each event is divided into 3 parts: the sensor (that receives information, for example, pressing a key or a specific signal), the actuator (which performs actions on objects, like animating a character or moving a camera) and the controller (which connects the sensor to the actuator). In the Mii School project, there are over 900 basic objects with associated events (some of them are complex objects such as a character's skeleton or its 3D mesh, and another are simpler, such as the dialogue box for a specific camera), and each object has an average of 10 events of its own that regulate their functioning (for example, in the cameras an event can indicate a movement and in a character the activation of an animation).

The Blender Game Engine also takes another secondary details into account, such as in which scenes the main character's cigarette or bottle should be seen or hidden, or what color should be the conversation box depending on the character who is speaking at that moment.

To summarize, during the execution of Mii School the Blender Game Engine must synchronize around 10.000 different events in real time, activating only those that are necessary right at the moment of the simulation and discarding the rest. Apart from this work, it also is in charge of rendering and illuminating the scenes in real time, as well as capturing information introduced by the user.

4 Satisfaction Results

The total simulation of Mii School 17 scenes lasts approximately 25 minutes. The student can choose his sex at the beginning of the simulation to personalize the animations to his own gender. All the information introduced by the student, as well as the choices selected in each one of the scenes and other data of interest, is stored in a web page format for the later viewing and analysis by the psychology researchers. Background music has been added in the scenes and audio in the conversations to achieve more realism. Proper movement of the cameras during the transition of scenes is also carefully made so the simulation has the quality of real movie.

This section shows the results from a first application of Mii School in a real educational environment. The showed data specifically mentions the satisfaction degree of participants with regard to matters concerning characteristic that our software has got.

In the pilot study, 65 students have participated: 30 men and 35 women. These participants belong to the first, second, third and fourth year of the Spanish Secondary School (E.S.O.) of a concerted public education school in Almería (Spain). The age of the participants was between 13 and 16 years old, with a mean age of 14.63 (SD: 1.14).

The following data was taken with the help of a satisfaction questionnaire developed specifically for this study that evaluates general issues concerning the general Mii School features using a scale of Likert, with 5 response options, from "*strongly disagree, never, nothing*" to *"strongly agree, quite, always",* including the neutral opinion "*do not know, no opinion"*. After evaluating the student´s responses, we can see high percentages of participants satisfied with Mii School characteristics.

Thus all the issues raised, except one, have a positive value of 80-90% of participants (in regards like *identifying the subject of the scenes*, *if appropriate instructions* *have been introduced*, or *time of recreated situations*). Only the item related with the Mii School program familiarity had a slightly lower value (specifically the 66.2%).

Table 2. Satisfaction of Mii School users

ITEMS	% students
It was easy to identify the subject (drugs, bullying) from each scene	80%
The instructions received by the program are enough to understand how it works	89,2%
The scenes information (dialogues, interactions, etc) was enough to understand the situations described	87,7%
The playing time of each scene was enough to understand its content.	90,8%
The responses playing time has been enough to recognize the options available	89,2%
I found family the use of Mii School,given that I am used to these technologies	66,2%
Mii School situations are appropriate for evaluating the issues of each scene.	89,2%

In the same study we compared the effectiveness of drugs detection and bullying behaviours with Mii School using several traditional pencil and paper assessment questionnaires. In general, Mii School was more sensitive to the detection of bullying behaviours and drugs consumption than paper test (Carmona, Espínola, Cangas & Iribarne, in press).

5 Future Works

As future works we want to add to Mii School several modules that will allow this software not only the drugs consumption detection, but also the drugs abuse prevention. Besides Mii School will be translated into several languages, and we are thinking about an online version of Mii School.

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KP-Lab System: A Collaborative Environment for Design, Realization and Examination of Different Knowledge Practices

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Abstract. This paper presents a collaborative working and learning environment called KP-Lab System. It provides a complex and multifunctional application built on principles of semantic web, exploiting also some web2.0 approaches as Google Apps or mashups. This system offers virtual user environment with different, necessary and advanced features for collaborative learning or working knowledge intensive activities. This paper briefly presents the whole system with special emphasis on its semantic-based aspects and analytical tools.

Keywords: collaborative system, practices, patterns, time-line, summative information.

1 Introduction

KP-Lab System provides modular, flexible and highly integrated system for collaborative realization of different knowledge practices, examination of previously realized practices and identification of potentially new interesting and useful knowledge. This system was designed and is still being developed within EU IST project called KP-Lab (web site: http://www.kp-lab.org/). KP-Lab is an ambitious project that focuses on developing theory, appropriate knowledge practices and a collaborative learning and working system aimed at facilitating innovative practices of sharing, creating and working with knowledge in education and workplaces.

The KP-Lab system can be compared with some other existing applications in mentioned domain, e.g. Moodle, BSCW, etc. This comparison is described in next section with some detailed information about offered functionalities.

The whole paper is organized in two main sections plus conclusion. This, introductory one contains general information about presented collaborative system KP-Lab and its comparison with other selected state-of-the art systems. The second chapter describes in detail architecture and main components of the KP-Lab system: platform and virtual user environment. The last chapter is devoted to some conclusions.

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1.1 State of the Art

Report on industry-led FP7 consultations [4] summarizes the characteristics of the current CWE (Collaborative Working Environment) as follows. CWE are not integrated and interoperational, they support mainly point to point and not multipoint conferencing, they are defined mainly for structured environment providing static shared objects and they do not support the unstructured orchestration of activities using collaboration aware objects. Finally they focus primarily on peer communication and not flexible team interaction.

KP-Lab system with its integrated functionalities represents step forward in the long process of achieving specified goals to provide interoperational system with possibility to make dynamic changes in realized processes or different types of shared objects, to provide different types of communication, primary synchronous as chat or virtual meeting tool with automatic creation of discussion maps; ubiquitous access through mobile devices, etc.

We provide comparison with selected representatives that belong to broader adopted systems as Moodle, BSCW and Claroline:

- Moodle[1] is typical representative of Course Management System (CMS) strongly oriented on the idea of integrated modules. Users have possibilities to create their own courses in different conditions but e.g. feature to analyse user's practices/activities is weakly developed. It is possible to explore performed activities based on relevant course or user with some basic information.
- BSCW[2] represents a strong commercial system that provides advanced functionalities as tagging, communities, templates, search on different indexing services, while editing tags or the indexes are not so well supported, also collaborative and idea generation tools are not available. In addition, it provides simple storage for performed activities and some basic statistics describing users' behaviour. The important fact is that this system is based on different technologies behind, i.e. processes are modelled through workflows, and data storage is implemented by transactional database.
- Claroline[3] is organized around the concept of space associated to a course or a pedagogical activity. It provides basic functionalities for e-platform and some advanced as possibility to creating complete sequences of learning activities; statistical information about access to the platform, tools or documents usage, forum contributions; but hardly addresses the management and flexible modification of processes.

2 KP-Lab System

The previous comparison shows that each system provides the basic functionalities for collaborative systems and some advanced based on its purposes. The main difference between them and KP-Lab System is its orientation on semantic technologies. It

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[1] http://moodle.org/
[2] http://public.bscw.de/
[3] http://www.claroline.net/

is built on principles of semantic web, e.g. ontologies are used as common communication framework in whole systems [3]; shared objects consist of two parts: content and metadata that are stored into semantic repository based on RDF standard, strongly exploitation of stored semantic information for tagging, semantic annotation, search, creation of different visual models (conceptual), description of shared objects and performed activities, etc. The other strong point of presented system is its operability and interactions with other existing solutions, i.e. access to different types of content repositories based on Java standards; possibility to import learning packaged from other collaborative systems within SCORM or IMS standard; integration with existing web2.0 applications as Google Calendar or Google Docs.

The KP-Lab System consists of two main parts: platform and virtual user environment. The KP-Lab platform provides storage and supporting functionalities for end-user layer in form of semantic middleware.

2.1 KP-Lab Platform

The KP-Lab platform (see Fig. 1) consists of several integrated groups of services that are combined in a flexible service-oriented architecture. This architecture represents a set of services that are based on heterogeneous technologies, but provides interoperability that is neither language nor platform dependent.

Technical services cover middleware support services for accessing the whole system based on predefined user's roles and access rights. This aspect is modeled through security ontology that is stored in knowledge repository.

Content management services manipulate with different types of content, e.g. document, video, sound files, pictures, etc. These services tightly interact with CTM on lower level in order to provide access to different types of repositories and with end user layer on upper level to offer features for uploading and versioning of content files.

The semantic middleware services provide storage (knowledge repository) and management services for semantic descriptions (metadata) of the shared objects created by the KP-Lab tools.

Functional services provide supporting functionalities for different end user tools, e.g. Help system that contains basic wiki pages with tutorials and manuals for individual tools, recommender for further user actions, search in help documents, etc. Search services are based on Solr search server[4] that provides API for indexing and faceted search. Knowledge analysis services provide middleware services for analytical tools above awareness repository.

Repositories contain three types of databases: knowledge, content and awareness:

- Knowledge repository is implemented within RDFSuite [1] that is based on RDF (Resource Description Framework[5]) standard. This standard enables the creation and exchange of resource metadata as normal Web data. RDFSuite is being developed at FORTH -ICS in Greece and comprises the Validating RDF Parser (VRP), the Schema-Specific Data Base (RSSDB) and interpreters for the RDF Query Language (RQL) and RDF Update Language (RUL).

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[4] http://wiki.apache.org/solr

[5] http://www.w3.org/RDF/

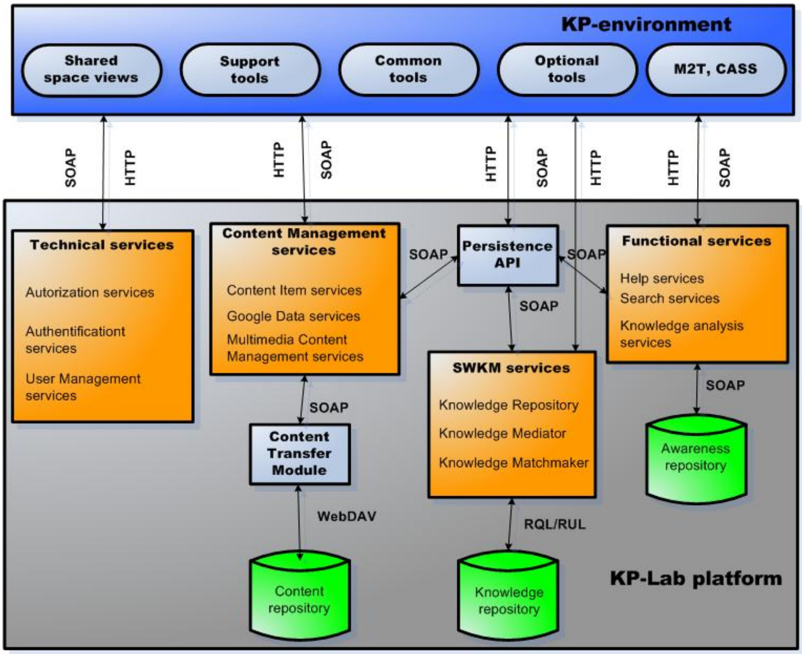

Fig. 1. Architecture of the whole KP-Lab System

- KP-Lab Content repository is implemented through Jackrabbit[6] engine for the compatibility with the JSR-170 standard
- Awareness repository is implemented within MySQL database and provides source data for notification and analytical services. Source data cover logs of events that represent all users' activities and changes within various shared objects in KP-environment [2].

Persistence-API is a Java client library, which provides the generic RDF persistence framework. It allows serialization and de-serialization of the Java objects into RDF repositories (based on the RQL and RUL). One of its main purposes is to separate business logic from RDF. By simple annotations, user can connect the Java Bean class with RDFSuite, without having any knowledge about RQL/RUL [5].

Content Transfer Module (CTM) is dedicated to creation and management of regular content (documents in various formats) used in shared objects (content described by metadata), either towards KP-Lab's own content repositories or external content repositories.

2.2 KP-Environment

KP-environment (KPE) represents user virtual environment with various integrated end-user tools divided into several groups (see Fig. 1):

[6] http://jackrabbit.apache.org/

Shared Space views represents basic user environment of a learning system aimed at facilitating innovative practices of sharing, creating and working with knowledge in education or workplaces. Users have possibilities to realize collaborative activities or practices around different types of shared objects organized in flexible manner based on user preferences, i.e. Content view for shared objects and relations between them, Process view for creation and realization of process models to represent practices or activities, Community view for identification of interesting relations and communication channels between different users and Tailored view as personal space for individual user purposes.

Support tools provide supporting functionalities for effective collaborative work or learning within virtual space, i.e. awareness (on-line notifications about changes in environment); search (free or semantic based on existing metadata); help system and possibility to define user personal preferences and settings.

A group called Common tools refers to a large set of tools that are tightly integrated into KP-environment, i.e. commenting or tagging (tags based on predefined vocabularies, or own tags), chat (individual or group), simple note editor and sketch pad, possibility to import or export data in form of packages based on IMS [6] or SCORM[7] standard, support for personal work within to-do list, integrated semantic wiki.

Optional tools are loosely integrated applications with main user environment accessible based on user preferences or expectations and they use directly KPE graphical user interface or own browser window. These applications provide advanced functionalities for: analyses of performed activities or practices based on monitored and saved data in Awareness repository (e.g. visualization of whole shared object building process based on defined time-line with identification of key persons, their contributions and relations between them; see next chapter for further details); possibility to export data from existing repositories in expected format for further analyses in third party tool as SPSS; exploitation of Google Calendar or Google Docs through open Google API; analyses of multimedia video clips through tagging features, management of tag vocabularies represented as ontologies in knowledge repository; possibility to create and manage visual conceptual models and own visual modeling languages.

CASS represents Java-application implemented on 3G mobile devices and provides access to the KPE through wireless connection. M2T offers conferencing features for management of virtual sessions or meeting with possibility to create discussion maps and analyses of finished discussions based on stored historical data.

2.3 Analytical Tools

The KP-Lab analytical tools represent very important part of described system as they provide interactive framework for different types of analyses based on user requirements or expectations. We provide two basic possible approaches.

The extraction of summarized information about performed activities or practices in KPE based on information stored in knowledge and awareness repositories. These information are obtained based on defined users' queries and cover various aggregations of available data, e.g. number of participants involved and number of actions performed by each of them; number of content items used / changes made / versions

[7] http://www.scormsoft.com/scorm/cam/contentPackages

produced; number of annotations defined / assigned / changed; number of comments added; number of to-do items created / fulfilled or not fulfilled; number of chats, meetings, links, etc. in given time interval, within given group or with other constraints posed by the user in the analysis phase.

The second approach is to consider the activities or practices in KPE as a series of different actions in a chronological order (time-line), possibly with different levels of granularity, where some subsets of them may have crucial importance (see Fig. 2). Such carefully (manually) selected subsets of actions can be called *critical patterns*. These patterns usually lead to some critical moments in a whole activity, which can mean, for example, a significant progress, discovery of new knowledge/approach, or on the other hand they may indicate un-success of a particular activity or its early finish.

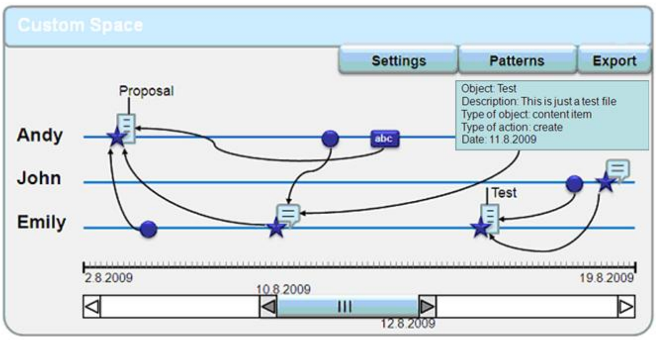

Fig. 2. TLBA visualization

Time-line based analysis (TLBA) provides a complex view of performed events and gives the possibility to focus on potentially interesting facts. This is an interesting way to reflect on the existing practices and following their transformation into innovative ones. Sequences of performed events with relevant elements in chronological order are visualized via defined (one or more parallel) time-line(s), see Fig. 2. Users have possibility to filter/customize the list of properties shown in the timeline based on their preferences. The important functionality of this tool is possibility to define and store interesting patterns from the timeline. Basic time-line visualization consists of automatically-collected events that are performed in KPE. In some situations, it is necessary to include elements called external events (performed outside KPE) that are relevant to analyzed process and this operation is performed manually by the user.

3 Conclusion

KP-Lab System represents interesting and promising initiative in the domain of collaborative systems in order to provide complex solution with various integrated end-user functionalities in one place to meet user expectations within design, management and analyses of different collaborative activities and practices in education or working conditions. KP-Lab System can be compared with existing widely adopted systems to identify positive advances, e.g. support of semantic principles, cooperation with web2.0 technologies, intuitive and interactive user environment, simple extensibility and replacement of previous system based on possibility to import data in standard packages, advanced analytical features to offer different perspectives on performed events, etc.

Public version of our system is available on http://2d.mobile.evtek.fi/shared-space.

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Machine Learning Support for Human Articulation of Concepts from Examples – A Learning Framework*

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Abstract. We aim to show that machine learning methods can provide meaningful feedback to help the student articulate concepts from examples, in particular from images. Therefore we present here a framework to support the learning through human visual classifications and machine learning methods.

Keywords: concept learning, machine learning, visual environment, learning framework.

1 Introduction: Research Motivation

In a century where technology is emerged into education, we want to see how can we use machine learning to support the articulation of concepts from examples, and in particular form images. Therefore, our research question is: *How efficient can the feedback of machine learning techniques can be for this human learning process?* That's what we start answering in this paper, by introducing a learning framework based on using machine learning to reason from student classifications. But let us analyze first what is driving our research.

People know from images more then just from using words[1]. Images help people externalize their intuitive knowledge, within a process called articulation, or transfer from tacit to explicit knowledge [2]. We evaluate the learning process though the articulation that a learner can provide to a concept. Articulation means descriptions, and therefore words. Hence, the main focus is on how to support the human learner extract the best words from images? Words, in our case *terms* (or *attributes*, as call them in this paper) need to reflect the topic and to be accepted by the learner and the teacher. Therefore, the teacher can provide an initial descriptive vocabulary, where terms are clues for the definition. In a similar way to a Socratic tutor, a learning system has to guide the human learner in articulating knowledge [3]. But in contrast to Socratic tutors, we want to have all the clues from the beginning and let the student discover the definition. Hence, the human learner will have the set of pieces of a puzzle whose correct arrangement correspond to the articulation of the concept. In addition to this, we know that people learn by classifying objects visually [4,5] and they learn much easier in a visual environment, then using only texts. Thus, one of our goals is learning by classifying in a visual environment to help the student focus.

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Other issues of our research are based on using machine learning to support the human learning of natural concepts [6] and on the use of the limited working memory capacity [7]. Natural concepts are difficult to represent as set of attributes, because they contains borderline cases and are influenced by contextual information. Concepts that people meet in everyday life are like this (such as concepts from *citizenship* or *environment* topics). Natural concepts present also the typicality property: some examples are more likely to belong to a concept, then others [6]. Among machine learning methods, conceptual clustering [8] can deal with typicality, by finding the basic description (applicable to most cases of a concept) and the inference rules (to explain borderline instances). Given the difficulty of describing concepts, we focus on supporting the student to articulate the concept description, by classifying learning objects (images and terms). Classification tasks are using the working memory [7]. Natural concepts affect the organization of memory, in the sense that concepts are organized hierarchically into memory, in a taxonomy [6].

The main research issue concerns the *reasoning via generalizing and specializing*. A previous approach on reasoning from general terms, specializes the terms to remove ambiguities, find relevant images and introduces actions on objects [9]. To learning by specializing, we add in our work the classification task, which is helping the student formulate the general terms (or attributes). More important, we propose to guide and suggest the refinement to the student. Combining generalization and specialization to get a correct concept description is our main research goal. We have to mention here that by generalization we mean building an extended vocabulary with more general terms in order to cover as many examples (images) as possible of the concept to be learned. As we will see, generalization brings conflicts (same general terms cannot distinguish between opposite examples). By specializing we refine the concept description to remove ambiguities (i.e. conflictual situations).

We present next our learning framework, the research hypotheses that will be supported within the framework and the evaluation methodology.

2 Machine Learning Supporting the Human Learn from Examples

In our work we aim to show that machine learning can provide useful feedback in order to help the student articulate the concept description. The problem has several aspects: 1) the learning tasks involving images and terms, 2) the machine learning feedback, 3) the articulation of the concept. Images and terms that we use in our research work are provided by the SILVER project, which focuses on knowledge visualization within e-learning environments [10].

2.1 The HMCD Learning Framework

We propose a learning framework that will use machine learning methods to reason from human visual classification with the purpose of helping the human externalize the intuitive knowledge and articulate the concept description. We call this framework HMCD (Human-Machine Concept Dance), due to the support for the articulation.

<u>Roles.</u> A scenario based on HMCD has three participants with different roles: a teacher, a student and the computer. We analyze first the teacher's role. We agree to the theory

according to which the human learning is situated within a context [11]. Hence, the teacher defines a *topic* to frame the domain. Then, is defining the *target concepts* (i.e. concepts to be learned during the learning session). Afterwards, the teacher selects the learning objects: the initial set of terms and the images. Through terms we understand a vocabulary with specialized keywords utilized in describing the images and the target concepts. Terms are binary attributes, because they represent *what* students can *see* in the image. The teacher gives the specific metadata (links terms to images).

The student is doing two classifications of the learning objects: first, building a hierarchy of terms, through extending the vocabulary with more general terms and second, grouping images in order to correspond to each target concept. The computer reasons from student's classifications and determine the compact metadata (specific terms from the images descriptions are replaced with their most general parents from the hierarchy). At a higher level of generality there are possible conflicts, which we call ambiguities: same metadata corresponds to different classes. For instance, within the topic *environment*, for the target concept *Effect-on-the-environment* [10], the compact metadata introduces conflicts (see table 1).

Table 1. Example of ambiguities introduced by compact metadata

ReconstructionOfVikingHouse (positive effect) PLANT={Grass, Wood} BUILDING_MATERIAL={Wood_shingle} BUSINESS={HighBuildingOccupancyLevel}	TheHeidiWeberPavillion (negative effect) PLANT={Grass, Trees} BUILDING_MATERIAL={Glass, Metal} BUSINESS={PlaceForBusinessOrTourism}

In this particular case (see table 1), specializing the term Business solves the ambiguity and keeps the coherence of describing the rest of the images from the set.

Computer's support is background and the student can choose using the suggested terms for specialization. After the learning session, the computer will verify student's understanding through a test.

Shortly, the computer roles is to detect ambiguities and to explain them to the learner. The computer offers a concept description, as abstract as possible, but discriminative enough. We want an *abstract description* in order to characterize as many example as possible of the concept, and to limit by thus the number of borderline cases of a natural concept [6]. In the same time, abstraction is linked to a limited set of attributes (terms) that can be memorized and understood by the student during a learning task [7].

Components. HMCD has three components (fig. 1): 1) the human visual classifications interface, 2) the ML support (background activity which can be switched on/off by the student) and 3) the articulation of the concept (the computer proposes the terms for specialization and verifies student's knowledge). The ML component explains ambiguities. Ambiguities explanation stimulates the reasoning by understanding close differences and similarities among instances [12].

According to the three components, the steps of the learning process are: a) generalization; b) specialization; c) refinement. Using deductive reasoning, which is a specialization process, and previously defined hypotheses (which in our case are represented by rough descriptions of concepts) determines a quicker learning then using induction (generalization) and accidental hypotheses [13].

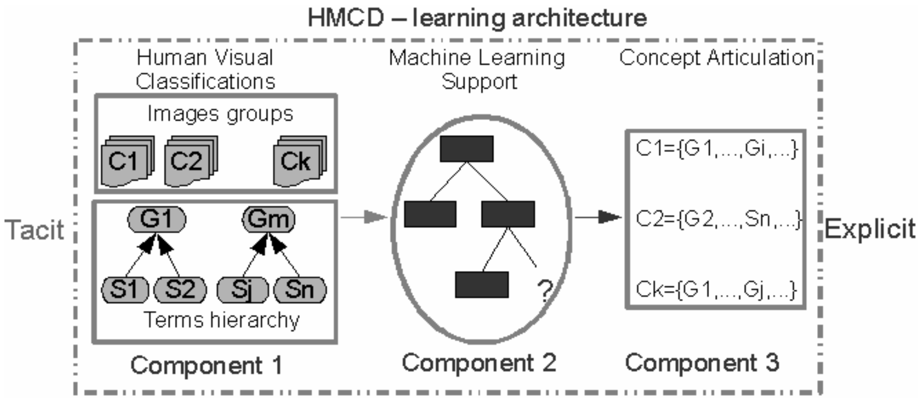

Fig. 1. The learning framework HMCD (Human Machine Concept Dance – using machine learning to support the human articulate the concept description)

2.2 Research Hypotheses

People can generalize, as a natural way of learning [6]. However, generalization brings conflicts (same descriptions for different concepts – as we can see in figure 3). This is caused by the fact that generalized terms hide distinguishing attributes, which can be found by specializing the general terms. We assume there are no conflicts at the most specific level of terms. Our question is *which terms to specialize first and what is the minimal set of terms that have to be specialized in order to remove conflicts but to keep a high level of abstraction*? Given these considerations, we present our research hypotheses:

(H1) People can learn from examples (in particular images) better with machine learning (ML) support than without. Our predictions are that the concept description given by the computer is more accurate and comprehensible due to the use of terms known by the student, but not more faster and not more enjoyable (hence different from the intuitive process of grouping terms and images).

For the second hypotheses, we consider different machine learning techniques, with potential to support learning natural concepts (decision trees - DT, version spaces - VD and conceptual clustering - CC). We know that each of these ML methods has advantages [8, 14]. DT and CC are sound methods (don't introduce errors). VS gives an intuitive understanding of learning as hypotheses searching. CC deals with typicality. From these considerations, it follows the second research hypothesis:

(H2) We can benefit from strength of each ML method mentioned above.

Working with specialized terms alone doesn't develop a general vocabulary. Generalizing only introduces errors in concepts descriptions. From this it results that:

(H3) ML can provide feedback (explanation) so that the human won't overgeneralize, when using machine learning and visual human classifications.

We will validate the hypotheses by evaluating students that will be using HMCD.

2.3 Evaluation Methodology

We consider supporting the hypotheses by evaluating test groups. We will check (H1) by evaluating two test groups: the first group of students works with a learning system based on machine learning feedback, while the second works without it. (H2) can be checked by allowing students to switch between different ML methods. We permit students communicate (they code their answers). Then we measure frequencies of students answers. To check (H3) we give different tasks to students: specialize, generalize, use ML or not. Then evaluate students comments while doing the tasks.

3 Summary and Future Work

In this paper we propose a learning framework based on using machine learning algorithms to support students learn concepts from images. Next we will implement and evaluate the framework. Through our work we highlight how machine learning can guide the human learn concepts from examples in a visual environment.

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Oratoria Online: The Use of Technology Enhaced Learning to Improve Students' Oral Skills

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Abstract. New ITCs have proven to be useful tools for implementing innovating didactic and pedagogical formula oriented to enhance students' en teachers' creativity. The up-and-coming massive e-learning and blended learning projects are clear examples of such a phenomenon. The teaching of oral communication offers a perfect scenario to experiment with these formulas. Since the traditional face to face approach for teaching 'Speech techniques' does not keep up with the new digital environment that surround students, it is necessary to move towards an 'Online oratory' model focused on using TEL to improve oral skills.

Valladolid University offers a subject called 'Técnicas de Expresión Oral' (Speech techniques) for an advertising and PR degree. Jon Dornaleteche has been the teacher in charged of it in the last four years. This paper summarizes all the achievements obtained by means of the application of ITCs and proposes a didactic guide to help teachers change their methods.

Keywords: Online Oratory, speech techniques, video blog, rhetoric, Internet, blended learning, ITCs.

Biographical notes: Jon Dornaleteche[1] is Associated Professor at Valladolid University and a member of LIPSIMEDIA (Media Laboratory of Psychology). He is currently teaching Advertising Narratives and Speech Techniques. Andrés Domínguez Sahagún[2], journalist and university teacher has helping Jon Dornaleteche to develop the didactic model and has assisted to many of his lessons as an supplementary teacher.

1 Introduction

This paper summarizes the main aspects of the subject 'Técnicas de Expresión Oral' taught in the 'Advertising and Public Relations' degree at Valladolid University during the last four years. This subject is officially called 'Speech techniques', but 'Online oratory' could be a better title because of all its technological implications. A series of notions, examples, activities and dynamics will be given in order to illustrate the innovations achieved concerning the use of TEL to improve students' oral skills.

In this context, Pedro Salinas (2004) points out that the institutions that used to monopolize the transmission of information and knowledge, such as universities, must now adjust to the new situation, in which they have ended up being another node

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in the ITCs' universe. The current students more often disregard the traditional processes of learning and choose a more transversal education based on new technologies. The new students' mentality requires restructuring the rigid methodologies and spaces of the conventional learning processes into others based on flexibility and interconnection. These new technologies also demand new ways to understand literacy. The greatest issue stems from the fact that some teachers are no longer literacy experts when it comes to digital media and web 2.0. As Vilches (2001) suggests, these changes entail the professional retraining of those teachers not yet familiar with the ITC's. If educators want to have their students motivated to learn, they have to keep up with the latest technologies.

In order to adapt to the new demands, it seems essential that the university community use and develop online systems to support knowledge exchange, collaborative learning and innovation such as the CMTube, suggested by the Centre for Advance Learning Technologies (Angehrn, Maxwell, Luccini and Rajola 2009). This system aims to stimulate on-line interactions such as game dynamics, profiling, network visualization and the use of video. According to them, CMTube generates three different kinds of values: the connection value, which refers to bonds between the agents of the process, actionable learning value, which relates to the acquisition of competences, and the gratification value that reflects the emotional side of learning. If we assume that education entails emotional responses, the exchange of information and knowledge using new technologies must be emotionally gratifying in order to be effective.

Other researches have been done concerning the future of e-learning and blended learning (Chatti, Jarke and Froch-Wilke 2007; Sigala 2007; Poce 2008). These researches focus on the importance of social networking and horizontal knowledge sharing. Among all the communication tools like e-mail, wikis, blogs, instant messages, discussing groups, media sharing sites, electronic journals, etc., social networks are the most growing devices because they function as channels for content generated and hosted by the users. In that sense, social networks are the virtual space in which modern communication takes place. Nevertheless, there are other researches that point to potential barriers of web 2.0-based learning (Benson, 2008). Benson claims that the popularity of social networking tools and its possible pedagogical use may confront privacy issues concerning the perception of truth and information security. Needless to say, modern universities have to take part in these issues. On one hand, they have to evolve from the traditional and canonical processes of learning to the new Technology Enhance Learning Methods such as CMTube or Online Oratory and, on the other hand, they must solve the matters related to privacy and information trust derived from TEL.

2 Online Oratory vs. (Traditional) Speech Techniques

The subject 'Speech Techniques' was first introduced in the Advertising and Public Relation curricula of Spain in 1995 (BOE)[1] and it has not progressed thus far. It has

[1] Boletín Oficial del Estado (Spain's Official Papers).

used the same teaching techniques since Cicero's De Oratore. It is not that the basis of rhetoric and oratory are invalid –in fact they have proven to be very efficient–, but they were written taking into account the technologies and the spaces they used to communicate back then. In the last 20 years, technologies have changed more than in two millennia changing radically the way we interact. That is why we need to reinvent how we teach and learn speech techniques; and that is why the Online Oratory model can be very helpful to improve students' oral skills at the same time it rises their digital media literacy.

The framework of any subject is defined by the space in which students and teacher interact. The wider the space is the more possibilities of interaction emerge. The Internet opens a 'world wide web' for that purpose: a system of interlinked documents. The traditional paradigm of one-way offline information channel provided by the teacher in Speech Techniques is no longer operative; instead, a new online model of multiple channels and resources of communication is implemented in Online Oratory. In the first model, the student must attend the lecture in order to participate in the oral activities and to be evaluated, whereas in the second one, half of the activities can be carried out and evaluated outside the classroom; the technologies needed for that purpose are a video camera (or webcam), a personal computer and Internet connection.

Nonetheless, the innovation of this online education model does not rely on the absence of on-site classes, since mastering the art of public speech requires live performances in front of audiences. The recording of performances at home only complements the work carried out on-site. In that sense, it is not a standard *blended learning* (Álvarez, 2005) model in which half of the process is carried out independently. As an alternative, the importance of the model proposed in this paper is that most of the online content is shown in the on-site class and that the student that wants to recall it can watch it again whenever an Internet terminal is available. The student has an active role in mastering relevant information for the rest of the class and the material recorded is accessible during the whole course. Instead, in the workspace of the traditional Speech Techniques the students' labor (the oral exercises) does not remain available for them.

The workspace and the schedule of the (traditional) Speech Techniques allowed each student to perform in the classroom three times maximum (due to time restrictions and number of students per group). Three times in four months does not give a beginner what it takes to be confident in front of a crowded audience. The art of public speech relies on the self awareness of the speakers' communication competences. Likewise, self-confidence is crucial for being a good speaker. Self-confidence and endurance are attributes that come through hard work and repetition (Cicero, 2001). The video recording gives the student the possibility of watching his or herself over and over again so that he or she has an idea of what his or her weaknesses and advantages are. In that sense, the video camera would be like a mirror that keeps their images as long as they want. Getting to perform in front of a camcorder repeatedly reinforces the students' oral skills because it adds extra-pressure to the training process. It simulates exercising in front of a small audience. This Online workspace would not make sense if there were no video resources.

So, if the video camera works as a 'capturing mirror', the Internet is the window from where anybody (specially the rest of the classmates) can have access to it. And if performing in front of a camera adds extra-pressure to the exercise, uploading it to the Internet makes it even more strained. They are talking to 'the world'; it gives them the feeling of having an impact on reality and therefore, a sense of responsibility. The pedagogical philosophy behind this practice is that the more the students get through these stressful situations, the better they will react in similar circumstances when needed. Nevertheless, these under-pressure practices require the proper guidelines in order to be effective. In the Online Oratory workspace the students have the chance to watch their teacher speaking online too. That is the key to encourage them to upload their performances. They have someone close to them as a reference. Moreover, the building-up a forum and sharing it with society improves the students' self-perception.

In the Online Oratory methodology, the teacher records him or herself giving a lecture and uploads the file to a *video hosting* channel. Then, the teacher plays the video online during the lecture so the teachers' image is doubled in the classroom. Students will do the same: their oral exercises are recorded and uploaded to *a video hosting channel* and then watched and commented during the class. ITCs offer a new 'virtual representation' of the participants. Even some parts the lectures are recorded. Once the exercises are recorded, they are edited, uploaded, watched and analyzed in further sessions. When the entire recording is done, there will plenty of material that may be used for a documentary of the learning process, showing common mistakes and the way to solve them. This documentary may help the students to have an overall idea of their work during the semester and it also may help other students from other faculties all over the world. The exercises uploaded to the Internet have received intense and continuous feedback from Southern American institutions.

The real innovation of this model is that most of the content of the lectures, on one hand, and of the students' homework, on the other, are recorded and uploaded. Then, the teacher organizes the videos in a *blog* where he/she may give written advices and evaluations of the exercises. The *blog* works as a 'virtual classroom'; all the students have access to it and all of them can leave comments on their work and classmates' work. Again, the innovation relies on the fact that the *blog* can be accessed online during the lecture time. These multimodal channels provided by the new technologies facilitate the access to what Castells (1997-1998) would call the 'information flow' and that would facilitate the individual to fully participate in a wider society led by these technology leaps.

Five years ago, none of this was possible. The official program was based on writing a dissertation and then presenting it in front of the classroom. Back then, it was difficult to imagine that access to ITCs would be so popular. The students do not need a classic video camera for 'Online Oratory', they can manage with the camera of the mobile phone. Five years ago there were no mobiles with video camera, and most of the students did not have a laptop or Internet connection at home. Throughout these years, ITCs have been widely spread among Spanish middle class. In this regard, it is crucial that the education institutions restructure their methods and practices. 'Online oratory' proposes a low-cost didactic strategy using TEL to improve students' oral skills and to spread collaborative values all over the world.

3 Online Oratory Step by Step

Next, the outline of the subject is given in case any other scholar might find it interesting:

- Title of the subject: Online Oratory
- General objectives: to develop students' oral skills in front of a crowed audience or in front of a video camera.
- Specific objectives: to increase self-esteem, develop communication competences, encourage creative thinking, master the art of rhetoric and oratory, and improve the use of ITCs (digital media and web literacy).
- Space: classroom with laptop, a big screen and Internet connection.
- Duration: 3 ECTS.
- Teaching materials: two video cameras, one giraffe microphone, a laptop with editing software, and Internet connection.
- Students' material: a video camera (even a mobile phone with video camera), a computer with editing software and Internet connection.
- Theoretical content: 1. Principles of communication, 2. Basics of web literacy, 3. History of rhetoric and oratory, 4. Fundamentals of rhetoric.
- Practical content: 1. Quoting 2, Storytelling, 3. Ironic speech, 4. Dissertation. (At least three minutes long each).
- Methodology:
    - Before the lecture period: 1. The teacher must record himself or herself talking about the objectives and the procedure of the subject / 2. The teacher must record the theoretical content of the subject / 3. The teacher must upload the files to his or her *video hosting* channel and then, update the *blog* with them / 4. The teacher must upload to the *blog* text files with the same theoretical content and procedures of the subject.
    - During the lecture period: 1. The teacher makes a survey to know the 'self-perceive communication competences' (McCroskey, 2006) and their expertise concerning ITCs / 2. The teacher records random interviews to have fresh testimonies of the students / 3. The teacher presents the objectives and the procedures of the subject to the students and asks them what they expect to learn from it / 4. The teacher asks some of the students to record parts of the lecture (the teacher briefly explains how the cameras and the microphone work) / 5. The teacher gives the guidelines of the practical content / 6. Once the students have prepared the discourses they give a speech in front of the classroom while his or her classmates record it / 7. The teacher evaluates the discourse as he or she is being recorded, then the teacher asks the students to comment the same discourse. The debate is also recorded / 8. After the debate, the students must record the discourse for homework taking into account the suggestions proposed by the teacher and the classmates. Then the students upload the video and send embed code to the teacher's email (the file must be tagged as Online Oratory) / 9. The teacher updates the *blog* with the students' discourses and makes his/her final

evaluation of the exercise. The teacher encourages the rest of the students to leave their comments / 10. Some of the discourses and twits are watched online during the class.

  - After the lecture period: 1.The teacher asks the students to record a video giving their impressions about the learning process and the quality of the teacher. The students are also encouraged to give advice for future exercises, debates, practices, materials, etc. / 2. The teacher takes the most relevant video material and edits a documentary of the whole process: a ‘making of’ / 3. The teacher uploads the documentary so that all his or her students and the rest of the world can watch it.

- Evaluation: the students must correctly carry out the four exercises (the quotation, the story, the ironic speech and the dissertation) and frequently participate in the classroom debates and the *blog* comments. The evaluation is about the evolution of the individual, not all the students have the same communication competences when they begin so the evaluation is progress based.

4 Conclusions

The traditional methodology used to teach oral communication techniques has become obsolete. “On-line oratory” is a new Technology Enhanced Learning system that updates ancient oratory and rhetoric. Online Oratory mixes old techniques with new digital media in a way that takes the best of each era for the best of our students. It rescues all the concepts that worked out back in the days for the understanding of human communication and persuasion and transmits them through student-friendly technologies that multiply the amount of information exchanged in a classroom.

The methodology also encourages students’ emotional implication in the content and high level of students’ participation in the decision-making process for the production and evaluation of the exercises. The common evaluation of their classmates helps students become more responsible, critical and empathic in their daily lives.

By repeatedly recording, uploading and watching the performances, both teacher and students learn more and better, at the same time they improve their media literacy and self-perception communication competence. The idea of producing a student-lead documentary on the learning experience complements this purpose and generates useful content for other future courses and universities around the world.

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Legibility for Users with Visual Disabilities

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Abstract. The aim of the research is to highlight the design for users with visual disabilities. In order to ensure validity, objectivity, and accurately information the following requirements were considered: Talking Signs, Tactile Maps, Floor Markings, Dual Signs, Color Contrast and Sans-serif Letters [3].

In conclusion, wayfinding systems are very important for disabled users and also guidelines recommended by the ADA and ANSI which includes the use of certain fonts, sizes, colors, contrasts, shapes, symbols, finishes, heights, and legibility. It is also recommended that a standard system be used to reduce confusion among users and to make it easier for new signs to be made [4]. Hopefully teaching new guidelines and encourage new ideas for identification and instructional signage will help to make a more effective and easily manageable system for the disabled users and for the entire population [5].

Keywords: Wayfinding, Disabled, Sign System, Signage, Environmental Graphic Design.

1 Introduction

The almost total absence of conditions and devices targeted specifically to the accessibility of blind and visually impaired or people with some visual deficiencies makes it essential to draw up specific strategies on creation of products and appropriate methodologies and procedures used in various fields of Design [6], [1], [7]. Dealing with this problem becomes extremely important because according to INE (2008) and through the results disposables in Census 2001 the visual disability has a great expression in Portugal. This problem shows that visual disabilities are over then 20 000 more that handicap disabilities. In turn, according to the -CEBV - Low Specialize Vision Center (2008) more then 400 to 500 thousand Portuguese can not read signs, even with glasses properly graduated, more than 200 thousand are not considered visually impaired, have low vision, and they don't have any type of support and, finally, around 50 thousand Portuguese with severe low vision are not identified.

It is therefore urgent to study and help to build a model of action and a set of guidelines / recommendations increasing scientific data to support designers in the future in various areas, from urban planning to architecture and design, as referred by some authors [3], [8], [9], [10], [11].

Based on this idea UNIDCOM/IADE, since it constitution, had developed a transdisciplinary character of its investigation projects in these areas of space cognition, orientation and signing [2]. This way it had created AISO Group - Interdisciplinary

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Analyze of Signing and Orientation Systems continuing POCTI/AUR/41712/2001 project as well as the Design Nucleo for the Sustainability with projects on the Inclusive Design Area.

The aim of this study is intended to help understand various needs of users in the field of orientation and space perception. It was optimized systems and products to support the accessibility and mobility tested in a real context, particularly on the Lighthouse's headquarters in New York. For such work was established and secured the participation of the designers and architects.

In this sense, the main objective of this research is the contribution for the questions of a design project, in the domain of accessibility, through compilation of a group of authentic scientific information, aiming to regularize and normalize the answers of designers and legislator to this group of population.

To achieve these objectives, it will be proposed a multidisciplinary approach and the use of different quantitative and qualitative methods appropriate to the several areas of specialization and different stages. These methods will allow characterize this type of user, theirs needs and space environment. Investigations and attempts to systematize recently were developed in some countries of Europe and North America and they are the baseline reference for this research.

At international level can be highlighted: Coco Rayner, Graphic Designer, a leader in the design of signs for the disabled where the projects stand out from the airport of Paris - Charles De Gaulle - exhibition at the National Museum of Colombia, Bogotá and direction of the museums of the Ministry of Culture of France; and Roger Whitehouse, a pioneer in understanding the legal aspects in the design for the disabled and for creation of "The Lighthouse International Headquarters" in New York (Calori, C. 2007). Roger Whitehouse, Nora Olgyay and Ken Ethridge, responsible for standards: ADA White Paperfor the SEGD (1990).

This research also aims to continue promoting policy of advanced training of human resources - doctoral studies - in this area of knowledge or to ensure the transfer of scientific knowledge for the benefit of civil society by promoting, among others, innovation and entrepreneurship competitiveness.

The aim of the paper is to show projects of wayfinding for the disabled based on new design codes and also to highlight the work of the designers, as Coco Raynes and Roger Whitehouse and finally case studies, as Lighthouse International Headquarters in New York designed by Roger White will help to describe how a good design could help blind and visual impaired users navigate their environment safely. In order to ensure validity, objectivity, and accurately information the following requirements were considered: Talking Signs, Tactile Maps, Floor Markings, Dual Signs, Color Contrast and Sans-serif Letters.

1.1 Structure and Description

The first part of the paper presents: the disability groups and the design codes:

1.1.1 Three Groups and Their Needs

The design code and the designers' work are geared toward three primary disability groups. They have direct ways of navigating their environment and have special needs each one distinct from the other:

The Blind -The blind cannot see signs, interior changes, color, or type. What the blind can "see" are people and spaces thought hearing and touch. The blind have a strong understanding of 3D space and the position of their bodies in it. When walking, they expect information to be where their hands fall and where their feet and cane make contact. The blind can also receive directions by following the flow of people and asking questions. The functionally blind make up approximately 2-3 percent of the population.

The Visually Impaired - Users with impaired vision require more signs than other people. They have greater need signs because they don't see their surroundings as well as others do. The visually impaired can see, but with great difficulty, especially type and color. They focus on many directions of one time and are always trying to focus on type information because they have a hard time seeing anything immediately. People with visual disabilities are easily disoriented, especially by small type. People with visual disabilities make up at least 25 percent of the population. Among people older than 65, this figure can rise as light as 75 percent.

The Physically Disabled - The physically disabled navigate their environment based on what services have been set up to meet their needs. Cub cuts in sidewalks, elevators, wider doors and bathrooms, and ramps are all physical additions to service the needs of this group. While paper does not focus specifically on the wayfinding requirements of this group. It is certainly built around the architectural design of the environment and whether improvements for the physically disabled are central to the design or a hidden background to the usual wayfinding process [6].

1.1.2 Design Codes

Until the twentieth century, the idea of the blind and visually impaired being able to navigate their environment was given no thought. The disabled stayed home or lived in special environments that could cater to their specific needs. Starting in 1929, with the establishment of the world's first seeing-eye dog school in Nashville, Tennessee, the blind began to gain the ability to navigate their environment, though interiors remained enormous problem. There were hardly any signs available for the blind. Buildings also were not geared to the physically disabled, with multiple stairs and a few maps. From the 1970 the sign designers began to create the first signs in Braille and raised letters that the blind could read. Researchers developed a better understanding of legibility issues related to color contrast and type size. Ramps began appearing as regular feature in buildings. Many organizations focusing on rights for the disabled began to develop laws that would protect their right to navigate the world unassisted. In the late 1980s, all this came together in the first national laws in the United States and the United Kingdom. Today an entire industry, as well as an academic and research base, has been built to meet the wayfinding needs of the disabled. Education efforts also began to pick up in the 1990s. Spearheaded by the Society for Environmental Graphic Design in USA and groups such as NHS Estates in UK (since November 2001, CHAD - The Centre for Healthcare Architecture and Design), designers began to see how to best implement projects based on the new design codes.

2 Methodology

The paper shows graphic systems used by designers based on ADA's codes and new technologies to assist in wayfinding for the blind and visual impaired.

The principal aspect of designing for different groups of the disabled is balancing the separation of sign information between people with visual disabilities and the blind. Like this is possible to meet the needs of both groups in one sign. This issue permeates nearly every aspect of the design codes, including those discussed below:

Location of Sign Information - To the blind, signs are all about tactility, which means that the placement of Braille and symbols is specified in most sign codes. Type should be directly above Braille and at specific distances in most of these codes. This restricts the location of information on signs, unless the same sign information is repeated in other locations. Many designers solve this issue by creating a "double sign," or a sign that contains both tactile and visual information, thereby duplicating information.

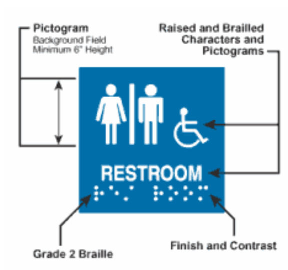

Fig. 1. Double sign (the sign contains information, tactile and visual)

Position of Signs - The blind also need to be located in specific places. Since most sighted people see information more easily when it is overhead or away from the clutter of the immediate environment, most codes have had to divide "directional" signs (signs with information directing the user to a specific location), and "identity" signs (signs that identify a location). Directional signs only need to respond to the visually impaired, while identity signs need to respond to both groups [8].

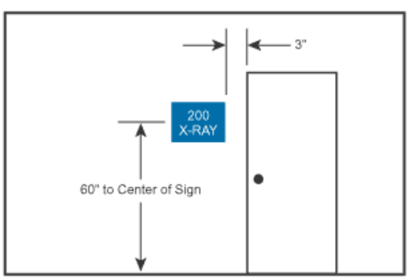

Fig. 2. An example of the position of the sign at the wall

Color Contrast and Lighting - Considerations regarding **c**olor contrast and lighting are not an issue for the blind, but they are the most crucial issues for people with visual disabilities due to age. As the eye ages it is less able to differentiate color [9]. The most sign users need high-contrast signs as well as adequate lighting for them to be legible. Color contrast also provides another rationale for the separation of signs for the blind and signs for the visually impaired. Since a tactile sign does not need to be seen at all, by separating them, the tactile sign can be all but invisible.

Fig. 3. An example of color contrast sign

Tactility Signs- Tactility also separates the needs of the blind from those of the sighted. Since blind people read by touch, sign elements must consist of raised surfaces, or should be placed on a table-top or on a diagonal surface to enhance ease of reading. Signs for the sighted are better read vertically. Even shadows cast by tactile signs can confuse a visually impaired reader.

Fig. 4. An example of a Tactility Sign

Typography- Type fonts are one area in which the needs of the sighted and blind are the most distinct. The blind need sans serif fonts that are ½-1 inch (1.3-2.5 cm) in size, and spaced far enough apart to allow for reading by touch. Lettering for the sighted usually needs to be as large as possible, and to have a wide variety of type fonts. The blind also find it easier to read letters that are all upper case, in contrast to the sighted, for who upper and lowercase is more legible.

Fig. 5. An example of sans serif font

New Technologies

Some designers today have used new technologies to assist in wayfinding for the blind through both audio and positioning devices. These technologies include:

Talking Signs - Talking Signs are simply signs with an activating button or sensor that allows the signs to "talk," giving identification, directions or other information. This technology is an infrared wireless communications system that provides remote directional human voice messages that make confident, independent travel possible for vision impaired and print-handicapped individuals. The system consists of short audio signals sent by invisible infrared light beams from permanently installed transmitters to a hand-held receiver that decodes the signal and delivers the voice message through its speaker or headset. The signals are directional, and the beam width and distance can be adjusted. The system works effectively in both interior and exterior applications.

Talking Signs may be used wherever landmark identification and wayfinding assistance are needed. To use a Talking Signs system, the user scans the environment with the hand-held receiver. As individual signals are encountered, the user hears the messages.

GPS Technology, Infrared and Wireless

Whatever type of technology is used, the idea that a handheld device can read information on a place is coming ever close to reality. Properly explaining directions will be crucial. Whatever does get selected, providing proper environmental cues will be just as important as the information placed on the handheld device.

When walking along streets or inside buildings, it is important for people with visual disabilities to acquire environmental information in order to update their mental map for accurate orientation as well as to ensure safe mobility. Various devices have been developed to acquire this information, but many problems remain unresolved. To overcome these difficulties, it was developed two new additions to a Remote Infrared Audible Signage System (Talking Signs(r)) for use by people with visual disabilities that they can use not only in public places but also in the personal environment of their daily life. These efforts are currently taking place through a joint Japanese-U.S. company collaboration. Wayfinder Access is an innovative GPS solution from the Swedish company Wayfinder Systems AB [10]. This application for Symbian phones is designed especially to work with screen readers like Mobile Speak or Talks from Nuance Communications and text-to-speech technology, and takes into consideration the special needs of the blind and visually impaired. With Symbian screen reader software, however, the visually impaired and blind get more than just the reading of the application's screens, but also a Braille support.

Case-Studies
The validation studies are based on case-studies:

Once considered a necessary tool of information—a growing number of people in the design, construction, development, and policy arenas have gained an appreciation of signage and environmental graphic designs for disabled in humanizing and demystifying the complexities of the built environment. They have found that well-designed signage and environmental graphic programs not only fulfill their communication function of informing, directing, and identifying the users, also serve to enhance the aesthetic and psychological qualities of an environment.

Coco Raynes, is one of the leading international designers of signs and informational graphics for the disabled. Some of her important projects include Paris Charles De Gaulle Airport, Museo Nacional de Colombia, Bogotá, Colombia Master Plan for an Educational Tactile Itinerary. Implementation Phase 1: Pre-Colombian to XVIIe Century, 1999 and Ministère de la Culture – Direction des Musées de France.

Raynes has specialized in using tactile and audio information. Tactile Maps, incorporated into directories and information tables, have been implemented in the programs for transportation and healthcare facilities, museums, parks, libraries, universities, corporate and retail buildings. Raynes' two significant innovations include: The RaynesRail is designed to comply with the true intent of ADA, the Braille and Audio Handrail System makes public buildings, parks, transportation facilities and museums accessible to everyone. The Rail provides blind travelers with a degree of independence previously unattainable in unknown surroundings. The Braille and audio messages provide directions, describe open areas, traffic patterns, and warn of ramps, stairs and turns. In museums, the audio provides cultural information. The audio units, with multi-lingual capabilities, are integrated in the Rail at strategic locations. Activated without any devices, they make the Rail a universal solution to be used by all.

The floor markings are often incorporated into the accessible wayfinding programs. These slightly raised dots are mounted on the floor to further delineate the circulation path. The dots can be followed visually, or by foot, and make a sound if tapped with a cane. Raynes has utilized floor markings for large facilities such as airports to give them more freedom.

Roger Whitehouse has been a pioneer on understanding the legal aspects of, and in designing for the disabled. Roger Whitehouse, Nora Olgyay and Ken Ethridge wrote the ADA White Paper for the SEGD. This laid out the guidelines for American signs and best practice for utilizing them. Roger has also conducted extensive research on design for the blind on behalf of the Lighthouse International Headquarters.
Roger has been a prominent advocate for the adoption of design principles to assist in making the environment accessible for the blinds and impaired users. The proposals that he created, for vision-impaired users among others, include audio-visual wayfinding landmarks, a custom typeface for tactile reading, and a wayfinding device called BrailleRail.

The Lighthouse International Headquarters in New York is one of the few buildings in the United States specifically planned to integrate the needs of people of all ages who have a broad range of vision, hearing and mobility impairments. The building is a "working laboratory" where many design features are test for the first time. In creating the building, architects and designers were guided, every step of the way with information from the Lighthouse vision researches and other staff experts. The Lighthouse consumers provided their input regarding lighting, signage, color contrast, audible communications, safety and orientation, and mobility issues through extensive testing and research... The resulting design had to fit the needs of a varied group without cluttering the space and impairing wayfinding. The architects and lighting designers began by developing a clear plan that eased wayfinding through the building. Some of the innovative features include: **Easy-to-navigate**- The architects designed a functional entryway that is divided by a railing, separating people who enter and leave the building. At the main reception desk, tactile and large print maps of the public floors help the consumer's plan their routes within the building. The recessed waiting area in the lobby has space below the bench seating for guide dogs.Full Light- Bright natural light from the oversized windows and custom-designed, non-glare artificial light fixtures throughout the building produce a soft light that avoids dramatic changes in level or intensity.

Contrasting Colors- Since loss of ability to perceive **c**olor contrast is one of most common effects of vision impairing, strong contrasting colors, warm white walls with magenta door trims are used trough the building. Floor tiles, in shades of dark purple and mauve, point out elevators and safe travel paths, and color and texture contrast between walls and floor, on stair treads, and along edges of desks also help maximize ease of use.

The Wayfinding Approach - Roger Whitehouse worked to support the innovative design features throughout the building with a sign system that could support people with varied disabilities. The designer began with extensive research measuring how the blind read, including how they read test symbols and maps. Whitehouse coupled this research with observations on how the blind and people with physical handicaps navigate space.

The results of Whitehouse's research found their way into a number of design features in the wayfinding system. The first was the observation that the blind felt more comfortable reading Braille and tactile letters set at an angle. This led to the simple, but innovative angled Braille signs and maps that are positioned at a comfortable height for reading. Another important research result that affected Whitehouse's design was that the blind feel much more comfortable following a continuous rail system that connect the signs. The design approach that answered this development was a tactile element that connects each room identification sign. Additional information along the path directs users to the elevators. The map design was another balancing act between the needs of the blind and those of the visually impaired. The represents a full and complete raised floor plan that is mixed with Braille information, thereby providing a clear view both for blind and the visually impaired.

Balancing the needs of the blind with the needs of the visually disabled is also important to the sign system. The Braille and the raised letters for the blind are very low-key and unobtrusive, while the visual letters and symbols used are large, with a high color contrast. One innovation that the designer incorporated at the Lighthouse that is now being integrated into many building is the talking sign [11]. These signs identify conference rooms, restrooms, and stairways out loud to users carrying special handheld receivers. The elevators feature a special enunciation system that identifies each floor and directs people toward the reception desks, where floor-special tactile maps are located. The Lighthouse International Headquarters may have taken the leadership approach to wayfinding for the blind and visually impaired, but all the design innovations can be incorporated into any facility.

3 Results and Discussions

Reopened on June 20, 1994, the Lighthouse's headquarters offered people of all abilities an opportunity to experience and give feedback on the concept of increasing independence through a more universal approach to wayfinding and graphic design [11].

Lighthouse staff took advantage of every opportunity for feedback from visitors to the building, whether they were nondisabled, visually-impaired, or cognitively or physically impaired. What they learned about signage, symbology, typefaces, and wayfinding became invaluable to graphic designers to learn to deal with these issues, not only in architectural graphics, but also in graphic user interfaces, and also in other areas of the graphic design. Upon completion of the project, Steven Goldberg of Mitchell/Giurgola Architects observed, "I don't think any of us who worked on the project will ever look on architecture the same way again" [12].

In Portugal where the wayfinding is very difficult for a disabled person navigate safely, however, the designers should outline a practical and comprehensive design method to wayfinding, using an inclusive design approach. The design guidelines should assist designers as well as developers, property owners and property managers in identifying ways of improving access to, into and through their new or existing property, particularly buildings and large complex facilities. The material sources include expert knowledge from architects, landscape architects, lawyers, engineers, building surveyors, building regulators, access consultants, local expertise and persons with a disability. In old and new buildings the clients commissioning the works should ensure that early consideration be given to making sure the building is accessible to everyone. In order to ensure that accessibility is seen as an integral part of the design process the client must emphasize the importance of accessibility when briefing their architect.

Design solutions and strategies that are useful, on-demand navigation information and aids for people who are blind or vision impaired, describing the environment and assisting them plan to reach their destinations. The following brief list provided in this section highlights some of the important issues that must be considered when providing a fully inclusive built environment:

Entrances -The entrance should be clearly distinguishable from the façade (use of glass, should be indicated clearly however fully glazed entrance doors should be avoided and also color contrast issues considered); Signs should be provided indicating entrance and directions to other parts of building; The door should provide a clear open width of at least 1m;Revolving doors should be avoided; Sliding electric doors are preferred option (consider open time).Powered doors can be provided, ideally using an infra-red operating mechanism (consider open time);Outward opening doors should be protected / recessed; Door closers on manual doors should be adjusted to minimum force necessary to open. Thresholds, entrance mats and changes in floor finishes should be flush; Door furniture provided should be easy to use and identify; and Lobbies need careful consideration.

Reception areas - Transitional lighting should be considered; Should have ample circulation space and have clearly defined (i.e. consider color contrast ;for carpet / skirting / walls) and unobstructed routes (i.e. recess radiators and fire extinguishers etc) to other parts of the building; Low level reception desk; Adequate seating / waiting area should be provided; Tactile plan of the building; and Information / Signage.

Doors often present the most problems for disabled people; Doors should have a minimum clear opening of at least 800mm, anything in excess of this is advisable i.e. 1m clear opening; Double doors should provide above opening through one leaf; Door frames / door / door furniture should have color / tonal contrast; Door furniture should be easy to use; Doors should require minimum force to open, consider providing automatic opening doors or electromagnetic catches linked to fire alarms; and Vision panels must be provided in internal doors.

Corridors / circulation -Clear circulation space in open plan areas and corridors should be at least 1.2m; In large open plan areas use floor finishes to define routes; Corridors can convey information and assist (or hinder) circulation and emergency evacuation; Avoid projections or outward opening doors on corridors; Recess radiators and other equipment; Avoid glazing at ends of corridors; Ensure lighting is adequate and does not create glare or silhouettes; Choose color schemes with good color and tonal contras; and Choose floor surfaces carefully.

Vertical circulation - For buildings of two storey or more suitable means of access must be provided to floors above ground; Passenger lifts are the preferred option; They should be at least 1100mm x 1400mm and have a door with a clear opening of 800mm. Larger lifts are preferred and reduce waiting times in larger buildings; A handrail should be located at 900mm high around the inside of the car; Audible and visual information should be provided to identify floor level and door opening / closing. The door should stay open for at least 5 seconds; A mirror should be placed on rear wall of the car; An emergency phone should be provided and clear instructions on how to use it provided; A clear area of 1500mm sq. should be provided outside the lift; and Consider using a dual supply lift that is capable of use in an emergency.

Signage- Signs should be located logically and easily identifiable; They should not cause obstruction; Care must be taken to provide good contrast; Do not locate behind glass; Use recognized symbols, color coding to supplement written information; and Consider using tactile signs where they can be easily reached.

Lighting - Good lighting is essential for everyone; Transitional lighting at the main entrance must be considered; Critical areas like stair-wells, corridors or other changes in level along routes need to be looked at and lighting levels increased; Good management can maximize the amount of light available; Position lights where they will not cause glare, reflection, shadows or pools of light and dark; and Fluorescent lights create a magnetic field and cause a hum for hearing aid users.

4 Conclusion

The aim of paper is to help designers who are not well acquainted with theories and practices of inclusive design and wish to learn more, and possibly to some authorities/countries who are not so sensitive or well qualified to help their disables. It shows a detailed presentation that can help architects/designers of developing countries involved in inclusive design. These design guidelines are based on current understanding in cognitive psychology, linguistics and best practice in orientation. [13].The provision of good access and facilities can be seriously undermined if it is difficult to find the way around a building. Good signs and wayfinding guidance are an essential part of any successful access strategy. Buildings should be designed in a way that makes it simple for people to find their way around. Although some way-finding aids are specifically designed for people with particular impairments, they are usually helpful to everyone. An environment developed with the needs of people with physical, sensory or cognitive impairments in mind will also be a much easier environment for all users to find their way around.

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Assessment of Andragogical Attributes of Distance Learners

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Abstract. The purpose of this research was to assess the andragogical attribute of adult students engaged in distance learning, specifically, with regards to the main construct, cognitive engagement versus academic achievement. Five hundred students were sampled and the response rate was 33.8%. From the analyses, the overall mean score for cognitive engagement is 3.75 from a scale of one to seven. The results indicated that knowledge gained through the e-distance learning is low and this evidence correlates to the average academic performance or CGPA of the respondents, which is between 2.50-2.99. The findings indicated a low level of integration and motivation in learning and consequently it is suggested that training programs and additional course revisions be integrated into the curriculum to ensure the chances of student success and reduce attrition rate.

Keywords: Andragogy, adult students, distance education, e-learning, deep learning, surface learning.

1 Introduction

Institutions of higher learning (IHL) in other parts of the world are spending much time, effort and investments to provide their students with quality education. This trend has rubbed off on Malaysia's higher education imperatives especially now with the current global economic crisis. In fact, the Ministry of Higher Education (MOHE) Malaysia is encouraging individuals to pursue their education part time by providing the necessary incentives. The effort becomes crucial when framed within the idea that traditional or adult students usually have more than one choice for their tertiary education and career prospects [10]. The common and popular choice offered for these working adults is in the form of distance education or off-campus learning. Currently, a third choice is offered to them in the form of electronic distance education or ePJJ. ePJJ allows universities to move away from the traditional lecture-based andragogy in favor of ICT as the enabler of imparting and internalizing knowledge. However, the most important issue is whether the students are getting back their money's worth through quality education that would be ingrained in them throughout their life time.

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1.1 Statement of the Problem

All distance education programs make use of information and communication technology (ICT) [5], henceforth, the learning outcome for adult students enrolled in ICT-based distance education programs (ePJJ) offered by the Institute of Education Development (InED), UiTM is debatable. Nevertheless, based on aggregated final examination results compared every semester, the academic performance of adult, distance students at the Institute of Educational Development (InED) have been low compared to their full-time counterparts. As such, this research is considered the first of its kind for InED because at this point of time, no study has been conducted to evaluate the andragogical attributes of cognitive engagement of distance learners. How deeply engaged are the students towards their learning process and how much value do they put in their learning process? These are questions that require answers through critical analyses of research data. The absorption of education, learning and the students' academic performance reflect how serious and focused these adult, working students are toward their studies. Thus, one of the research objectives is to determine the level of engagement in e-learning mode for adult students registered with InED. Is it at par with how much time is spent at monthly seminars and discussions or interactions through e-forums? Hence, the relationships between perceived course value, student engagement, deep learning and surface learning among electronic distance education or ePJJ students are the bases for this study. However, at the pilot stage and for this paper, only one antecedent is highlighted. As it is and prior to this study, the value of learning by ePJJ students is ambiguous and unproven relative to their academic performance. Statistically evidenced findings are required to significantly prove this relationship in order to upgrade ePJJ's e-learning offerings as well as their educational development. This ambiguity is also evidence in Biggs and Tang's [2] study however, their research outcome showed that more learner-centered and collaborative activities have proven to enhance a student's learning experience on the effectiveness of online education for adult students [16]. In the case of ePJJ students registered with InED, more face-to-face activities are not possible as seminar meetings are limited to five a semester. Communication and interaction with course facilitators are done through e-forums embedded in the customized learning management system called the *i-class*. Henceforth, cognitive engagement and perceived course value are believed to be integral to a student's positive learning experience [3]. In fact, Corno and Mandinach [3] reported that a student's engagement was evident when he or she showed prolonged attention to a mentally challenging task which resulted in authentic learning and increased levels of higher order thinking. Applying this to the study and from several years of observation and tracking the feedbacks received from the ePjj students, the cognitive and deep learning aspects are temporarily enhanced prior to final examinations, hence, surface learning is actually the short-term, habitual learning employed by the students in order to get through their papers.

Another study on cognitive engagement by Richardson and Newby [11] showed that an engaged student is a motivated student, that is, motivation and learning strategies lead to cognitive engagement for proper manipulation of the learning environment. This, in turn leads to perceived course value, which is an equally important concept in evaluating a student's learning experience. Course value is defined as a measure of how valuable a student feels a given course is, including whether the course stimulated the student's interest in the subject matter or whether the course has real-world application and is thought to be important to the student's future [3]. Thus, stimulating real-world projects can assist the student in identifying learning goals which could generate increased motivation and learning [9]. It is indeed without doubt that there are a number of factors that influence a student's cognitive engagement. Consequently, InED's learning strategies for ePJJ inherently affect the students' cognitive engagement. Therefore, a better understanding and comprehension of the e-learning courses would sustain the students' academic performance [17] [12].

1.2 Significance of Study

Students' academic success brings with it a range of benefits not only the prospect of career advancement, but the enhancement of human capital to commensurate the standard of living in a population [18], therefore, this has been the priority for all institutions of higher learning (IHL) or universities. The students' performances in terms of their final examination results would inadvertently raise the standard of learning and competitiveness in any IHL. In electronic distance education or ePJJ, the standard of academic excellence and performance are still lagging. Comparisons made between the final examination results of full-time students to that of e-learning (ePJJ) students have shown marked differences. The findings from this study are significant and would provide the platform and justification for certain changes in ePJJ educational development outlook and policy. Besides the micro importance, at the macro level, there would be significant contribution to the breadth of literature in the field of e-learning in distance education.

1.3 Research Method

This is a cross-sectional survey research where an online questionnaire was used to collect data within a three-month period. Prior to the actual data collection, a preliminary study was conducted to gauge the viability of the research design, analysis strategy and sample size considerations [14] [6] [1]. Two sampling techniques were used; stratified and systematic samplings. Besides being superior than random sampling because it reduces sampling error, the former was employed since a stratum (which is a subset of the population) was required to identify the common characteristic of the units of analysis [8] [6] [15] [14]. The characteristic was that all the students are part-time, distance learners registered with the Institute of Educational Development (InED), UiTM. Next, a sufficient number of students from each stratum, which in this case was approximately 5-10% of each program's population were identified from the list of names provided by InED's coordinator. From approximately 6,000 (N) general population of distance learners enrolled at InED, 500 (n) was the sample size identified from 19 programs.

An online questionnaire was created consisting of 30 questions measured on a scale of 1 (Very Strongly Disagree) to 7 (Very Strongly Agree). Using the university's online survey software called Perseus, 31 questions for the independent variables were created under Section A, nine of which are meant to measure cognitive engagement. Section B consists of six demographic variables. The e-questionnaire was deployed for three months from late June to September 2009, after which the response rate came in at 33.8% or 169 completed responses.

Another important aspect of the survey instrument which is crucial to the research is the reliability analysis. As emphasized by Jackson [8], Stangor [14], Heiman [6] and Beins [1], survey instruments have to be analyzed to ensure that the measurement scales and the items that make them up are dependable and consistent. In this case, the Cronbach Alpha reliability statistic was 0.940, which means that the instrument is highly reliable.

2 Findings

A total of 169 or 33.8% of the distance education students responded to the online questionnaire. From that number, 76 were male and 93 were female (Figure 1). An assessment of their academic performance determined through their cumulative grade point average (CGPA) is shown in Figure 2, where the highest number of respondents'(77) CGPA score was between 2.50-2.99.

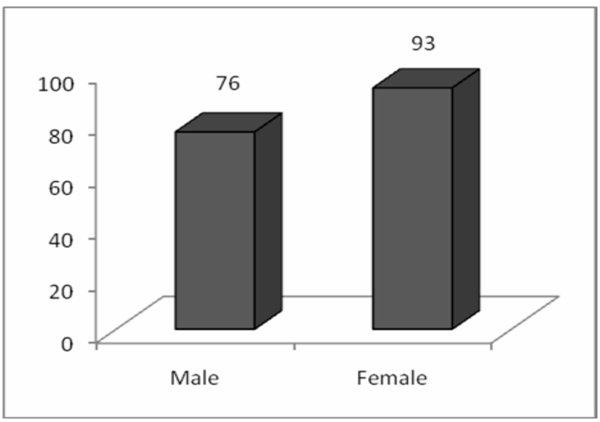

Fig. 1. Breakdown of respondents by Gender

Consequently, the mediocre CGPA score was reflected in the students' level of cognitive engagement as shown in Table 1 where the highest mean score is student engagement at 4.48 from a scale of one to seven. Second is course value at 4.36, followed by deep learning at 3.95. The lowest mean score is surface learning at 2.21. Consequently, the aggregated mean score of these four sub-variables were further averaged to derive the overall mean for cognitive engagement which is 3.75. Elaboration and discussion on these results will be elucidated in the following section.

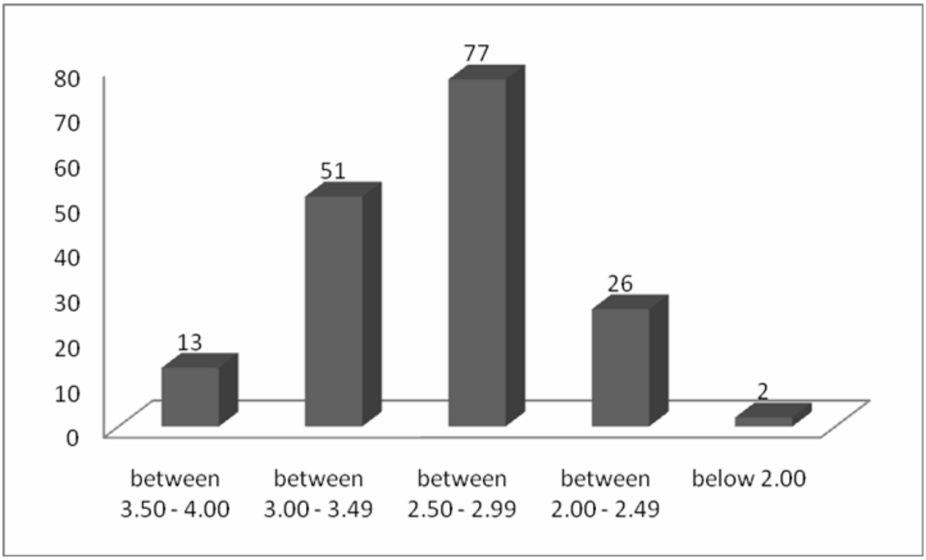

Fig. 2. Breakdown of Students' CGPA

Table 1. Mean scores of the four sub-variables and Cognitive Engagement

VARIABLES	MEAN SCORE	OVERALL MEAN
Course Value	4.36	
Student Engagement	4.48	
Deep Learning	3.95	
Surface Learning	2.21	
COGNITIVE ENGAGEMENT		**3.75**

3 Conclusion and Recommendation

Based on the findings, there is clear indication that cognitive engagement is rather weak for adult students undertaking e-distance learning and this is reflected in their mediocre academic performance. The overall mean score of 3.75 falls between the scale of 3 (Disagree) and 4 (Neutral). In fact, the score is closer to neutral, which means that the students neither agree nor disagree with the level of engagement is distance learning mode. This evidence is supported by Selwyn et al's [13] statement that having and using the Internet does not necessarily make someone an Internet user for life or technology savvy. In this case, a customized learning management system was the platform for teaching and learning for the adult learners. Furthermore, the situation is aggravated as the students are enrolled on a part-time basis, and as such, the continuous learning environment afforded for full-time students is unfortunately, not accorded to the adult learners. In fact, the balancing act of work, personal life and studies are responsibilities that have to be prioritized by the students themselves. The possible implication to this disengagement could be due to a low level of integration and utilization of student's motivation and strategies throughout their study plan. In addition, the learning and teaching materials are taught in English and language is also a barrier to the andragogical process. As a recommendation, training programs on the use of the learning management system (LMS) should be mandated for new students. In addition, students' input and feedback to the program coordinators should be expedited as seminar meetings are few and far between. Students' level of interaction on the e-forum can easily be detected and statistically shown by the LMS. Consequently, the coordinators should consistently observe the lack of participation and communicate with the students. No matter that these are adult, working students, the fact that they are lost in the educational transition requires the coordinators to consistently motivate, encourage and provide a supportive learning environment [4]. By doing so, the students' academic achievement can be positively exhibited in their final examination results.

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Moodle 2.0 Web Services Layer and Its New Application Contexts

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Abstract. Owing to the intrinsic relation among actual education and new technologies, it results essential the fact to found the new ways to satisfy both sides of the modern eLearning platforms, the needs of students and tutors and the enough technologies to support it. Consequently, the possibility to interconnect the LMS with other external applications to enrich and strengthen the comprehension of learning process is one of the principal paths to follow.

Keywords: Moodle 2.0, Web services, PLE, backoffice, new learning moodels, SOA.

1 Introduction

Since the apparition of the web and other technologies related with it the manner of teaching and learning have been changing. Thus, when talking about eLearning its constant evolution must be considered. This development is no longer just due to technological changes that support new models of learning but also to new motivations, trends, educational models and so on. Some of those changes are:

1. With the emergence of the first PLE (Personal Learning Environment) is producing a shift in *elearning* approaches. The online course is no longer seen as an extension of face to face learning, but begins to focus on the student, their needs and preferences [1].
2. There is also a gap between the actors involved in the learning process. Many of the students were born in the digital age and all technological resources used in different contexts (digital natives). Moreover teachers should use some of those resources without understanding or having much knowledge of them (digital immigrants) [2].
3. The expansion of sozializing trends, constructivism, applications, tools and paradigms could play an important role in the so-called *eLearning* 2.0 [3].
4. New educational strategies such as those linked to the Bologna process requires support to new learning strategies, such as the recognition of non-formal and informal learning, support life-long learning, to make learning attractive and to strengthen links with working life and society [4].

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In this situation, the technology must provide support for different situations, defining, in each case, more comprehensive and specialized contexts and scenarios.

This paper will present one of these new scenarios such as a Service Oriented Architecture approach applied to eLearning. Specifically considering the web services layer for Moodle 2.0 and one of its possible uses, a backoffice application.

To do this, first step is an introduction to the theoretical basis and related works, then the backoffice client application and its funcionlaties will be described, finally some conclusions and future work will be exposed.

2 Related Works

By way of make easily to recognize and understand the related works, thus will be divided in SOA approach in education and Moodle web services layer.

2.1 SOA Approach in Education

As Dr Charles Severance [5] (founder of the Open Source LMS Sakai and currently working for IMS) states: LMS “are all mature enough that the majority of faculties and student users are generally satisfied regardless of which system chosen”. It seems that LMS systems have achieved a stability and maturity, a Golden Age of LMS; LMS adopt each other's features and are slowly beginning to look like clones of one another. Nevertheless the LMS, as has previously been mentioned, it must be reinvented or be extinguished due to the new eLearning realities.

To incorporate the new generation of learning applications inside the LMS there is a need for interoperability between systems. One new approach to reach interoperability between different systems is the Service Oriented Architecture (SOA). The Service Oriented Architecture (SOA) is a software engineering approach that provides a separation between the interface of a service, and its underlying implementation. For consumer applications of services, it does not matter how services are implemented, how contents are stored and how they are structured. In the SOA approach consumer applications can interoperate across the widest set of service providers (implementations), and providers can easily be swapped on-the-fly without modification to application code.

SOA preserves the investment in software development as underlying technologies and mechanisms evolve and allow enterprises to incorporate externally developed application software without the cost of a porting effort to achieve interoperability with an existing computing infrastructure. [6]

There have been several initiatives for the adaptation of SOA services for LMS and to join LMS to other applications. As an example some initiatives could be considered:

- The adaptation of a part of LMS services to mobile devices [7].
- The definition of service-oriented architectures for the semantic search and retrieval of learning information as the LUISA project [8].
- The integration between different learning tools and systems.[9]

Each of these Initiatives are trying to obtain new benefits from the LMS. In the following sections another initiative. Also will be described a new backoffice client that allows final user to exploit new contexts. Our approach is to propose and develop novel solutions that help different users of LCMS to extract specific knowledge related to the complex process of education and learning throughout the use of a web services. To do this a SOA approach based on Moodle is considered.

2.2 Moodle Web Services Layer

From the architectural point of view Moodle is based on a model-view-controller controller. This pattern is common in interactive applications that evolve rapidly. This architecture is complemented by other patterns that provide flexibility to the system.

The adoption of the SOA and its integration in Moodle requires a deep knowledge of a system core library that, due to an evolutive development is not particularly consistent. The core system is structured in modules, each of them providing a wide set of functions. Each module has a connection and access policy based on roles. This policy has to be considered in the design of the services.

The Moodle lead developer and founder Martin Dougiamas, assigned in early 2008 to the team in UPC [10] the task of developing a new API to access the services of the Moodle core system, with independence of its implementation, that may remain stable in the following versions of Moodle. This task is described in the Moodle tracker [11] and in Moodle Docs [12]. This API consists on a set of Web services that encapsulate most of the services that an external (and even internal) application shall need from a Moodle server. In October 2008 this Web services layer has been integrated in the Moodle standard distribution for Moodle 1.9.3 and is going to be the standard interoperability subsystem for the future versions of Moodle.

This layer is intended to be useful for all developers who want to build applications for Moodle, because this development can lead to a documented and stable API to hack into Moodle that should overcome new versions of Moodle.

This API is the base to develop a set of Web services served by Moodle: Moodle-DFWSs.

Moodle needs to be accessible using any transport protocol present or future. So it cannot depend on a concrete Web services protocol, name it XML-RCP, SOAP, REST etc. Moodle-DFWSs be implemented in the present version of Moodle (Moodle 1.9) and in the future versions as well (appearing as a core feature in Moodle 2.0 expected early 2009). Moodle-DFWSs architecture need to be extendable, so each Moodle Module can be a service provider. The proposed architecture consists in 3 layers described in Fig 1. These layers are:

- Connectors Layer: Contains the connectors that implement services to local or remote applications.
- Integration layer: This layer consists on The API (being implemented) that provides a one-point access to the Moodle plus contrib functionalities.
- Services Layer: Is where real things happen. The API knows how to deal with the Moodle core, and in future posts we will deal on how the activity modules, course formats and plugins can offer their services to the clients.

The Connectors layer can implement connectors adjusted, without hacking inside Moodle and creating code that will survive the new releases of Moodle for some years, to behave according to different standards. This will be the base of a great area of new LMS applications.

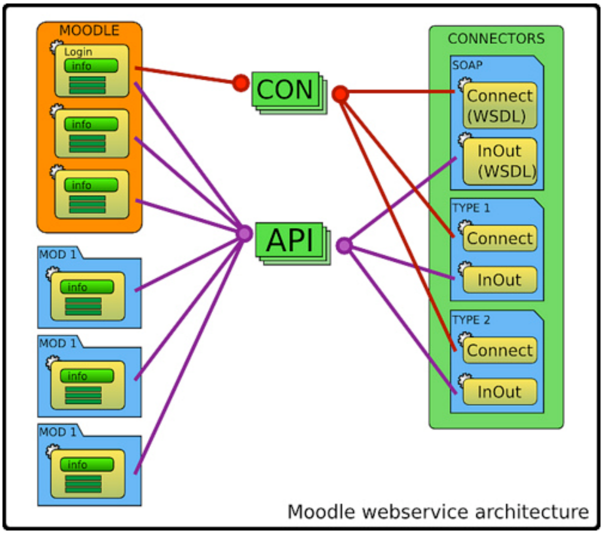

Fig. 1. Moodle Webservice Architecture

3 Backoffice Web Client

3.1 Main Reasons for This Development

Moodle is being consolidated more and more, as today shows that there are 45,494 registered sites using this platform [13]. Given this number, and since in many cases it is necessary to use them in institutions with proprietary systems, new needs appear. Among these new requirements can be the integration of Moodle with backoffice tools.

The idea behind is that the application can interact with several systems at once, performing the same action in several places, making it all work together. Instead of making a transaction twice, only an integrated operation is required.

To do this, a new tool has been defined. This tool lets users perform backoffice operations using Moodle Web services layer. Also, by way of example, the tool has other features not included in Moodle, which could be useful in managing activities. It also allows testing the operation of the web services layer and the detection of functional gaps.

3.2 Backoffice Tool Main Features

The creation of this tool shows that alternative interfaces and clients could be created. These clients can interact with Moodle, increasing greatly its capacities, from being a monolithic platform to an interoperable application.

To do this the Moodle Web services layer is required. This layer consists of a set of contracts that make use of certain functions defined in Moodle externallib. These contracts are described in Figure 2 using SOAml[14].

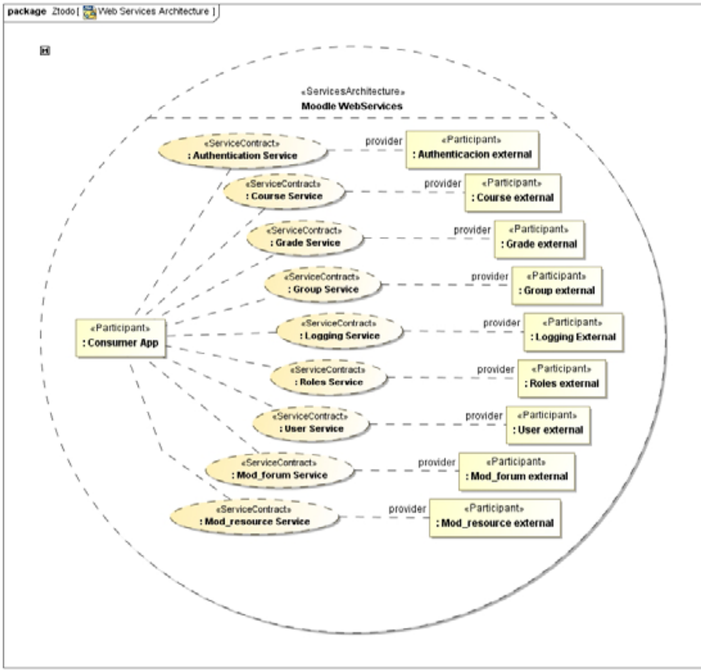

Fig. 2. Some of Web services Moodle contracts

Since the connectors corresponding functions are invoked, which use Moodle code to perform the appropriate tasks and, depending on its mission, return, create, modify or store information in the database. Specifically in this case, single management system will be considered. These may include:

- Client administration: This is the main part of the tool. By now it only allows choosing the protocol that is going to be used to connect with the platform (REST, SOAP, XML-RPC) and testing the functions existing in the externallib's code.
- Users administration: This client permits total management of Moodle users trough a simple and intuitive interface. The aim is to facilitate the users administration without accessing to the platform.
- Courses administration: This part provides the main features associated with courses such as creating, modifying, deleting and viewing their settings. The content management into the courses depends on the Web Services API development, but at the moment all the main contents can be accessed and managed from the client.
- Roles administration: Roles administration allows assigning capabilities based on the context where user is located. In addition to this, roles can be created, modified or delete from this part.
- Logs administration: It allows administrators to control the activity in Moodle, so that they can view the logs happened in a course, a date or made by a user.

Fig. 3. Information Visualization Applet

3.3 Other Funcionalities

In addition to all the possibilities that web services allow, such as the creation of clients and tools that can access to Moodle from alternatives and adapted to new technologies interfaces, Moodle web services permits to create several new features that don't exist it the platform. This client have some of this new features in order to make some actions simpler and exploit the API potency:

- Alert inactive users: Every platform has a lot of inactive users that has never entered the platform or they don't do as usual as they should. Usually, teacher must access to user logs and find the last access to warn them (sending a message) if necessary. This client has a feature that allows teachers to choose the number of days that users must have been inactive and the text to send. The tool looks for the users and send the message. When finished, it displays a list with all the users that should have received the message.
- Logs visualization tool: According to [15], Visual Analytics is an emerging area of research and practice that aims to support analytical reasoning through interactive visual interfaces. This kind of analysis can feedback, with non-evident information from the LMS, reports that facilitate the learning, monitoring and making significant business decisions regarding courses. A visualization tool for temporal information analysis [16] is used in this application. The main target of the tool is to find behaving patterns in learners and teachers. This tool will consist in a JAVA applet included in the client, and it will connect to Moodle so as to get logs trough the Web services. After this, the tool will show the information in a suitable way Fig 3.

4 Conclusions

Taking into account the changes that are occurring in the learning processes, technology must provide solutions. Specifically, SOA approaches will provide some of them, as is the example of Moodle Web services layer. This approach will facilitate the implementation of external Tools, as the previously described, which interact transparently with the LMS.

This kind of approach will provide reusability, flexibility, scalability and compatibility to eLearning platforms. It is also possible to extend the functionality of learning platforms as it does backoffice tool. Thus allowing the opening of learning to other technology trends as could be visualization of information. Such proposals open new ways for learning, in the search of the personalization of learning, with the PLE and iPLE.

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Didactic Scenarios and ICT: A Good Practice Guide

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Abstract. In this paper a 'good practice guide' is presented for creating Didactic Scenarios (D.S.) with the support of ICT. This guide is based on: a) empirical data collected during longitudinal training programs addressed to secondary education teachers, b) observation of the way ICT is used in both levels of education and c) modern didactical theories.

Keywords: Didactic Scenarios, ICT.

1 Introduction

The term *Didactic Scenario* (D.S.) refers to a relatively complete description of a teaching lesson including not only the teachers' actions but also the expected reactions of the students. Moreover, it includes the justification of the teachers' didactical choices. As we shall explain below, D.S. differs from a lesson plan, its description or its content. D.S., as both theoretical and practical concept, constitutes an issue that has been the center of discussion in the educational community for a long period. Recently, the rapid development of ICT in education forced teachers to reconsider the lessons' design since ICT have to be incorporated in modern educational scenarios. In Greece, there exists one more reason to keep this discussion since teachers' training on ICT during the last years highlighted a series of questions asking urgently their answers: What exactly is D.S.? How is it constructed? How this could be used? The whole situation becomes more confusing since experts' opinions do not coincide. In this paper we propose a good practice guide for constructing D.S. using ICT. This guide is the result of a synthesis of different published views on the topic [3], [5] adapted mainly (but not exclusively) in didactic methods relevant to Math, Science, Informatics. We combined elements that seem to be common in the didactic methodology of different learning objects. In its initial version this guide was focused on math teaching [3]. However, we gradually realized the existence of elements that were common in a variety of lessons that are taught in school and therefore we were directed to a guide that could fill the demand for more and different lessons. Our intention is to propose this guide as an everyday "tool" that will be used not in an 'algorithmic' way nor as a 'recipe' for producing scenarios and lesson plans. On the contrary, its usage presupposes that the teacher is aware of the learning object and the way students learn. Some features necessary for constructing and applying a modern D.S. are highlighted.

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2 Conditions for Creating and Designing D.S.

Our starting point is the constructivist hypothesis that the knowledge is constructed by the students themselves via their interaction with the *milieu*. Thus, the students grasp the new information, transform older concepts, and create a new set of concepts, relations and properties. In this context, the students' activities take meaning in a very specific manner and the teachers' choices are very different compared to the ones taken in the traditional lessons. For example, it is likely for students' errors to express a previous knowledge that has not been properly transformed and therefore these errors are a clue for teachers' future actions. Teachers must take seriously account of these errors while interacting with students. A set of activities must be suitably organized so as for the students to transform their existed knowledge to a new, more refined one. An important parameter for obtaining this is the so-called *open problems*. The teacher poses the problems and the students have to ask for relevant information, to combine them, to apply formulas or methods, to co-operate in order to find the solution. ICT is used in this context as part of the milieu the students interact with, as a set of various cognitive tools that are used in the problem solving process and this is the rationale we adopt in this guide.

D.S. (or **Didactic Situation** in Math Education [2]) could be defined as the description of a teaching process focused on a specific cognitive object, with specific teaching aim, including specified didactic principles and practices. The most important in D.S. is rather the route of the students, than the linear description of teachers' actions. Various parameters are included in modern D.S. such as interaction and roles of participants, students' concepts and expected errors, didactical obstacles, and so on. In such a teaching approach it is possible to combine more than one source (variety of different software, notes, instruments in laboratory, geometrical instruments) so as to obtain a learning outcome. Elaborating a scenario means that there are some critical points that must be handled carefully:

(1) Avoidance of meaningless verbalism. Very often the proposed scenarios include parts that systematically lead to the repetition of stereotypical phrases of questionable usability. As a typical example, one can think about the almost ritual reference to "*constructivist theories of learning*", which is repeated stereotypically in a large number of scenarios produced by the teachers as a typical "duty".

(2) The feasibility and usability of the D.S. The D.S. has to be feasible, to describe situations able to be realized in the given schooling time and context. Moreover, it is not proper to make tremendous effort or to waste a lot of time for creating a scenario.

(3) The most important when creating a scenario is the negotiation of its "weaknesses". For example, creating a new D.S. out of nothing (*creation ex nihilo*).

3 Configuration of a D.S.

3.1 Starting a Scenario

There are several ways to start from zero a D.S. so as to teach a specific concept. We could mention some of them: i) presenting the circumstances that resulted to adopting this concept. For example, the need to redefine the boundaries of the fields in Egypt, every time Nile flooded, resulted to the development of the concept of area. In Science, the history of astronomy or of the atoms as basic units of matter, are some typical examples of unsolved problems that made necessary to invent new theories. What is common in these cases is the presentation of a concept or a theory, as a *tool* which resolves and gives meaning to a series of problems. ii) using Internet as a source that offers data relevant to the concepts (historical elements, complete lesson plans, applets, etc). iii) starting from the students' difficulties (systematic errors, misconceptions), the teacher could design a lesson aiming to provoke a socio-cognitive conflict via a didactic situation that leads to dead end. Then the only way to overcome the conflict is the new concept or method that was the teacher's intention.

3.2 Epistemological Approach – In the Context of a "School Epistemology"

The importance of the concepts taught in school is tightly connected with the present opinion about the status of these concepts in the knowledge system that is "transmitted" by the school. The relative value of these concepts is determined by a rather complicated framework of didactic principles which in any case change very often. For example, some concepts or methods might be extremely important during a historical (school) period of time and literally disappear in another. Absolute value in mathematics, the famous "simple method of three" and the systematic memorization of grammatical rules are some typical cases of didactic issues and practices that disappeared because they had been considered as old-fashioned from a modern didactic point of view or because the progress in the domain made them inconsistent with the present scientific or didactical ideas. In other cases, the significance of the taught concepts depends on their conceptual connection with other ones and on their future usage: for example, the teaching of the syntax of the Ancient Greek Language takes place in a certain grade and it is important since the same students will use the syntax in a subsequent grade for translating and understanding ancient Greek texts. In Mathematics also, the Pythagorean Theorem is connected with square root and irrational numbers in the 8^{th} Grade, but the extensions of the same theorem (side of a triangle that is opposite to an acute or an obtuse angle) are taught later on the 11^{th} Grade. It is vital for the teacher to be able to understand this kind of relationships or to know how to reach the relevant information.

3.3 Extensions

In the school reality all the concepts are connected directly with others. So, it is necessary for the teacher to be aware of the potential extensions of each concept. Is it possible for the specific activity to be the origin for other, more partial activities that broaden the initial one? Is it possible to use this method or this result for another problem or activity? Is it possible for the specific activity to activate the students' questioning towards a further examination? For example, a scenario based on the question whether the perpendicular bisectors of a triangle are passing or not through the same point, could be broadened for the case of this point to be inside the triangle or on one of its sides.

3.4 Predicting Difficulties

D.S. must incorporate all of the students' usual difficulties relevant to the specific concept. For example, most of the students believe that $(A+B)^2=A^2+B^2$ and "forget" the double product of the terms. (Probably) this is due to the fact that many mathematical properties obey the "linearity" rule F(A*B)=F(A)*F(B). In Science very often students believe that if no force is applied to a moving object, then it will stop moving or that heavier objects are falling more quickly than lighter ones. Generally, all these students' wrong ideas must be part of a D.S. as they can play a vital role in the development of these scenarios. Educational software could help in a variety of ways for exceeding these mistaken concepts. Simulations, for example, allow the repetition of phenomena and their study in different circumstances. This creates an obvious distance between what the students predict and what 'really' happens in the (simulated) reality.

3.5 The Rationale of Using Digital Systems

Availability of adequate digital infrastructure is not itself a reason for materializing a teaching activity based on technology. Actually, a combination of the current technological infrastructure and the innovative organizing of the lesson is required. Otherwise, the digital infrastructure is reduced just to support a 'traditional' lesson. For example, asking information on the Internet is an important activity that is more complex compared to using 'classic' sources such as newspapers and encyclopedias. The students must be able to: search and choose among the tons of data the ones that are useful; check whether they are valid and up-to-date; be aware and sensitive about ethics and copy-right issues. This means: a) lesson's organizing in a completely new way (compared to the traditional one) and b) equipping students with certain skills. It must be avoided also using technology in favor of lessons that have a traditional character. Webquests constitute a typical example. As a teaching method they present a lot of attractive features. However, for the sake of saving time, they easily are converted to a set of completely guided activities. Consequently, the assessment of choice of the used software must be based not only on its innovative character but on its estimated didactic effectiveness. It is the rationale of the teaching that justifies the usage of digital systems rather than the opposite. On the other hand, it is possible to face additional problems when using some software. It will be necessary to waste time for making the students familiar with the specific environment. Another potential reservation concerns the possibility for the students to acquire a limited concept image. Sometimes the usage of digital systems gives emphasis to some aspects of a concept when there has not been established other prerequisite knowledge [6]. Or, it is likely for a limitation to some skills to occur. Resorting, for example, to handheld calculators in the very early grades may suspend their ability for mental calculations. It is also known that the immediate feedback the user receives through the interface prevents or strengthens a problem solving process. But this feedback may cause misconceptions to the students for some concepts. Finally, it is worthwhile mentioning that sometimes it is the software or the digital environment itself that causes mistaken conceptions to the students.

3.6 Teaching "Noise"

By this term we refer to undesirable side effects that could overshadow the real object of a lesson. There exist, for example, learning objects that demand the usage of external sources or instruments (geometrical instruments, blackboard, additional written texts). In this case it is frequent for the students to waste time trying to use these instruments. However, the usage of technology tends to minimize some kinds of "noise"– wasting valuable time for making long calculations is minimized when using digital systems that make these calculations instantly.

3.7 Usage of Additional External Sources

As it has already been mentioned above, the teacher must be aware of the existence of sources (the Internet, for example) that could allow him: to retrieve information relevant to the taught concept; to find -if possible- additional teaching material, notes, reports from similar teaching efforts, etc.

3.8 Multiple Representations – Multiple Approaches

Modern software allow multiple representations of concepts, relationships and evolution of phenomena. For example, using simulation software for studying various phenomena (car crash, evolution of the fauna in an ecosystem), the user can follow the evolution of the (simulated) phenomenon as also the evolution of some (qualitative or quantitative) parameters in real time in the form of tables, graphs, bar charts and so on. So, a D.S. must take account of this dimension. Most of the times, while teaching a lesson, for 'economy' reasons the presentation of the new concepts is realized using just one representation, restricting thus the complete approach of the phenomenon. Another aspect of the issue is that digital technology could contribute to redefine the content of the school lessons: the global spreading of graphing calculators facilitated the readjustment of lessons such as Algebra and Science so as to incorporate graphs in a greater extent than before. Presenting concepts, relationships, phenomena in multiple representational frameworks means that it is possible to obtain deeper and more complete understanding of both the phenomenon ant the used 'tools' (i.e., tables, diagrams, algebraic expressions, etc.).

3.9 Underlying Learning Theories

The underlying teaching and learning theories the teacher adopts (which very often are not explicit) determine decisively the lesson's organizing. Even though most of the modern software refer to constructivism and explorative learning, this does not mean they adopt them. Teacher's intention to design a specific activity could be ruled by theoretical principles that by-pass the ones that characterize the software itself. Thus, it is possible, for an open software with so many capabilities to be used exclusively for drill and practice activities guided completely by the teacher. Similar phenomena could be met in conservative educational systems, like the Greek one, that do not adopt easily innovative practices. This issue has to be examined thoroughly by the teacher, since it is directly connected to his personal opinions and theories.

Moreover, the teacher has to reflect on whether the way he organizes the lesson corresponds to more general views, concerning the organizing of teaching or the way students learn.

3.10 Change in Lesson's Organizing and in Concept's Meaning

Digital educational environments allow innovative teaching approaches. The case of 'rigorous proof' in teaching Geometry is a typical example. Modern software allow verification (but not a rigorous proof) of conjectures through experimentation. This changes radically teacher's capabilities since s/he is able now to ask the students to ascertain initially (by trials) the truth of a proposition and later to prove it. Furthermore, the various environments of communication and social networking and the web 2.0 environments, create new kinds of text and new sociolinguistic practices [4] and offer new possibilities in language teaching unexplored in a great extend. All these changes result to restructuring lessons and giving different meaning to concepts and methods that are negotiated during teaching.

3.11 Didactic and Computational Transposition

The term 'transposition' when used in Education describes all the changes in the concept's meaning that take place during the 'transfer' of the concept ('transposition') from its initial science domain to Education. In analogy, 'transposing' concepts of the Science domain to digital environments [1] means their transformation in a certain degree: In Dynamic Geometry systems, straight lines include finite number of pixels rather than infinite number of points; in a more general way in a digital system the concept that is to be taught is usually mediated. The modern educational software interface allows the management of microworlds, which represent or simulate a system. So, although the user has the feeling that s/he handles a microworld directly, in actual fact s/he handles indirectly a particular materialisation of the simulation of a system. In Geometry, for example, using different software, the students could have at first glance the same shape (triangle or rectangle) in the interface which however, behave differently in each environment. This is an aspect that must be taken seriously into account when a D.S. in a digital environment is designed.

3.12 Didactic Contract

Didactic Contract [2] could be defined as the set of teacher's behaviors expected by the student and vice versa, in the context of a didactic interaction. The term *behavior* refers mainly to actions and reactions relevant to teaching. Here is a simple example: If the teacher poses an unsolvable problem and avoids informing the students, this could cause objections from the part of the students. The students consider this behavior as a violation of some implicit rules that constitute part of the so-called didactic contract. This contract is not explicitly expressed and becomes noticeable whenever it is violated. Simulating real phenomena in the classroom could influence the way the students' answers become valid. Instead of having the teacher to accept or reject them, it is possible for the system to make the decision according to whether these answers fit to the simulated system (change of didactic contract). ICT's usage in the teaching process always cause changes to the invisible but powerful contract. So, it is necessary for the teacher to take account of it and to adapt his lesson accordingly.

3.13 Feasibility and Lesson Organizing

Depending on the specific D.S., teachers have to handle the number of students, the number of the available computers, the way of working (individually, in groups), time (how many hours?). There are also some extra factors that must be taken into account. For example, the usage of two or more software in tandem in one teaching hour is desirable in the most of the cases but it is time consuming. The teacher has to make some choices so as to make his D.S. as far as possible realistic.

4 Instead of Conclusions

The “good practice guide” presented here is not considered as a complete one. We omitted some of its parts considered more than obvious (the lessons’ content) as also parts that are important but they refer to more general issues such as interdisciplinary aspects, didactical methods, etc. Besides, what presented here is not always obligatorily included in a D.S. since some of its parts won’t be able to be applied in a specific scenario. It is obvious also that there exists a partial coverage among the parts of the guide since their boundaries are not strictly defined. It seems finally that there exist some characteristics that are common in the teaching process no matter what the taught lesson is. This means that the impact of ICT on teaching is neither temporary nor connected exclusively with only some categories of lessons such as Math or Science. This impact is equally important for a variety of lessons strengthening thus the suspicion that ICT’s impact is deeper than imagined.

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Interactive Whiteboard Integration in Classrooms: Active Teachers Understanding about Their Training Process

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Abstract. With the incorporation in education of Information and Communication Technologies (ICT), especially the Interactive Whiteboard (IWB), emerges the need for a proper teacher training process due to adequate the integration and the didactic use of this tool in the classroom. This article discusses the teachers' perception on the training process for ICT integration. Its main aim is to contribute to the unification of minimum criteria for effective ICT implementation in any training process for active teachers. This case study begins from the development of a training model called Eduticom which was putted into practice in 4 schools in Catalonia, Spain. Findings indicated different teachers' needs such as an appropriate infrastructure, a proper management and a flexible training model which essentially addresses methodological and didactic aspects of IWB uses in the classroom.

Keywords: interactive whiteboard, teachers understanding, training model, ICT, education.

1 Introduction

Information and Communication Technologies (ICT) integration in classrooms has been massive in recent years [1] and Spain is not an exception. Spanish government has invested 100 million Euros in order to promote the *Escuela 2.0* project for 2009-2010. As a result of it, 400 thousand students aged between 10 and 13 and 20 thousand teachers will have their own laptop and the classrooms will be provided with interactive whiteboards and Internet wireless connection [2].

The success of this kind of initiatives can be an unlimited source of educational innovation opportunities for new organizations as well as changes in the regular educational environment. Furthermore, it can help to update processes and inclusion of new generations of citizens. Therefore it becomes necessary that all professionals involved in education get adapted to these constant changes through training processes in order to achieve an efficient use of ICT in schools [3].

The teacher training process goes through the stages of initial training, professional induction and lifelong learning or improvement [4]. Regarding the first two stages, actual facts show that most teachers have not been ICT trained, so the third stage

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referring to lifelong learning becomes more important. This last stage is understood as a resource or means to implement any change in education [5], as a reply to the professional practice demands [6] or to facilitate interaction, creativity and self-sufficiency of teachers so they may be able to adapt to the environmental requirements [7], among others.

In order to contribute to teachers' digital literacy and to encourage collaborative work with ICT in the classroom using interactive whiteboards (IWB), the Social Pedagogy and ICT Research Group (PSITIC) along with the Ituarte Technology Center (CETEI) developed a training and advising model for teachers called Eduticom [8].

This educational model is based on a continued counseling for educational innovation with ICT, under a social constructivist perspective and consistent with the school educational project. This model presents both the process of implementing new interactive media in the classroom and the educational innovations that can be developed more creatively and effectively with its support. Specifically, the Eduticom model is based on five phases established by the British Educational Communications and Technology Agency [9]: familiarization, utilization, integration, reorientation and evolution, and fixes the development of these phases in two years of education and advising activities.

In this context and from the research that addresses the implementation of the teacher training model, the aim of this paper is to define the understandings of teachers about the process of training and consultancy for integration of ICT –specifically the IWB– in the classroom. Moreover, it aims to contribute to the unification of minimum criteria for effective implementation of any training process for active teachers in ICT.

2 Metodology

Our research is based on the case study of the Eduticom training and advising model for teachers, framed in the context of the research "An interdisciplinary educational assessment research around the specific contributions and didactic excellence of the interactive whiteboards use in the regular classroom" [10]. The investigation emerges from descriptive, analytic and evaluative considerations with the application of qualitative strategies and instruments.

The participant sample is formed by 36 teachers belonging to four Early Childhood Education and Elementary Education schools in Catalonia. The selection criterion of these schools is receiving or having received training and advice on the integration of IWB in regular classroom through the Eduticom model.

The instruments used for data collection and the proceedings followed during the research are described as follow. We applied tree questionnaires for teachers –initial, continuous and final assessment- comprising eight, thirteen and eighteen open-ended and closed-ended questions respectively. These questions are organized in these categories: environmental needs and the teaching staff expectations about training, Familiarity/sensibility to ICT, Eduticom training course characteristics, IWB individual practice and IWB classroom application. The last instrument is a focus-group, conducted on each school and based on a script of 19 questions around three categories: satisfaction level regarding training, acquired ICT knowledge and skills and changes in teaching due to the use of ICT and more specifically the IWB. The analysis of data obtained was carried out using the Atlas.ti v6 application.

3 Results

From the analysis and triangulation of data we obtain the perceptions stated with more frequency by teachers throughout the training and advising process on IWB.

- As well as the interactive whiteboard, the computer, the projector and the suitable software, the school must be provided with the necessary infrastructure for the incorporation of these digital resources in the classroom.
- Correct management of the space where the IWB is located, in order to allow teachers both practicing and teaching.
- The training must emphasize methodological and didactic aspects of the new ICT tools and their application into classroom rather than on technical aspects.
- The training model must be flexible enough to incorporate and get adapted to the needs of the teachers involved. For example, adapting the subjects and the duration according to the teachers' ICT skills.
- It is crucial involvement of trainers in the program's design regarding its organization, duration and content. It is highly valued the combination of theoretical, practical and technical sessions during training, moreover if activities proposed are intended to a later application in the classroom.
- It is important the trainers' constant training in all aspects related to the application of interactive digital tools and most suitable methodological strategies.
- The groups the course is organized in should include few participants to make the process more personal.

4 Conclusion

Any process of ICT integration requires constant updating of professional teaching staff to get the needed skills to develop pedagogical innovation with ICT. This process transforms teaching practice, school's life and personal development, among others. It would be virtually impossible to consider the incorporation of a tool, such as IWB, without taking the interdependence between the various factors that are part of the educational process into account.

Thus, the integration of digital tools in schools should emphasize both relationships and exchanges among the different actors involved. One should go beyond the isolated actions or punctual transformations, such as technical usage of a single tool, and must give more importance to didactic and methodological incorporation of these digital resources and their effective implementation into the classroom.

From this point of view, the change is not focused on the particular intervention of an individual but in the educational institution as a whole. It is about a continuous process, so it requires the ongoing support from trainers, in a flexible way adapted to characteristics of every school.

A policy of distribution and management of ICT resources in the scenarios in which both formative process and actions of teachers in their own practice with ICT will be developed is also considered essential.

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Teaching Business Simulation Games: Comparing Achievements Frontal Teaching vs. eLearning

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Abstract. This paper addresses the issue of comparing results achieved by students taught the same course but in two drastically different – a regular, frontal method and an eLearning method. The subject taught required intensive communications among the students, thus making the eLearning students, a priori, less likely to do well in it. The research, comparing the achievements of students in a business simulation game over three semesters, shows that the use of eLearning method did not result in any differences in performance, grades or cooperation, thus strengthening the case for using eLearning in this type of course.

Keywords: eLearning, Synchronous eLearning, Simulation, Business Simulation Game, Management Game.

1 Introduction

eLearning systems, in various forms, have been in use for quite some time now. In its modern form, it started with "open universities", where teaching materials were sent to the students along with instructions regarding assignments that were required to be completed by a certain date and then mailed back to the teacher. The inherent sluggishness of mail systems made it quite cumbersome, but it still provided a solution when no physical access to the campus was possible. With the advent of modern telecommunications that enables fast, safe and reliable transfer of computer files between users who were quite remote physically from each other, eLearning took on a new form: instead of sending the materials and the assignments by regular mail, email was used. However, students and teachers were not required to be connected to the computerized system at the same time [1]. The rapid acceptance of the Internet and its capacity to enable many users, from all over the world, to be connected simultaneously to the same computers, spurred the development of synchronous eLearning systems which enable almost "live" lessons to be given through the intermediation of dedicated software systems [2], [3], [4], [5]. These systems have been used for teaching a variety of courses, but in most cases the courses chosen to be taught this way were those that were predominantly based on frontal lectures and the students' interaction – both with the teacher and among themselves – was minimal. The question that this work tries to answer is whether synchronous eLearning can have good results in

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courses requiring intensive interactions between the students and the teaching staff and also among the students themselves. We do this by offering the same identical course – requiring such interactions as an integral part - using both the formal teaching method and the eLearning method, and comparing the results obtained by the two groups. It is shown that there are no differences in the measurable achievements and satisfaction between these two groups, and thus synchronous eLearning may be successfully used for this type of courses in addition to the courses already offered using it.

2 "Business Management Simulation Game" Course

Management simulation games are widely used for training management teams and students [6], [7]. "Business Management Simulation Game" is an interdisciplinary course at the College of Management's School of Business Administration [8]. It is a mandatory course for all undergraduate students during their last year of studies. Integrative approaches used in this course enable students to gain managerial skills and to develop a broad-minded approach to the diverse operations associated with running a business corporation: accounting, marketing, finance, human resources management, manufacturing, resource planning, international activity and more. Decision-making processes and teamwork are inherent, by simulating a management board of a commercial firm.

Technically the course proceeds by simulation software. This software integrates all student teams' decisions and produces detailed reports and performance indicators. Students use various analytical and deduction tools (some computerized) in order to make their decisions.

The simulation process algorithm is based on several business models and represents the reaction of a competitive market to different prices and the perceived value of the goods and services the competing teams offer. Each team (representing a firm) comprises a group of 3 – 5 members, who play the role of a managerial team at a firm. The industry, regarded as the total number of teams, consists of up to twelve competing firms. The market reaction to a firm's decisions is measured by demand for its products, reflecting the appropriateness of the firm's decisions to the industry, on the one hand, and their edge over competitors, on the other. Thus, the firms' performance, like in the "real world", depends on the decisions made by the other groups, market conditions and the state of the economy. Each group meets one or more of the game's staff members every week for a consultation on the professional aspects and possible consequences of the decisions they make.

A decision set, loaded into the system every week, represents six months in the firm's life. The duration of the semester and the need to teach many of real-life business situations as well as technical points regarding usage of the software leave, in effect, only 8 game periods, equal to four years in a company's life, for the students to control.

A central control server is used for uploading decisions and downloading results. Every team receives a set of managerial reports that reflect its performance during the last period. The private management reports that are individually downloaded by each group include a summary of its decisions, operational data, financial reports (income and expense statement, balance sheet, cash flow) and market research. The research includes industry information, consumer- related data and partial data about competitors.

Calculating performance points is based on a few factors, such as profitability, matching supply (manufacturing capacity) to market demand, financial resources, consistency between decisions and strategy, business ethics and the way each firm is evaluated by different stakeholders. In addition to the simulation process, students are required to hand in four home assignments, and to pass a midterm exam.

The course is supported by Web-based technologies that enable easy bidirectional access and smooth transactions.

3 Research Rationale

As at many institutions of higher education in Israel (and the world, actually), faculty members at the School of Business Administration have been debating the use of various eLearning methods, specifically the extent to which it should be used with traditional methods.

The chief subject of debate has been the question of how much eLearning is desirable. In order to answer this question appropriately, faculty members at the School felt that it was necessary to examine all the available courses and decide whether some of them were inherently unsuitable for eLearning.

The idea behind this research was to see if the decisions made by students taking the business simulation course by eLearning were qualitatively different from those of the students taking the course in the regular, frontal lecture mode. The students taking the course via eLearning were encouraged to use eLearning tools for their meetings, discussions and decision-making sessions. In other words, encounters between students would be electronic and not face-to-face or over the phone.

We hoped that getting positive results – that is, showing that the decisions and achievements of the students taking the course by eLearning would be no worse than those of the students taking the course by the regular method – would help convince many in our school and college to expand the use of eLearning to more courses, including those courses requiring intensive, frequent, multi-partner cooperation among the students.

Since the course is given to a large group of students simultaneously (in a number of classes), it was possible to divide the classes into two categories. Some classes would continue to be taught in regular frontal lectures while the other category would consist of those students taking the course by eLearning. The classes would be given in the same manner as far as the materials, assignments, testing and grading were concerned. No special adjustments or changes in the course would be made for the eLearning class. The course would simply be given in the same manner, with the same teaching staff, during the same semester. Since the teachers in the eLearning classes would be the same teachers giving the frontal lectures (on different days and times, of course) the issue of teacher-related changes would be controlled. In addition, the large student numbers (about 600) would guarantee sufficiently large samples without any statistical compromises.

4 Methodology

All students started and finished the course at the same time during their regular semesters and as part of their study program. This was true for the students that took the course frontally as well as for the eLearning students. With the exception of the teaching method, the assignments, tests and course structures were identical. The students knew, when they registered for the course, which method would be used in their section. Periodically, a questionnaire was given to the students; answering it was a course requirement. The purpose of the questionnaire (Appendix 1) was to reveal to the staff the reactions of the students to the content delivered during the lessons and to the instruction method. In addition to collecting that information, the students were also asked to report on their management meetings – meetings that were held in order to "manage" their company. They were asked to report the meeting's quality, organization and outcomes. All answers were kept in a database that was later analyzed.

The hypotheses of this research were:

1. There would be no difference in the student achievements between the group that took the course using the traditional method and the group that took it using the eLearning method.
2. The quality of the “management meetings” would be the same for both groups.

In order to test these hypotheses, the following questions were answered by statistical analysis of the database:

1. Were the achievements in the courses correlated with the teaching method and, if so, what is the correlation?
2. Were the achievements in the courses correlated with the methods used for the “management meetings”, and, if so, what is the correlation?
3. Was one method preferable to the other as far as group results were concerned?
4. Was there a significant difference in the duration of the management meetings” between those held face-to-face and those held over the Internet? If so, which method generated the longer sessions?
5. What was the level of student satisfaction from the two type of meeting methods and did the participants find them productive?
6. In both the regular method and eLearning approach, what was the overall level of student satisfaction from the course and its instruction method?

The research was conducted over three semesters. During the first of these three semesters, about 300 students took the course. In the second semester, about 660 students took the course. The third semester had about the same number of students in the course as the first one. Overall, about 1,250 students took the course. It should be noted that since all the students were required to fill out questionnaires, no sampling was required and the statistical tests were done on the entire population.

5 Main Research Findings

- There were no differences in the course achievements and grades between those students that took the frontal course and those that took it using the eLearning method.
- No correlation existed between the management meeting method and the achievements in the course.
- At the group level, too, there were no differences in achievements and grades between those groups that took the course using the traditional method and those that took it using the eLearning method.
- There were no differences between the two groups in the time the students from each group spent on their internal management meetings. Special attention was given to this issue, because we were interested to see if there were any learning patterns, particularly in those groups that used the eLearning method. It turned out that there were no differences between groups using the two methods throughout the semester. The same result was observed in the analysis of all the weekly questionnaires.
- No differences were found in the level of student satisfaction between the two groups.
- Satisfaction from the quality of the instruction given during the classes was significantly higher among the students that took the eLearning classes. Similarly, the students that took the eLearning classes were more satisfied with the learning materials than their colleagues in the frontally taught classrooms. This was not the result of superior teaching since the same teachers gave sessions using both methods.

6 Conclusions

The results show that a synchronous, distance-learning method for teaching a business simulation game course neither diminishes the course's effectiveness nor does it affect student performance. The grades of the students taking the distance learning course were essentially the same as that those of their colleagues who were taught conventionally during the same semester. On the contrary, if there was any difference in the results – taken broadly to include not only the grades and the achievements of the students, both individually and in groups, but also the overall satisfaction from the course and from the learning method – this difference was in favor of the eLearning method. Those students who took the course based on the distance-learning method had a significantly better learning experience than their colleagues in the conventionally taught course.

The business simulation game is a unique course in the sense that most of the teaching hours allocated to it are not lectures delivered by the teachers, but rather consulting meetings for analysis and decision-making. It also requires intensive efforts by the students within their teams. Thus, it is possible that the results obtained in this research were also unique, influenced by the specific nature of this course. In order to understand better the effects of eLearning, more research will have to be done on courses where the whole curriculum is based on frontal lectures vs. an eLearning (synchronous) rendition of the same course. A comparison of achievements and satisfaction levels among students taking the same course but by different methods would sharply delineate the advantages and disadvantages of the two methods. It is fair to conclude that eLearning courses requiring intensive interactions among the participating students can be taught using the synchronous eLearning method.

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The VOLARE Methodology: Using Technology to Help Changing the Traditional Lecture Model

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Abstract. We describe the VOLARE ("Video On Line As Replacement of old tEaching practices") methodology, whose aim is to help traditional teachers to switch from the frontal lecture model to a pedogically more sound and effective strategy. The key of the methodology relies in taking advantage of today's innovative technology to relief the teacher from the duty of "knowledge presentation". The teacher can hence devote all the efforts to a more participatory and interactive exchange with the students.

Keywords: Video-lectures, teaching methodologies.

1 Introduction

The traditional learning model based on frontal lectures held in class has been highly criticized because of the passive role played by the students. Constructionist (see e.g. [1] for a general discussion of learning theories), and more recently, connectivist [2] approaches have been suggested as possible alternatives. It is however not so easy to start a transition towards these innovative and presumably more effective teaching styles. Many hurdles make the switch difficult. For instance it is not easy to apply the new paradigms to large audiences: it is generally necessary to split the class in smaller groups guided by tutors (either in presence or on-line), which means that the delivery of a course becomes significantly more expensive.

Temporal limitations also play an important role in keeping the *status-quo*: teachers often need almost all of the lecture slots to deliver the content. The belief that a constructivist approach is more time-consuming may be wrong but it is widespread. This factor is another significant obstacle to a methodological transition. Time is in fact a precious resource.

Also, many teachers think that students need to have some background knowledge and a basic understanding of the problem domain before they can effectively engage in problem-solving or collaborative learning. Classical on-line course in fact follow a standard pattern: first they deliver knowledge, and then they proceed to sections where the students are supposed to be more active (e.g. by doing exercises that should assess their degree of understanding). Many blended approaches can also be mapped to the same pattern: first knowledge is delivered (typically on line) and then collaborative or constructive approaches are taken in non-virtual sessions.

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In the present paper we suggest a methodology that should make it easier for teachers that presently use a traditional, frontal approach to migrate to a (at least) more interactive teaching style. Information and Communication Technology (ICT) plays, in our approach, a fundamental role in allowing such a change. We focus on academic teaching rather than on the processes that take place in the primary and secondary schools, although the same principles could probably be adapted for these cases, with different implementations. The methodology we propose has been experimented with success by the author, and a larger scale experiment is presently in progress.

2 The Methodology

2.1 Our Postulates

Our starting postulate is that the students' activity can be divided into three phases:

- KA - Knowledge acquisition
- DU - Deeper understanding
- KC - Knowledge consolidation.

During the first phase, the student is exposed to the theory and ideas. In the DU phase the student "digests" the material, interiorizes the concepts, and creates his own models, establishing the main links with his previous knowledge. The third phase consolidates the understanding and applies it to cases (e.g.) through exercises.

Obviously this is an approximation, as multiple cycles may take place. For instance, during the KC phase the student may discover discrepancies (e.g. caused by misunderstandings and misconceptions) that trigger another pass through the second phase or even elicit the need for a review of the material used in the KA phase.

As a second approximation, we assume that each of the three phases lasts approximately an equal amount of time. We know that deeper and deeper understanding levels occur throughout life, and that knowledge consolidation may be a slow process that goes even beyond the lifetime of a course, but we believe our approximations provide a reasonable and pragmatic working hypothesis.

In the European Union, one academic year corresponds to 60 credits of the ECTS (European Credit Transfer and Accumulation System) credits, and it is equivalent to 1500–1800 hours of study irrespective of standard or qualification type. Institutions are free to decide how many of the 25 hours-per-credit are delivered in presence, and how many rely on individual study: on the average however approximately one third of the time is spent in class, while two thirds correspond to individual (or group) unsupervised study. Courses based on laboratory are an exception, and they may have a different time allocation: for example two thirds of the time may be spent in the lab, and the rest of it is used (e.g.) to produce reports. Laboratory courses are by definition already based on "learn by doing", so that we do not need to deal with them. We focus our attention on more theoretical courses, where only one third of the total time is spent in class, and which are more likely to suffer from the "frontal teaching syndrome".

In the frontal lecture style most – if not all – the time spent in class with the teacher is devoted to passing knowledge to the student. The teacher focuses on the first part of the learning cycle (KA). The action is mostly limited to the "illustration" of the concepts and practices. During the rest of the time the student is on his own. The operations he needs to perform are internalizing and consolidating the understanding, remembering topics and techniques, putting into practice the acquired knowledge (e.g. by doing exercises). Although in some cases there are lectures devoted to exercises, students are mostly left on their own in these very critical phases. In particular, the DU phase is the one where discussion would be most useful; yet the traditional approaches provide here very limited help (such as teacher's office hours). Group study is a succedaneum – but it is typically left to the students' initiative.

2.2 The VOLARE Methodology

Our idea is to get much more teacher involvement during the DU phase. The teachers' time is however a finite (and expensive) resource: hence to move resources to this phase, it is necessary to subtract them elsewhere (i.e. from KA). The idea in not new: Collard et al. [3] devised a strategy to encourage students to use the textbook, learning material before the lecture. Online pre-lecture assignments were used to provide structured motivation for students to begin learning material before coming to class. Collard et al. report that they were successful in getting students to prepare for lecture on a regular basis. Also, they claim that students felt positively about it. Obviously the idea of using pre-lecture readings is not a new one: many teachers have tried to apply it (e.g. in high-school), but it is usually not really effective, nor it can be assumed to completely fulfil the KA phase.

Our proposal is far more radical. The methodology we propose is named VOLARE: "Video On Line As Replacement of old tEaching practices". In our approach, all the time in class should be spent supporting the DU phase. To do so, we need to free the teacher from the KA duties. The key element is to virtualize the presence of the teacher in the KA phase. We achieve that through usage of video on line. Here we are making another assumption, i.e. that the quality of the experience provided by a recorded frontal lecture is comparable with the lecture itself. We defer our attempt to proof that there is strong evidence in this sense to section 2.2, and proceed with the description of method.

Students are required to view the video before coming to class: the time in class is then fully devoted to discussions, collaborative activities, guided exercises, and strong interactions among students and teacher.

The video contains a traditional lecture, possibly given by the very same teacher. Although it is certainly possible to use as material for the KA phase some of the many educational videos that are available for free (e.g. on iTunes-U, or in the MIT OpenCourseware initiative), there are important advantages when a teacher uses his own recorded lectures. In first place, the teacher can convey exactly his own view, and give his own perspective and imprint to the course. The second benefit is that the teacher has a stronger sense of "ownership" of the course. It is certain matter of teaching styles, but for instance even when PowerPoint slides are available for a standard course, many teachers prefer to at least adapt them to better reflect their view.

Similarly, we believe that using one's own videos would, at least for those teachers, is better than rely on other material.

Obviously such choice implies a non-trivial requirement: the teacher must have recordings of his previous lectures. Again, there are cost, time and effectiveness issues to be considered. One possible option is to prepare videos e in a neutral environment ("canned lectures"), in front of a video camera (and possibly with an "art direction"). The second option is to record real lectures given in the classroom. The first option is generally more costly, but what is most important is that "canned lectures", although polished and professionally looking, are generally… extremely boring! This is not just our opinion, but a fact that has been proved by an interesting investigation by Fritze and Nordkvelle [4]. The main reason is that in a sterile environment the teacher has no feedback from real students. In class instead the teacher has constant responses from the students – even if they do not speak. He can see the faces, understand if he has being boring, if students need to be cheered up with a mot of spirit, if anything needs to be repeated using yet another metaphor or by using one more example. Recording "on the field" is an essential requirement to make the learning experience though the video most similar to the one that is available in class. Moreover, this solution also dramatically reduces costs, at least because it does not require a teacher to perform extra activity. There is freely available software (as e.g. the LODE system[1]) that even allows self-recording and publishing (without external assistance).

We envision the transition from frontal teaching to VOLARE as a progressive process: during one academic year (some of) the lectures are recorded, and then they are used during the next year. Initially the recording can be limited to a few lectures, so that the VOLARE methodology can be introduced gradually.

2.3 Evidence of the Pedagogical Validity of Videolectures

Over the last decade, video-lectures became more and more popular. Essential ingredients are good sound quality, good readability of the accompanying slides, annotation and clips, the possibility to navigate the lecture both by slide title and by a time-bar. The availability of a local copy of the learning material (as opposed to being able to view it only in streaming mode) is also considered a plus.

Early experiments reported a clear inferiority of remote lectures when compared to in-classroom lectures (e.g. [5]), but these results reflected the immaturity of the technology at that time (the multimedia quality being heavily jeopardized by the scarce infrastructural efficiency). Over the last decade, the situation has clearly changed up to the point that recent literature is strongly positive in evaluating the success of video-lectures, as e.g. witnessed by:

- McCrohon et al. [6]: "92% of students who access the video-streamed lectures (…) agreed that this was a useful learning resource";
- Ronchetti [7]: "students find an added value in having a multimedia version of the traditional lecture, especially if provided through a tool that has a well-thought user interface";
- Glowalla [8]: learners show a better concentration in front of a video than in a classroom;

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[1] http://latemar.science.unitn.it/LODE

• Brown and Liedholm [9]: video-lectures were very valuable for 77% of the students;
• Reisslein et al. [10]: students felt that the web-carried video helped them to stay focused during the instruction. Video-lectures-based “distance education was at least as good as traditional classroom instruction”;
• Chung [11]: for a good majority of students, “a distance learning course without on-line (video) lecture would compromise learning”;
• Maness [12]: video-lectures “are indeed adequate alternatives to live lectures for engineering students”,

For a wider and deeper analysis of the available literature see [13].

On the negative side, in a distance-learning context that was heavily based on video-lectures, students reported insufficient interaction with the instructor and insufficient interaction with fellow students [10]. Demetriadis and Pombortsis [14] brought evidence that “e-lectures can be safely used as students’ introductory learning material to increase flexibility of learning, but only within a pedagogically limited perspective of learning as knowledge acquisition (as opposed to construction)”. The VOLARE methodology takes into account exactly these negative aspects. It uses video only for KA, and fully compensates the lack of interaction during the video-lecture by providing strong interaction in class throughout the DU phase. Moreover, moving the KA phase on the video offers advantages in terms of flexibility and of the possibility of reviewing portions of a lecture, which certainly favour a better comprehension.

3 Related Work

Lage et al. [15] proposed a methodology that they called “Inverted classroom” that is a precursor of VOLARE. According to them, “inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa”. Their approach is hence aligned with the general idea of the pre-lecture readings. VOLARE makes a more explicit use of modern technology and harvests the decade of experiments performed on on-line video-lectures.

Independently, Foertsch et al. [16] came to a similar idea. Online lectures are used to substitute traditional lectures with more laboratory sessions. The outcome was that “the replacement of live lectures with online lectures and Team Labs significantly enhanced the usefulness, convenience, and value of the course for the majority of students”.

Day and Foley [17] performed an experiment that is similar to what we propose; the main difference with VOLARE is that they used “canned lectures”. Although they were not able to fully control all possible variables in the experiment, students who followed the video + class mode outperformed those following traditional lectures.

4 Discussion and Conclusions

A limitation of the VOLARE approach is that videos must be available in order to apply the methodology, and a strong emphasis is on the fact that videos must be recordings of real lectures delivered in class. Since this process spans over at least two academic years (one for recording and one for using the recorded videos), it is feasible only for the courses in which the content does not dramatically change from one year to the next. This is actually the case for most basic courses, where content may even remain almost exactly the same for (at least) a few years. Also, if the class is composed by only a small number of students, then the teaching/learning pace may be different in different years because of statistical fluctuations in the students' preparation and ability. If the number of students is relatively large (i.e. at least 50 or 60 students), as it often happens in basic courses, the statistical differences between different years are however not to be significant.

Evolution of the course however need not be frozen: a reasonable scenario could be that (after the bootstrap) every year on third of the lectures is re-recorded (allowing for content modification), while for the other two thirds VOLARE is applied. Of course this is just an example, as the percentage of content modification can be freely varied.

The VOLARE idea has been experimented by the author during the academic year 2008/09. A preliminary assessment of the methodology has been reported elsewhere [18]. The students' feedback on the experiment was quite encouraging. It showed that students perceived it as effective and that it actually brought to a more interesting teaching. Given the limited extent of the experiment, it was impossible to judge if, beyond the perception, the methodology actually achieves better results in terms of better students' performances. A more extensive test is presently being run during the academic year 2009/2010.

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Towards an Automatic Forum Summarization to Support Tutoring

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Abstract. The process of summarizing information is becoming increasingly important in the light of recent advances in resource creation and distribution and the resulting influx of large numbers of information in everyday life. These advances are also challenging educational institutions to adopt the opportunities of distributed knowledge sharing and communication. Among the most recent trends, the availability of social communication networks, knowledge representation and of activate learning gives rise for a new landscape of learning as a networked, situated, contextual and life-long activities. In this scenario, new perspectives on learning and teaching processes must be developed and supported, relating learning models, content-based tools, social organization and knowledge sharing.

1 Introduction

The Internet has grown beyond merely hosting and displaying information passively. It provides easy access for people to share, socialize, and interact with one another. Information displayed and exchanged between people are dynamic, in contrast to static information depicted in the older age of the Internet.

Forums are web virtual spaces where people can ask questions, answer questions and participate in discussions. The availability of vast amounts of thread discussions in forums has promoted increasing interests in knowledge acquisition and summarization for forum threads. Forum thread usually consists of an initiating post and a number of reply posts.

Text summarization has been an interesting and active research area since the 60's. The definition and assumption is that a small portion or several keywords of the original long document can represent the whole informatively and/or indicatively. Reading or processing this shorter version of the document would save time and other resources [1]. This property is especially true and urgently needed at present due to the vast availability of information.

Moreover, the Web is moving toward a social place and increasingly producing new applications: there has been a shift from just existing on the Web to participating on the Web. Community applications and online social networks have recently become very popular, both in personal/social and professional/organizational domains [2]. Most of these collaborative applications provide common features such as content creation and sharing, content-based tools for discussions, user-to-user connections and

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networks of users sharing common interest, reflecting today's Web 2.0 rich Internet application-development methodologies. Concept-based systems to facilitate knowledge representation and extraction and content integration are obtaining a great deal of interest [3].

Concept-based approach to represent dynamic and unstructured information can be useful to address issues like trying to determine the key concepts and to summarize the information exchanged within a personalized environment. Indeed, a virtual learning system is not only a set of contents anymore, but also may include a collaboration spaces and tools such as forums, chats or shared document areas. To support automatic analysis of learner's progress in terms of the knowledge structures they have acquired, different methodology can be used. For example, it could be useful to automatically construct concept maps or domain ontologies based on the messages posted to online discussion forum.

2 Interaction

The amount of interaction in technology-enhanced learning systems appears to be an important element of learning effectiveness. Wagner [4] defined interaction as an interplay and exchange in which individuals and groups influence each other. Thus interaction focuses on the interpersonal behaviors in a learning community. Gunawardena and Zittle [5] argued that on-line students can create social presence by projecting their identities and building on-line communities through text-based communications alone.

Rovai and Barnum [6] also provided evidence that students' perceived that learning from on-line courses was positively related to quantitative measures of course interaction. However, judgments about the relative importance of the two interaction variables are difficult because these variables are correlated. Nonetheless, only the active interaction measure, representing for example the number of student message posted to discussion boards or the number of participation in forum thread, was significant. This finding affirms the importance of providing opportunities for on-line students to learn by active interaction with each other and with the instructor [7]. Consequently, educators should develop and include highly interactive material in distance learning and encourage students to participate in on-line discussions. Findings also suggest that passive interaction, analogous to listening to but not participating in discussions, was not a significant predictor of perceived learning in the present study. Therefore, using strategies that promote active interaction appears to lead to greater perceived learning and may result in higher levels of learner satisfaction with the on-line learning environment. The quality of interactions is another important aspect of communications that should be the topic of further research and goes over the objective of actual work.

So, it is necessary to support tutors in order to manage the communication services provided by the community and to monitor student interactions. This aspect has been largely neglected in the literature. However, supporting tutors is very important to make learning communities effective.

Although some platforms offer reporting tools, when there are a great number of students and a great diversity of interactions, it becomes hard for a tutor to extract useful information. Conceptual-based techniques can build analytic models and uncover useful information from data.

The system we want to propose can find application in any context in which the group interaction is a requisite, and we believe that a Web-based learning system is an ideal application domain.

3 Background of Summarization

Summarization is a widely researched problem. As a result, researchers have reported a rich collection of approaches for document summarization.

There are two main types of approaches available in the literature. The first is a class of approaches that deals with the problem of document classification from a theoretical point of view, making no assumption on the application of these approaches. These include statistical [8], analytical [9], information retrieval [10] and information fusion [11] approaches. The second class of resources deal with techniques that are focused on specific applications, such as baseball program summaries [12], clinical data visualization [13] and web browsing on handheld devices [14]. In addition, [15] reports a comprehensive review.

In this paper, a practical approach is proposed for extracting the most relevant keywords from the forum threads to form a summary without assumption on the application domain and to subsequently find out concepts from the keyword extraction based on statistics and synsets extraction using WordNet. Then semantic similarity analysis is conducted between keywords to produce a set of semantic relevant words summarizing actual forum significance.

WordNet [16] is an online lexical reference system, in which English nouns, verbs, adjectives and adverbs are organized into synonym sets. Each synset represents one sense, that is one underlying lexical concept. Different relations link the synonym sets, such as IS-A for verbs and nouns, IS-PART-OF for nouns, etc. Verbs and nouns senses are organized in hierarchies forming a “forest” of trees. For each keyword in WordNet, we can have a set of senses and, in the case of nouns and verbs, a generalization path from each sense to the root sense of the hierarchy. WordNet could be used as a useful resource with respect to the semantic tagging process and has so far been used in various applications including Information Retrieval, Word Sense Disambiguation, Text and Document Classification and many others.

Noun synsets are related to each other through hypernymy (generalization), hyponymy (specialization), holonymy (whole of) and meronymy (part of) relations. Of these, (hypernymy, hyponymy) and (meronymy, holonymy) are complementary pairs. The verb and adjective synsets are very sparsely connected with each other. No relation is available between noun and verb synsets. However, 4500 adjective synsets are related to noun synsets with pertainyms (pertaining to) and attra (attributed with) relations.

To extract important information from forum threads, we use the following feature extraction pre-process. Firstly, we label occurrences of each word in the document as a part of speech (POS) in grammar. This POS tagger discriminates the POS in grammar of each word in a sentence. After labelling all the words, we select those labelled as noun and verbs as our candidates. We then use the stemmer to reduce variants of the same root word to a common concept and filter the stop words.

A vocabulary problem exists when a term is present in several concepts; determining the correct concept for an ambiguous word is difficult, as is deciding the concept of a document containing several ambiguous terms. To handle the word sense disambiguation problem we intend to use similarity measures based on WordNet.

The use of the described Word Sense Disambiguation step reduces classification errors due to ambiguous words, so as allowing a better precision in the summarization process. For example, if the terms “procedure”, “subprogram” and “routine” appear in the same resource, we consider three occurrences of the same sysnset “{06494814}: routine, subroutine, subprogram, procedure, function (a set sequence of steps, part of larger computer program)” and not one occurrence for each word.

Moreover, the implemented WSD procedure allows more accurate information representation. For example, let us consider to process two sentences containing the “mouse” polysemous word. The disambiguation process applied to the first sentence “The white cat is hunting the mouse.” produces the following WordNet definition:

- {2244530}: mouse – (any of numerous small rodents typically resembling diminutive rats having pointed snouts and small ears on elongated bodies with slender usually hairless tails);

while the same process applied to the second sentence “The mouse is near the pc.” produces the following result:

- {3651364}: mouse, computer mouse – (a hand-operated electronic device that controls the coordinates of a cursor on your computer screen as you move it around on a pad; on the bottom of the mouse is a ball that rolls on the surface of the pad; “a mouse takes much more room than a trackball”).

After the WSD, forum information are represented by using a list of WordNet concepts obtained by the described architecture from the forum content and their related occurrence.

4 Summarization System Architecture

After several transformations and reductions of the input text, the result is a semantics map representing the terms and the relative frequency. Depending on their frequency, we can consider the term more or less important within the context. Each term is reduced to common root using a stemming process.

The next step is to reduce the list according to term frequency: we calculate the average value of frequencies and we discard the terms corresponding to the frequency below the average. In fact, we do not want to completely delete the results obtained up until now, but we would like to offer to the end-user different semantic maps relating to the different stages of reduction and refinement of the text.

Last process step is more complex but very effective. For each remaining term we evaluate its synset, that is names, verbs, adjectives and adverbs grouped into sets of cognitive synonyms [10]. Each of these is compared with the others 'parent terms' so verifying the existence of a conceptual link between analyzed words. If this succeeds, we delete an entire branch of the tree, otherwise, the process continues with subsequent comparisons.

This last stage is recursive so to prune more possible branches and to obtain a reduced and significant set of terms. The project is structured so that any user, while not having read the text of the post, understand the concept underlying the message.

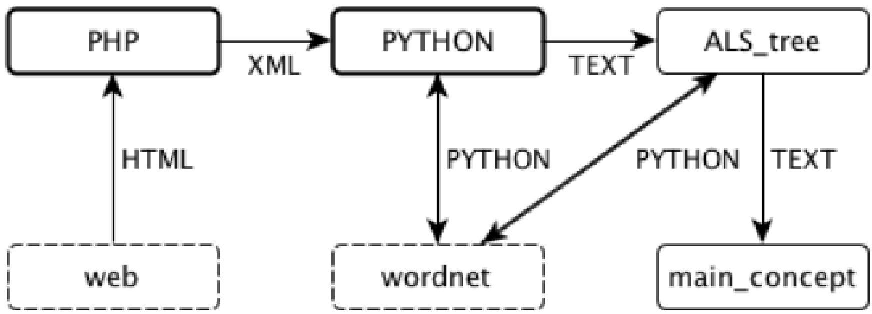

Fig. 1. The process information flow

Figure 1 shows the whole process information flow. The first computation is a php-based reading of the web content. Next, we transfer XML document to the python compiler that, through the use of WordNet and Natural Language Toolkit libraries, returns the reduced tree in a text-based format (ALS_tree, Lexical and Semantic Analisys tree). Successively, we extract, using WordNet and python language, the main concept representing analyzed text. The main concept contains one or more meaningful phrases.

As final result, we obtain a key term list who, through the semantics of its terms can summarize the concept expressed in the analyzed post. Less detail, i.e. a greater granularity of the information (more posts, whole discussion or whole forum) is easily available by recursively applying described reduction process.

5 Considerations

Summarization can be evaluated using intrinsic or extrinsic measures; while the first one methods attempt to measure summary quality using human evaluation, extrinsic methods measure the same through a task-based performance measure such the information retrieval-oriented task. In our experiments we utilized intrinsic approach analyzing W3Schools forums [6], official forum of the W3C (http://www.w3cforum.com/).

We have performed a lot of intrinsic experimental tests obtaining and elaborating a corpus of about 100 threads. This experiment is to evaluate the usefulness of concept extraction in summarization process, by manually reading whole thread content and comparing with automatic extracted concepts. The results show that automatic concept-based summarization greatly improves the performance and produces useful information extraction supporting tutors and making learning communities effective. The extracted concepts represent a good summarization of thread contents.

Advanced in concept-based representation appears as a promising technology for implementing distance learning environment, enabling the organization and delivery of learning materials around small pieces of semantically enriched resources [17, 18]. Items can be easily organized into customized learning courses and delivered on demand to the user, according to her/his profile and business needs [19, 20].

In our experience, concept-based summarization has proven a potentially useful tool to provide a good support for tutors in virtual learning communities. To the best of our knowledge, no systems use concept-based approach to represent online forum information in a learning environment.

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Efficiency Assessment of a Blended-Learning Educational Methodology in Engineering

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Abstract. The content of this presentation highlights the importance of an active learning methodology in engineering university degrees in Spain. We present of some of the outcomes from an experimental study carried out during the academic years 2007/08 and 2008/09 with engineering students (Technical Industrial Engineering: Mechanics, Civical Design Engineering: Civical building, Technical Architecture and Technical Engineering on Computer Management.) at the University of Salamanca. In this research we select a subject which is common for the four degrees: Computer Science. This study has the aim of contributing to the improvement of education and teaching methods for a better performance of students in Engineering.

Keywords: Active learning methodology, formative processes in engineering, learning assessment, competence assessment, blended-learning.

1 Research Context

The research we are presenting here can be located in the framework of research, innovation and university teaching, and, more specifically, in the teaching of engineering. The European Space for Higher Education demands the assessment of new competentes in students, what entails relevant changes in competence design, applied teaching methodology and assessment tools. ([6]; [13]; [11]; [16]; [17]; etc.).

Scientifical Works are being developed in the framework of Engineering to produce fruitful results published in doctoral theses, articles and conferences which focus on this area. Some examples of relevant magazines in the field are: *International Journal of Engineering Education (IJEE)* (http://www.ijee.dit.ie/) or *European Journal of Engineering Education (EJEE)* (http://www.sefi.be/?page_id=20). Some examples of doctoral theses and reports that we can quote are: [20]; [14]; [15], or Conferences and seminars such as *International seminar on innovative teaching and learning in*

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engineering education (Valladolid, 2006) or the *XII Congreso Universitario de Innovación Educativa en las Enseñanzas Técnicas, (CUIEET-* Barcelona, 2004).

We are dealing with an updated topic, where educational research studies are necessary to determine the impact of the educative reform on university students' learning results. With the development of this research we tackle several very relevant aspects in this context: (i) The study of the characteristics that a teaching methodology adapted to the requirements of the European Space for Higher Education in the subjects of engineering degrees in Spain. (ii) The design and implementation of an adequate teaching methodology that establishes a reasonable compromise between desired characteristics and resources available and (iii) the proposal of new assessment tools adapted to the new methodologies and necessities of the European Space for Higher Education.

This methodological renewal, that we aim to validate in a scientific way, is going to be supported by the use of new technologies ([1]; [4]; [8]; [10]). On the other hand, computing tools on their own will not automatically change teaching methodologies. This is the reason why we are working on blended-learning models *(b-learning)* ([2]; [3]; [5]; [7]; [9]); that is to say, a combination of classes to attend and online activities through institutional grids or open-coded platforms and Web 2.0. applications o fan individual or group use of both students and teachers.

2 Experience on a Methodology Based on Active Learning Processes in Engineering Students

The context where this research has been carried out is the Polythechnic School of Zamora, University of Salamanca (Spain). The sample of study is formed by students enrolled in the subjects *Computer Science, Applied Computer Science or Computing Systems* during the academic years 2007-2008 and 2008-2009 (n total = 218).

2.1 Objetives and Hypotheses

With this research we aim to demonstrate how efficient a new methodology would be in the area of Computing Sciences for Engineering, and try to contribute to the increase in the level of competence learning of students, and, therefore, to the improvement of teaching quality in engineering in the educative Spanish system.

From this departure point, scientific **hypotheses** that we try to test are:

- Competence learning level of students after the inclusion of new teaching technologies (based on constructive learning, collaborative work and *blended learning* resources) will be higher than in traditional teaching contexts.
- Satisfaction level of students towards the new methodology used will be significantly higher than in those students present in a traditional teaching environment.

2.2 Research Design

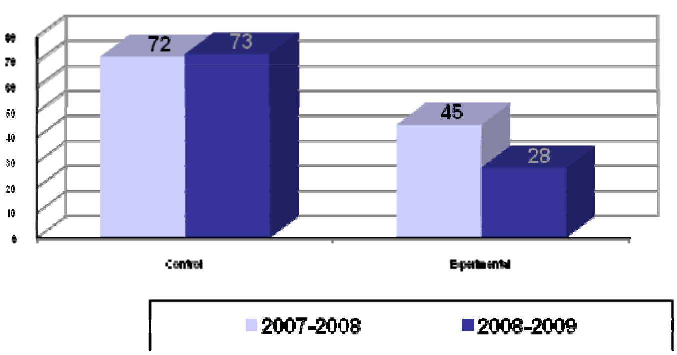
The research methodology that better suits the securing of the objectives planned and providing an answer for the hypotheses formulated corresponds to the quasi-experimental method (control and handling of variables). Experimental techniques have allowed us to test hypotheses through the assignation of different assessment types to different groups of students belonging to different engineering degrees. To choose experimental groups of characters select experimental and control variables and organise the answers to be analysed is what we aim to attain with this project. As it has been done in some other studies, we have decided to design a pretest-postest with a control group, [18]:

Groups of first course of Computer	**N 07** **N 08**	**Asignation**	**Pretest** **(Oct. 07)** **(Oct. 08)**	**Application** **(Oct.-Dec 07)** **(Oct.-Dec08)**	**Postest** **(Jan 08)** **(Jan 09)**
A1 I.T. Computational management- Year 07-08 y 08-09	25 25	Non random Non random	O_1 O_1	Innovation	O_2 O_2
A2 I. T. Industrial- EXPERIMENTAL Year 07-08 y 08-09	20 20	Non random Non random	O_1 O_1	Innovation	O_2 O_2
A3. I.T.O.P. EXPERIMENTAL Year 07-08 y 08-09	20 20	Non random Non random	O_1 O_1	Innovation	O_2 O_2
B1 I.T. Industrial – CONTROL Year 07-08 y 08-09	20 20	Non random Non random	O_1 O_1	Traditional Traditional	O_2 O_2
B2 Tech. Architecture – CONTROL Year 07-08 y 08-09	75 75	Non random Non random	O_1 O_1	Traditional Traditional	O_2 O_2

2.3 Sample

We can define the sample object of study as the group of students of the Polythechnic School of Zamora, University of Salamanca, in 2007-08 and 2008-09. In relation to the sample, we will select the subject Computer Science, in the first year of the degree to develop the experiment. Three will be experimental groups, and control the rest.

Conditions required in this type of research (personal and contextual variable control, intervention on both students and teachers, voluntary participation of characters, material conditions of the research, shortage of resources, etc.) have impelled us to privilege internal validity of the study over the external one.



Graph 1. Representation of the sample studied according to degree and academic year

2.4 Variables

Variables considered are detailed below. The dependent variable is defined as the 'didactic methodology' used, and which is measured in two levels: (a) active learning methodology, with the support of an experimental use of ICTs, and (b) traditional-control methodology. Regarding the principal dependent variable, we highlight the level of 'competence learning' acquired by students at the end of the semester. As control variables we consider, on the one hand, the level of previous knowledge of students, their marks, learning styles, time devoted to studying, attitudes towards the use of ICTs, interest towards the content. On the other hand, we have into account that the teacher of all experimental groups is the same, and the planning of the subject is also common.

2.5 Instruments

Measurement instruments for each of the variables taken into account belong to two main types:

a) Data questionnaires of both academic and sociocultural type for students.
b) Standardized tests to measure the different learning styles.
c) Multiple-answer objective tests to measure the level of conceptual knowledge in its diverse types (knowledge, understanding, application; following taxonomies such as Bloom's)

Type of variable	Variable	Instrument
Dependent	- Level of theoretical knowledge on the contents of Computer Science	- Objective test
	- Level of skill in the use of computing tools	- Estimation scale/Control list (Observation)
	- Satisfaction of students towards methodology	- Questionnaire (Likert Scale)
Independent	-Learning methodology (experimental and traditional)	
Modulative or control:	- Sex, age, motivation, expectations, previous academic performance (access tests…) - Learning style -Attitude (beliefs, afectivity)	- Ad hoc questionnaire - CHAEA (Honey and Alonso) - Questionnaire (Likert scale)

2.6 Results Advance

The analysis of data is being carried out through the programme SPSS 17.0 (University of Salamanca licensed).The analysis that better suit this type of information are descriptive, (central and deviation tendency measurements) and inferential (T-tests to measure the difference in average data for both correlated and independent variables, variance analysis in the case of more than one group in the independent variable and non-parametric tests when there is no compliance of conditions), always based on the specific objectives of this study.

Diverted from the analysis carried out with the data obtained, we present an advance of results, differentiated according to the groups: experimental and control. First we present data corresponding to the academic year 2007-2008, and then the ones from 2008-2009.

Year 2007/2008

In the academic year 2007-2008 we contrasted if there existed statistically significant differences in the **pretest** (level of previous knowledge), and noticed that there are differences that favour the experimental group (t=4,453, p=0,006). In we take into account the five degrees (F=7,070; p=0,000), we corroborate that differences exist between Mechanical Technical Engineering (group A y B) and Technical engineering on Computing Management, and between Technical Architecture and Technical engineering on Computing Management.

Table 1. T-test for independent samples, according to group (control-experimental). Year 2007/08.

	Experimental (n=27)		Control (n=72)		Independent t-test	
	$\overline{X}$	s_x	$\overline{X}$	s_x	t	p
Punctuation pretest	0,92	0,87	1,53	1,13	4,453	0,006

Table 2. T-test for independent samples, according to group (control-experimental). Year 2007/08.

	Experimental (n=45)		Control (n=52)		Independent t-test	
	$\overline{X}$	s_x	$\overline{X}$	s_x	t	p
Punctuation postest	2,8671	1,93458	2,3508	1,84961	-1,342	0,183

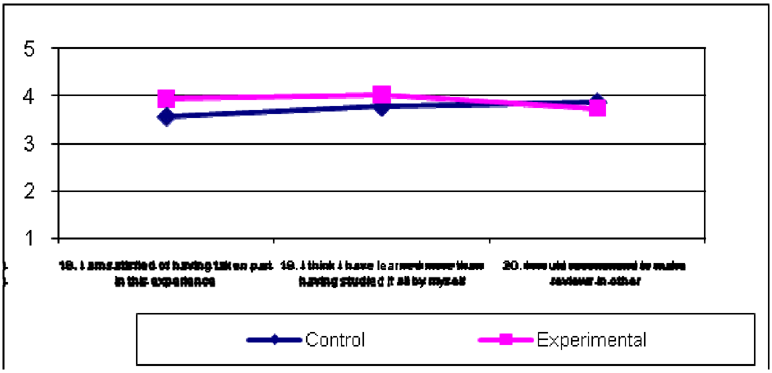
In the contrast between **postest** (final performance test), and according to the methodology used, we find that there are no significant differences (see table 2) in respect to the learning methodology (t=-1,342; p=0,183), in a n.s. 0,05.

Accordingly, if we consider the five different degrees in an independent way, results obtained make it evident that there is no difference in the final performance test. (F=2,771; p= 0,032).

In regard to the second dependent variable considered in this study, **satisfaction** of students, we would like to emphasize that, resides there are no statistically significant differences in relation to the group, there are evidences of a higher satisfaction in the experimental Group, as it can be observed in the following graph.

Year 2008/2009

In the Academic Year 2008-2009, and taking into account the results obtained from the analysis of data in the **pretest,** we check that there are no statistically significant differences according to the groups (t=0,472; p=0,623).



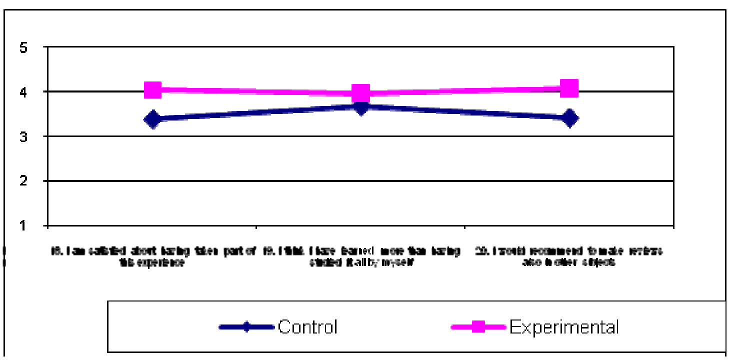
Graph 2. Satisfaction differences, according to the group

Table 3. T-test for pretest independent samples, according to group (control-experimental) Year 2008/09

	Experimental (n=24)		Control (n=31)		Independent t-test	
	$\overline{X}$	s_x	$\overline{X}$	s_x	t	p
Punctuation pretest	1,0239	0,87775	0,9311	0,86628	0,472	0,638

Table 4. T-test for postest independent samples, according to group (control-experimental) Year 2008/09

	Experimental (n=24)		Control (n=31)		Independent t-test	
	$\overline{X}$	s_x	$\overline{X}$	s_x	t	p
Punctuation postest	2,86	1,717	2,454	1,22	0,981	0,331



Graph 3. Satisfaction differences, according to the group

In the **postest**, we notice that again there are no differences among groups depending on the learning methodology applied in each of the cases. Nevertheless, if we consider the five different degrees independently, we find differences (F=8,765; p=0,000), between Technical Computing Management Engineering ($\overline{X}$=4,31) and Technical architecture ($\overline{X}$=1,79), and between Technical Computing Management Engineering and Civil Technical Engineering ($\overline{X}$=1,84).

Regarding **satisfaction** of students, we highlight the fact that there are differences in the ítems "I am satisfied of having taken part in this experience" (t=-3,516; p=0,01) and " I would recommend to make reviews also in other subjects" (t=-3,314; p=0,001).

3 Conclusions

Besides the fact that the restricted scope of a paper does not allow us to expose the complete methodological development followed in this study, we consider that we have provided empirical evidences that will awake reflection on didactic planning which contribute in an efficient way to the improvement of learning in Engineering.

On the other hand, methodology used, based on "experience on an active teaching methodology" enables a higher responsibility of the student towards the learning process, a higher motivation and a final result more satisfactory for all the participants in the process.

It is true that the use of experimental methodology in educative contexts entails certain problems of internal validity that it is necessary to note and reduce, among them the effect of the control of odd variables not taken into account in the study.

As we have been testing, through results of empirical research in our Group at the University of Salamanca (Spain) (GRIAL, http://grial.usal.es/grial/), it is necessary that more group works are produced in an interdisciplinary collaboration mode among engineering, educational and ICTs experts.

Research on the impact of ICTs on the learning processes of university students is a necessary task on which we have to apply mixed research methodologies, based on empirical methodologies that provide researchers with new theories about the new educational reality that we find nowadays.

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TELL(Technology-Enhanced Language Learning) and Less-Commonly Taught Languages: The Case of Modern Greek

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Abstract. It is true that not all languages start from an even situation: some languages (which are considered "privileged", "strong" or "widely spoken/used/taught") happen to have large numbers of speakers, others have few. In order to preserve, promote and spread Less Commonly Taught Languages (LCTL) it is important to avail of all potential promotion and dissemination mechanisms, one of which is Technology-Enhanced Language Learning (TELL). In this paper we shall first discuss LCTL in the TELL context and we shall then present a TELL application for Modern Greek, which aspires to contribute to the promotion and dissemination of a "small" language via the technology channel.

Keywords: Technology-Enhanced Language Learning (TELL), Less Commonly Taught Languages, Modern Greek, courseware.

1 Introduction

It is true that not all languages start from an even situation: some languages (which are considered "privileged", "strong" or "widely spoken/used/taught") happen to have a large pool of speakers, others have few. In this paper the terms "Less Commonly Taught Languages" (LCTL), "small" and "lesser-spoken/used/taught" languages will be used as free variants to denote any language which has a relatively small pool of native speakers and "is not used in global or wider European communications" (Piri, 2002, p. 7). The challenges for teaching and learning a LCTL stem from social, political and financial factors: why invest (or waste?) money, time and effort on a language with a small market, which will probably not contribute to career enhancement and evolution? Why hire language teachers and create learning materials for a limited number of students (the majority of which will most likely drop classes once they complete the beginner's course)? Why place value on a language of low social prestige, therefore considered "useless"? These concerns are acute when it comes to LCTL in general and prevail in the LCTL TELL context in particular.

The significance of learning and speaking a foreign language is manifold: apparently, monolingualism is increasingly regarded as a handicap in a modern, globalizing world (Crystal, 2003; Hamel, 2006; Phillipson, 2003). Learning a foreign language encourages the learner to open up to other people and to begin to comprehend

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the target culture (C2). Learning less widely used languages, in particular, is considered an important step against sameness and towards preserving linguistic and cultural diversity and pluralism, hence promoting language as an integral part of human rights (De Varennes, 2001).

The aim of this paper is first to discuss LCTL in the TELL context and then to present a courseware developed for Modern Greek (MG) as an attempt to preserve, enhance and "revitalize" a small language via the powerful TELL channel.

2 Considering LCTL in the TELL Context

Ward and Genabith argue that "One way to kill off a language is to teach another one" (Ward & Genabith, 2003, p. 236) and they consider the mass media as agents of "linguistic genocide". Based on the clear predominance of strong languages on the Web, one could perhaps add the Internet as another potential (and extremely powerful) agent of this genocide. In the context of the "global" village, international communication has shifted from a plural use of several languages to a pre-eminence of English.

Since Netizens with different mother tongues communicate with each other basically through English, many researchers are sceptical about the future of the other languages and express their concerns. Crystal (2001) wonders if linguistic creativity and flexibility will be lost as globalization imposes sameness. The answer is provided again by Crystal who argues: "An endangered language will progress if its speakers can make use of electronic technology" (Crystal, 2002, p. 141). We fully share this view and we believe that this statement may apply not only to endangered but also to less-spoken languages such as MG, since the distinction between widely vs. LCTL could be conceived as analogous to the difference between "technology-rich" vs. "technology-poor" languages. In the light of new data and in the context of what has become known as the "computer culture", empowering a small language is to a large extent interwoven with advances in the language engineering field. This mandates the development of the necessary language technologies and e-learning materials as an important compensatory measure that needs to be taken to avoid possible gradual attrition of less widely used languages and to contribute to maintaining a plurilingual (and therefore pluricultural) perspective.

In order to empower, promote and spread small languages it is important to avail of all potential dissemination mechanisms, one of which is TELL or CALL (Computer-Assisted Language Learning). Developing materials for second/foreign language (L2) learning within the TELL framework nowadays constitutes a necessity and may significantly contribute (apparently combined with appropriate language policies and measures on a national and international level) to the "revitalization" and dissemination of lesser-used languages. Developing TELL applications does not only ensure equal opportunities of all languages and cultures but also addresses the needs of those people who are interested in such languages but cannot attend language courses either due to personal issues (related to mobility, age, sex, financial status etc.) or simply because no courses are available in (or near) the area where they reside. In this context, we consider TELL as an extremely powerful mechanism which may provide easy and affordable access to L2 education and thus lay an optimal foundation for successful lifelong L2 learning, this being one of the hallmarks of a civilized society.

However, the scarcity of sound (both technologically and pedagogically) TELL applications for LCTL is a fact since for TELL developers it may be "…hard to keep track of all the developments happening in the world of CALL" (Ward & Genabith, 2003, p. 240). Usually, small languages lack the necessary language technology resources and tools and TELL developers lag behind the most recent advances in the field, which are again developed for widely used languages with particular emphasis -apparently- in English. However, the initiatives that have appeared in recent years indicate that this necessity has clearly been understood, hence allowing for optimistic thoughts for the future of LCTL in the TELL context. One of these initiatives for Modern Greek will be presented in the next section.

3 TELL and Modern Greek: The "filoglossia+" Courseware

Undoubtedly MG does not belong to those languages deemed "useful" to know. Still, it is a powerful cultural language spoken in the same geographical location for 4.000 years and a source of loan words for the creation of thousands of scientific terms in many languages. MG is the national language in Greece and Cyprus (spoken by about 14 million people), one of the official and working languages of the European Union, the L2 in Greece and Cyprus (used by more than 1.000.000 people) and a minority language spoken by millions of people worldwide.

In the last 15 years there has been a constantly increasing demand and interest in teaching and learning MG as L2. This interest combined with the evolution of language engineering in Greece has led to the development of state-of-the-art language tools and an array of language resources and multimedia learning modules in the local market. TELL still constitutes a relatively new field in Greece, however, and despite its novelty, a number of TELL applications have already emerged in the local market. In order to address the needs of the above target-groups and render MG more accessible worldwide, the Institute for Language and Speech Processing (ILSP)/"Athena" R.C. has designed and developed the "filoglossia+" series, a multimedia courseware for MG which spans four CD-ROMs, with each disk containing 5 chapters (i.e. 20 chapters in total). The courseware is currently available in 6 versions employing English, Chinese, Albanian, Bulgarian, Serbian and Romanian as support languages respectively. The support language is used to provide translations, explanations of language phenomena and sociocultural issues of the Modern Greek society.

filoglossia+ may be used as a supplement in guided instruction as well as a stand-alone learning tool for self-study purposes employed by motivated adult learners who wish (or do not have any other option than) to function autonomously and be self-guided in the L2 learning process. It is currently employed or recommended for use by various educational institutions involved in teaching MG abroad (e.g. Drexel University in the US, Universidad Nacional Autónoma de México, Universität Salzburg, Universidad Nacional del Sur in Argentina, University of Cambridge in the UK, Institut für Weiterbildung-Wiener Volkshochschulen in Austria etc.) either as a supplementary learning tool combined with other learning materials or as a self-learning tool.

The immense growth of the Internet usage has led ILSP towards the creation of a Web-based application for the same purpose, which comprises a free online version of the filoglossia+ CD-ROMs (available at http://www.xanthi.ilsp.gr/filog/). The Web courseware (for a description see Hatzigeorgiou, Sidiropoulos, & Charalabopoulou, 2005) attempts to retain the majority of the pedagogical and design characteristics of the CD-ROM series, however it includes a subset of the language material of the CD-ROM version and the Greek-English glossary and the speech tools available in the series have not been integrated in the on-line version.

3.1 Target Group and Pedagogical Objectives

The courseware targets adult learners of MG who have no previous knowledge of the language and wish to obtain the necessary linguistic equipment required for general language purposes. The language material of the application follows the general specifications provided by the Common European Framework of Reference/CEFR (2001), a language guide which “describes in a comprehensive way what language learners have to learn to do in order to use a language for communication and what knowledge and skills they have to develop so as to be able to act effectively”. (p. 1).

Since meaningful communication requires culture (Roberts 1998) and given that language is a social semiotic (Halliday & Hasan, 1985) an attempt is made in filoglossia+ to combine L2 with culture learning. Seelye (1993) makes a distinction between big Culture (big C) and little culture (little c), the former referring to cultural products such as literature, painting, sculpture, music etc. and the latter used to encompass routine aspects of life and daily habits. Although not developed on a purely sociocultural approach, in order to help the learner of Greek become acquainted with facets of big C and little c, filoglossia+ includes allusions to aspects of the C2 (a presentation of contemporary Greek painters, Greek archaeological treasures, Greek architecture, traditional and contemporary Greek music), as well as a number of paralinguistic features which aim to acquaint the user with how the language code is adjusted to the social norms of C2 (e.g. what language needs to be deployed in formal vs. informal interaction) and extralinguistic features (e.g. body language, issues of Greek etiquette), all these presented either as stand-alone sections or interspersed throughout the application.

3.2 Structure and Components

The language material is distributed in twenty chapters. The first chapter is introductory and the last is a consolidation unit with revision exercises. The introductory unit presents the Greek alphabet (a cumbersome area for novice learners of Greek whose L1 is based on the Latin alphabet), stress and genders and articles. The Greek letters are embedded in words in different positions (word-initial, word-internal, word-final) and uttered by native speakers in video clips. All Greek words deployed here as examples are used as loan words in many other languages in an attempt to encourage the learners and make them feel that they know (some) Greek already! Model examples of nearest English equivalents of the Greek phonemes are also provided.

With the exception of the first and last chapter, all chapters comprise four language sections (Dialogue, Vocabulary, Grammar and Useful Phrases), a Greek-English glossary and two speech tools. In particular:

1. Dialogue: This section is the nucleus of each chapter and is introduced with a short text, which provides an outline of the story covered in each chapter. The dialogue is supported by videos, the majority of which are filmed in authentic settings (e.g. super market, airport, subway, restaurant, shops). The English translations are always available and can be viewed by clicking on the British flag button. The users may access the whole dialogue text any time, click on any of the dialogue sentences and listen to them working at their own pace. The dialogue texts feature Greeks who make use of colloquial and sociolinguistic appropriate language in the context of everyday life situations.
2. Vocabulary**:** The vocabulary section is divided into "basic" and "additional". Contrary to the dialogue section, where users work on a sentence level, in the "basic vocabulary" section the users are encouraged to work on a word level: they may activate all words of the dialogue text, listen to them pronounced by a native speaker, realize how they are used in context by reading the sentence and watching the relevant video segment in which the actual word occurs. Recording facilities are also available, enabling the users to record their voice pronouncing each word and then comparing it to the native speaker's model. Each word is also grammatically annotated. In the additional vocabulary section, more words and phrases that are likely to be used within the framework of the communicative situation of each dialogue are introduced in order to help the learners further expand their mental lexicon.
3. Grammar: in this section, the most important morphosyntactic phenomena occurring in the dialogue texts are presented and discussed in a communicative context. All explanations in this section are provided in English, while a number of exercises have been integrated to establish a sufficient level of comprehension for the specific grammatical phenomena.
4. Useful phrases**:** The aim of this section is twofold: (a) to help the user accumulate a sufficient knowledge of the use of particular stereotyped phrases most likely to be used within the context of the communicative situation of each dialogue and (b) to point out language variations determined by the social norms of the target culture (e.g. formal vs. informal conversations). The phrases are presented in short video clips and are accompanied by interactive role-playing activities in which the user's voice overlays the video dialogue by using a voice recording tool.

A number of exercises of various types and ergonomies accompany each section and aim at testing and reinforcing the comprehension of materials covered. In the current versions, error handling involves automatic and instant assessment of the user's input, which is based on string-matching techniques and is restricted to the "right/wrong" type of feedback provided by an agent, while an answer key is also available to the users at any time.

A bilingual Greek-English e-glossary has also been integrated in the application, which includes all words that appear in the application (approximately 3.200 lemmas) and may be accessed at any point. The glossary contains the lemmas, their English translations and examples of use (again translated in English). It also provides conjugation of verbs and declension of nouns and adjectives.

Finally, two speech tools have been embedded in the courseware in order to facilitate mastering the MG pronunciation, which will be discussed in Section 3.4.

3.3 Theoretical Underpinnings

Following current trends in L2 learning based on recent Second Language Acquisition (SLA) findings, in general terms the courseware combines the communicative approach to L2 learning with a presentation of the rich morphological system of MG, aiming at the acquisition of communicative fluency and linguistic accuracy. In line with Krashen's input hypothesis (Krashen, 1993) filoglossia+ enables access to rich language input which is rendered here in different forms by employing an abundance of multimedia materials and thus accommodates both visual and audio learners.

In an attempt to replicate the conditions of a vis-à-vis interaction between a native speaker and a non-native which are considered to be beneficial for SLA (Chapelle, 1998), a type of a modification of input is introduced here, which functions as follows: in case of comprehension breakdown, the versatility of the courseware allows the users to customize the input via enabling, for instance, access to the translation of the Greek input in English, the transcripts of the videos and/or subtitles, looking up unknown words in the bilingual e-glossary etc.

In a communicative approach fashion, fluency is achieved by exposing the user to lots of videos filmed in authentic settings and dealing with communicative situations in which socioculturally appropriate language is deployed, as determined by the social norms of the target culture. With regard to linguistic accuracy, the users are occasionally urged to switch their focus from meaning to form in order to master the rich morphological system of the language. The structures to be taught in each chapter are projected by employing different ways and techniques and in most cases they have a communicative "lining". Taking into account the importance of background knowledge in L2 learning (Lee, 1986; Nunan, 1985) -especially in the case of adult L2 learners- the use of the knowledge of L1 may facilitate and accelerate L2 learning because it makes learners more confident and independent in their learning process. Therefore, when deemed necessary similarities and differences between L1 and L2 are pointed out.

3.4 Technologies and Tools

filoglossia+ deploys and exploits the multimedia technologies and potentials. A plethora of audio and video clips portraying everyday life situations have been integrated, which also include features of cultural value. In the application all video segments are linked to and synchronized with their transcripts and the narrative of all videos is available as Greek text and in English translation.

Since one of the peculiarities of MG is its alphabet and the historical orthography (leading to difficulties both in reading and pronunciation), two speech tools have been integrated to help the novice learner become familiar with and properly articulate the

Greek phonemes: an Automatic Phonetic Transcription (APT) Tool and a Text-to-Speech (TTS) converter, both developed by ILSP.

The APT tool is used to convert arbitrary written input to its International Phonetic Alphabet (IPA) equivalent (an explanation of IPA symbols is provided in the first chapter of the courseware). This tool can be proven very useful for learning Greek, taking in consideration that the Greek Alphabet may take up quite a large amount of learning time and thus retard progress in the communicative skills. The APT tool is based on a number of rules, which describe all potential realizations of every phonetic unit in particular phonetic environments and convert the Greek written text into its phonetic version. This tool may be particularly useful to novice learners of Greek who have not yet mastered the Greek alphabet and are therefore uncertain about how a Greek word should be pronounced. The TTS tool produces an audio output from its textual input using a digitized voice. The speech synthesizer can work with arbitrary Greek input, provides the pronunciation of any typed word, phrase, or sentence, and functions in this context as a simplified Pronunciation/Reading Tutor.

The courseware allows for free navigation, but if the users wish to follow a pre-defined path, they simply have to access the chapters and language sections in a linear order. Error handling is based on string matching and the error notification message is instantly provided. The feedback is of the “right-wrong” type provided by an agent when the users click the “check!” button to check their input. Recording facilities are also available: the users are stimulated to produce words or utterances that are subsequently recorded and played back so they can study their own output and attempt to improve it by comparing it to the native speaker’s pre-recorded model.

filoglossia+ has been reviewed by the CALICO experts (Computer-Assisted Language Instruction Consortium, review available at https://www.calico.org/p-341-Filoglossia%2B%20(92007).html) and it has also been evaluated by a sample of adult learners of MG (n=100) who live abroad and were asked to use the English version of the courseware in a self-learning mode and evaluate all its aspects (for details on the evaluation method, tools and results see Charalabopoulou, 2006).

4 Conclusion

In this paper we have argued that the future of LCTL can be safeguarded through TELL and we have presented a courseware for Modern Greek which aspires to contribute to the spread and dissemination of the language via the powerful technology channel. Due to the novelty of the TELL field in Greece, there is room for improvement both in terms of quantity and quality of the existing e-learning materials and language engineering in general in order to take advantage of the recent developments and thus reach a competitive level worldwide. filoglossia+ constitutes an ambitious endeavour to this direction. The future versions of the courseware will be entirely on-line, will include a set of additional tools and improved functionalities and will exploit Web 2.0 tools and technologies in order to create an e-learning platform for Greek that will increase the visibility of the language at international level and will help the learners worldwide master Greek.

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A Case Study of Modular-Based Project Oriented Learning in Electrical Engineering

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Abstract. Considering the worldwide acceptance of problem/project-based learning methods, the Department of Electrical and Electronics Engineering at Dokuz Eylül University replaced its curriculum with a modular-based problem/project oriented one in Fall 2002. Current education system consists of sequentially given two, three or four week-long problem or project-based modules. Different from the conventional approach, in our system traditional courses are individually covered as independent modules given in sequential manner. While the first three years consist mainly of problem-based modules, senior year is purely project oriented. In this study, we present our experiences through the example of a senior year module. Our experience suggests that project-oriented learning in senior year is an effective method of teaching not only the theoretical or practical aspects of the subject matter but also the necessary qualities for real life experiences of soon-to-be engineers.

1 Introduction

Since real engineering problem solving often involves working from a starting point with less than perfect information, Project-Oriented Learning (POL) in later years of engineering education gives students a chance to experience a real life engineering application [1]. This involves not only the practical application of the theoretical knowledge students acquire but also realizing the additional information, tools, knowledge etc. they will need to solve the problem. In conventional teaching methods the concern is to teach the theoretical fundamentals of the subject matter thoroughly. Practical aspects and application experiences are not of concern until graduation. Dealing with an open-ended real life application which cover not only the complete content of the course but also some additional knowledge and skills is not usually a common practice in a course or in a course's laboratory in conventional education system. Project-oriented approach provides a simulated work environment in which the student copes with a project/problem as an engineer would do either as an individual or as a group member [2], [3].

Considering the changing demands of industry and the requirements of revised accreditation criteria who look for engineers who not only possess a solid understanding of the fundamental science of engineering, but also have a practical and robust approach to problem solving, function well in a team and have

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excellent communication skills, Department of Electrical and Electronics Engineering at Dokuz Eylül University replaced its curriculum with a modular-based problem/project oriented one in Fall 2002 [4], [5]. Different from the conventional approach, in our system traditional courses are individually covered as independent modules given in sequential manner. First three years of the curriculum is mostly problem-based [6]. The senior year, on the other hand, is designed as purely project-oriented. The first semester of the senior year consists of mandatory modules one of which is the EE411 Digital Signal Processing (DSP) module. The second semester contains variety of modules of different subject areas and the students are free to choose four of them to complete the semester. Beside these project-oriented modules, during the senior year students are expected to complete their individual senior year project.

In this study, we give a case study applied for the Digital Signal Processing course[1]. In what follows we will present our experiences on project-based teaching through the example of a senior year module, EE411 Digital Signal Processing. Section 2 presents learning objectives of the module. Details of the methodology and feedback of students on POL are presented in Sections 3 and 4, respectively. Finally, Section 5 gives the concluding remarks.

2 Learning Outcomes of DSP Module

Each student must comply with the module learning outcomes where outcomes of all modules must adhere to the requirements of the program (for our program requirements see [8]). Learning outcomes that students should achieve in order to pass the module can be grouped in many different ways. We adopt the model of Quality Assurance Agency for Higher Education - Engineering Benchmark Statement [9] to group module learning outcomes as follows:

- Knowledge and Understanding : Fundamentals of Digital Signal Processing, transform domain representations of digital signals, filter elements and structures, Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) digital filter design, applications to real-life problems,
- Intellectual Abilities : Apply analytical thinking to digital signal processing related problems, select and develop appropriate signal processing method, employ computer software for simulation of DSP systems,
- Practical Skills: Use computer for programming, presentation and working purposes, use Matlab Digital Signal Processing Toolbox, program Matlab Graphical User Interface (GUI), simulate mathematical models, gather, process and display/output data using appropriate tools,
- Transferable Skills: Manage time and resources effectively, work in a team/group constructively and supportively, develop communication skills, utilize information and communication technology in the preparation, process and presentation of information.

[1] A previous version of this study has appeared in a national congress in Turkish [7].

3 Methodology

3.1 Components of the Project-Based Module

Each semester consists of different number of modules which are arranged in a sequential order such that students focus on only one subject area as DSP, Digital Communication, Control Systems within each module. EE411 Digital Signal Processing module is the first module of the seventh semester of our curriculum and encompasses four weeks. The module consists of different components with different educational aims as given below:

POL sessions: In these sessions, the project is introduced to the students of small groups and the progress of students is observed and guided by a tutor. Having a tutor in these sessions is important for tracking the progress, checking records, dealing with the problems and providing additional support and advice as needed. With the careful guidance of the tutor, problem in hand is discussed, and the provided information is analyzed. The "should do" and "should learn" lists are prepared by students as a group in each POL session.

In a four-week project-based module such as EE411 there are five POL sessions two of which are in the first week. The first POL session aims to introduce the project. Students are presented with the short description and the goals of the project. The detailed description of specific tasks that should be completed during the module is also presented. In this first session, in light of provided information preliminary discussions are conducted and a coarse work plan is prepared. In the second session, each group presents their feasibility report which provides a detailed work plan and time table. Students have to prepare interim reports for the following POL sessions and the progress of each group is closely monitored by the tutor. A final project report including the details of the solution and project results is handed over at the last POL session.

Presentations: There are 20-credit hour presentations in the module schedule. These lectures aim to fill the gap between theoretical concepts and their practical applications in the field.

Consultation: Additional guidance and consultation can be provided for both on matters related to projects and concepts taught in lectures.

Discussion: Module discussion takes place in the middle of the third week when module progress nears completion. Purpose of this activity is to discuss the progress of the module and the projects with the students. Students meet with module directors to share problems or difficulties they faced and receive guidance. This session provides groups with a chance for self evaluation of their progress and a comparison with other groups' performances.

Module Exam: Evaluation of the theoretical concepts is accomplished through a written exam at the end of the module.

Exam Discussion: After the module exam there is a discussion session in which the students and module directors discuss the exam questions and their solutions.

Laboratory Hours: There are both electronics engineering and computer laboratory hours in the module. In the first week's lab sessions an introduction to the Matlab signal processing toolbox is provided by teaching assistants. During the remaining laboratory hours guidance is provided as needed.

Engineering Orientation: The integration provided by projects, presentations and laboratories is strengthened by an orientation seminar. Its aim is to provide the students with real life aspects and applications of the subject matter. The orientation seminar takes place at the end of the third week.

3.2 Project Assignment

A very general description of the problem is introduced through a project brief. Students are expected to acquire the necessary background information through independent research. Lectures and other activities are used as resources to gather information and guidance by students. In the project brief which is handed out in the first POL session, in addition to a brief problem description, project goals, specific tasks, and details of evaluation of the module are presented. In specific tasks part we specify the reports to be prepared and their due dates and the requirements of the project presentation. Other than that students are free to build their own working plan and timetable. There are usually 3 or 4 different projects for the module and groups are randomly assigned with one of these projects.

As an example, a project can consist of a design of digital stereo FM transmitter and receiver. This project involves analog to digital, digital to analog conversion, design of digital filters for different purposes such as preemphasis, deemphasis filters, pilot tone recovery etc., creation of a digital sinusoidal signal, frequency doubling, digital signal multiplexing, FM modulation and demodulation, simulating a white Gaussian noise signal in digital platform. Tasks included in the project basically cover almost all of the learning objectives of the EE411 Digital Signal Processing module. Encoding and decoding of telephone touch pad signals, QRS complex detection in ECG analysis, analyzing musical tones, design of a digital synthesizer, linear predictive coding of speech, and radar simulation are other examples of assigned projects.

3.3 Performance Evaluation

We evaluate the overall performance of the students by measuring four different skills. Namely, we evaluate their knowledge-based skills, process skills, teamworking skills and formal communication skills. For this purpose we identify five different elements to be graded individually. We then aggregate the grades according to the predefined weights to produce an overall score. The elements themselves, their weights and criteria for grading are defined as follows: i) POL Session (15%), ii) Oral/poster Presentation (15%), iii) Final Report (30%), iv) Written Examination (40%). While students are graded individually in POL sessions and written examinations, they are given group grades in other activities.

Table 1. Feedback of students on POL

Do you agree with the following?	*5*	*4*	*3*	*2*	*1*
Dealing with only one subject area affects the learning positively	8	48	19	19	6
Duration of module is sufficient	8	25	6	44	17
Dealing with only one subject area increases permanency of acquired knowledge	6	25	17	35	17
Duration of the module is sufficient to assimilate the content	4	13	12	40	31
Presentation hours are enough	2	17	29	44	8
POL contributes to the permanency of learning objectives	50	44	4	2	0
Content of presentations contributes to implementation of projects	20	55	12	12	2
Preparing a final report helps in reinforcing the information	12	25	18	27	18
POL sessions contribute positively to the implementation of the project	17	43	26	6	8
Regular reporting helps to monitor the progress of the project	8	63	12	12	6
Increases ability for preparing a formal report	19	58	15	4	4
Criteria for evaluation are appropriate and fairly weighted	8	33	23	27	10
POL is an effective tool for gaining engineering skills	55	37	6	0	2
I enjoyed working in a group	29	51	12	8	0
I am satisfied with sharing of workload and responsibilities	33	40	17	8	2
POL is a positive experience for engineering life	47	45	4	2	2
Improves abilities for using time efficiently	15	42	31	12	0
Strengthens written and oral communication skills	19	52	13	12	4
Improves abilities for preparing a poster	19	67	9	5	0

4 Questionnaire

Right after the completion of the module, students are asked to fill out surveys which contained 19 questions. There are five possible answers for each survey question: Fully agree (5), agree (4), indecisive (3), disagree (2), and fully disagree (1). In the above table, the number in each cell is the percentage of students who selected that particular choice. The survey is filled out by 52 students in total.

The purpose of the survey is to determine the opinion of students on the modular-based POL. The results in Table 1 show that students generally agree on the main aims of POL. At first look, we notice that students are not satisfied with the duration of the module (61%). In a similar vein, they think that the amount of presentation hours is insufficient (52%) and the duration of module is not long enough for assimilating the theoretical content (71%). However, considering the fact that four successive modules are covered in a fourteen-week semester, to increase neither the amount of presentation nor the duration of the module seem possible. On the other hand, we gladly observe that almost all of the students agree upon the positive contributions on the permanency of the learning objectives of POL (94%). Additionally, they also think that POL is a strongly beneficial experience for their future engineering life. The results show that students enjoy working in teams (80%), enjoy sharing workload and responsibilities (73%) and find POL sessions useful (60%). The results also indicate that written and oral communication skills of students are improved fairly well (71%).

Furthermore, most of the students agree that their abilities for writing formal reports (77%) and preparing poster presentations (86%) are strengthened.

5 Conclusion

The combination of lectures, labs, and POL sessions within the umbrella of a project-based module turns out to be quite an effective way of preparing students for their engineering life by putting theory into practice. This way, students develop a better understanding of the value and limitations of theoretical knowledge by virtue of its application to practical problems. Beside achieving the learning objectives of the module students also gain some generic skills and abilities that will be useful in both work and the other aspects of their life. The results of the student survey and our experience attest that the duration of the module may be extended for a better assimilation of module content. In light of similar experiences also in other modules, a curriculum modification along these lines is under consideration.

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Origami in Education Enhanced by Computer Technology: A Case Study of Teaching Hexaflexagon in Math Class

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Abstract. This paper reports an experience of the author teaching high school 3D geometry with origami. In this case, students were originally expected to construct a 3D-hexaflexagon by imitating video tape so that they can understand some related math concepts better. However students demonstrated strong willing of exploring the concerned enchanting paper craft. They did not want to just memorize the folding procedures or be limited within verifying some math concepts. The teacher had then to extend the class time to 2 class periods, so that a series of creative activities are invited in. After the primary goals have been reached, two extra activities were launched. First, by exploring a torus forming animation, they explored a different algorithm of forming a hexaflexagon. Secondly, when another animation of Hexaflexagon made by the teacher was presented, the students can then explore the function of the slope of the creases. Some smart students found hexaflexagons with different shape or even different type. So the thinking level of the students reached the highest creating level by curriculum re-design. This case study comes to the conclusions that origami as well as good questions motivate students' higher level thinking. As students' scaffolds, video and animation technology are essential in helping the learners understanding origami in right perspectives.

Keywords: Hexaflexagon, origami, technology enhanced learning, project study.

1 Introduction

Origami is an ancient Asian paper-folding art which has an intimate relationship with mathematics. It is said to have a history of more than 1,500 years. Large number of lesson plans has been created by math teachers up to now [2]. Since origami is a skillful work and needs hands and brain to work together, more and more elder people do origami to prevent themselves from Alzheimer disease now. So origami is getting more and more popular around world than mathematics. But origami is often difficult to teach and learn especially in a large class and when the folding procedures get too complicated. The problem lies in difficulty of describing the folding details clearly by gesture language or video.

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The motion paper craft “hexaflexagon” was invented in the fall of 1939 by an English graduate student Arthur H. Stone who was then studying mathematics at Princeton University. By playing with a strip of paper casually, he found an intriguing structure which can flex. It is described in a book that “He had folded the strip diagonally at three places and joined the ends so that it made a hexagon. When he pinched two adjacent triangles together and pushed the opposite corner of the hexagon toward the center, the hexagon would open out again, like a budding flower, and show a completely new face…. ”. The so-called “hexaflexagon” soon caught a lot of attentions from the public around. Till now, amateurs and professional researchers have published lots of papers along this topic [3]~[8].

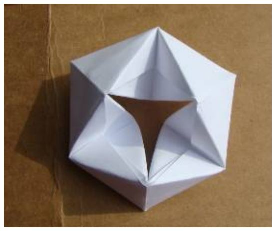

Fig. 1. A 3D hexaflexagon is a motion paper craft made by origami

Though Hexaflexagon has come into being since twentieth century and has gained a lot of fans in western world, it is still less popular in China. With the new movement of reforming math classes demanding higher level thinking, developing creative activities for student becomes more and more urgent. Can Origami make some difference? Can Hexaflexagon be used to cultivate students’ creativity? What knowledge can be related to Hexaflexagon? What is the role of it?

In a local high school, I made an experiment to reveal the facts. I chose 16 average students and asked the principal an extra class of origami lesson. At first, I just want to see if the hand craft content can grasp students’ interests. I wished I could inspire the students to create. To my great surprise, the class finally had to extend to a series of two classes due to students’ great passion on making the craft.

This curriculum was designed under the guides of several theories. The first is the Bloom’s taxonomy of cognition. I used that theory to determine my objectives of the students’ activities. Second theory is the Polyia’s famous *How to solve it* book. It guides me to find good questions to ask my students. And the third theory is TRIZ systematic innovation methods. It helps me and the students to find the new structures of flexagons.

2 The Process of the Classes

The whole case can be divided into two sessions. Each session lasts one class period. Students were at first divided into 4 groups, each group contained 4 students. They were supplied with hard paper, ruler, scissors and glue at each class session.

2.1 The First Class Period

At the beginning of the first class period, the students were told the story of hexaflexagon. Then each group was supplied a sample hexaflexagon made by the teacher beforehand. While playing with the model, curious students began to wonder how this can happen.

Then according to my previous design, each 4-student group was engaged in making a tetrahedron from a given 1×2 rectangle as a warm-up exercise. They were shown on the screen the template below to help them make creases.

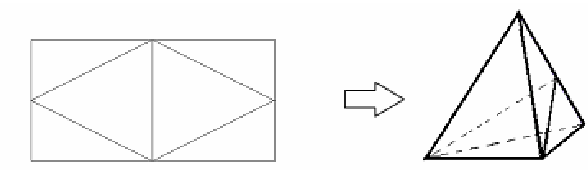

Fig. 2. Make tetrahedron from a 1×2 rectangle. Students can find this small model useful in understand the angle between two planes and some other math concepts.

Question: what would it like to hinge six of your tetrahedron one by one at the shorter edges and finally form a ring?

The students guessed the answer. That would form a hexaflexagon!

I asked continually: what if we would like that ring come from a whole piece of paper?

With that question in mind, students were shown the videoed procedures of making a hexaflexagon. This pre-recorded video clip showed every detail to make the paper craft step by step. The students were asked to watch carefully every step so that they could imitate all the procedures later. I played the video several times and stopped where I felt certain explanations were needed.

Students then started to make their own model with those procedures in their minds. The teacher walked around student groups and gives some guides when needed. Some students who are slow may need printed templates to find out where to make creases.

When all the creases were precisely made, they came to the key procedure of forming 2D paper into 3D shape. I showed the class myself as in the video so that students can see more clearly: the left and right ends were first glued together, then the upper edge was slowly curled inside until met the lower edge, finally the exposed edge (lower edge on 2D) fixed onto the lower layer edge (top edge on 2D).

While the students finishing their work, they felt very happy and exciting at the structure. I asked those quick students continue exploring their model to understand the procedures of making.

When all the students finished, I asked them to think of some good questions about what we have done. I mentioned the Chinese word for knowledge “ ” can be explained as “learning of asking” so to encourage each group to brainstorm and collect their good questions. They gave me positive feedbacks on this new task.

Here are some questions that students have raised: what is the measure of angle between the two planes in each tetrahedron? What is the distance between the two short

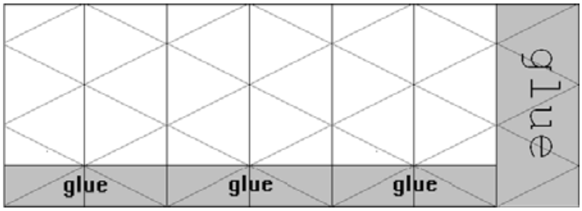

Fig. 3. Make a hexaflexagon from a half-A4 paper. The six vertical creases divide the strip length into seven equal parts. Each of the slant line has a slope of 1/2 or 1/2.

skew edges in each tetrahedron? Can each triangle face be adjusted to equilateral triangle on the model?

While doing this, they actually explored the answer to the big questions “what kind of the paper craft can flex?” and “Are there any other different type of 3D flexagon?”

I planned another class for the same 16 students to answer those questions one week later.

2.2 The Second Class Period

During the interval of the two classes, I managed to make two computer animations to illustrate two important facts. One animation was about a torus forming procedure; another simulated the motion of a hexaflexagon. I prepared some questions to ask my student heuristically.

So after one week’s preparation, I decided to allow the students reveal some secrets behind the paper craft. When the class met again a week later, an animation was present to the class first. I hoped it can give students a hint of another hexaflexagon forming algorithm.

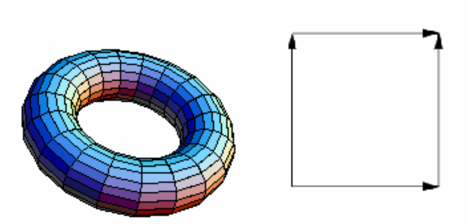

Fig. 4. A torus constructing animation screen shot

Question: can you find a different way of forming a hexaflexagon?

Since in the eye of topology, a hexaflexagon is equal (homeomorphism) to a torus, one can imagine there should be another forming scheme of hexaflexagon similar to that of a torus in the simulating animation. Now the students are asked to check this idea. Each group now was supplied with a semi finished hexaflexagon and was supposed to test the feasibility of exchanged the order of two gluing procedures.

Each group successfully finished a hexaflexagon through a way different from previous one. They felt happy to have gained a better understanding of the hexaflexagon structure. They compared the advantages and disadvantages of the new forming algorithm.

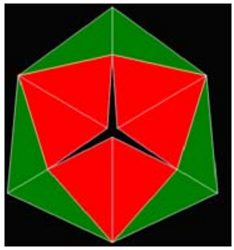

Fig. 5. Simulation software to illustrate the motion of a hexaflexagon

After the first exploring activity, I raised to the class a bigger question.

Question: Can a hexaflexagon with shape parameter other than" $\pm\frac{1}{2}$ "flex?

At the same time, my second animation was played to the class.

By watching hexaflexagon in the bird's view, one can clearly see the very moment when the middle hole vanishes and the outline of the figure become a right hexagon. This is the crucial moment that one can thus determine the shape parameter. The students worked in group and finally established a conjecture that any parameter whose absolute value less than 1/2 can also yield flexible hexaflexagon.

By adjusting shape parameter in the software, students confirmed their conjecture.

The students spontaneously made an experiment to proof their conjecture. Three groups made thinner hexaflexagons to find out their flexibility. One group tried to make a "fat" hexaflexagon with parameter $\sqrt{3}$. Their results were satisfying. Just as what the animation revealed, a fat model gets blocked at the center (It can only be constructed by second forming algorithm).

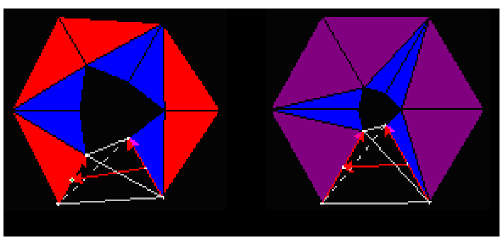

Fig. 6. the shape parameter decides a hexaflexagon to be "thin" or "fat". The thin one can flex and the fat one can not flex.

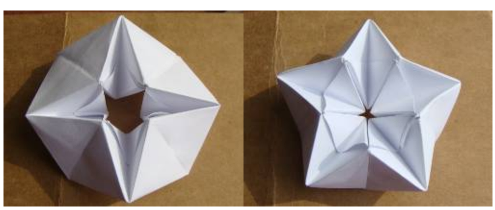

Fig. 7. Some other two different flexagons which are 8 (left) and 10 (right) tetrahedrons hinged together

Near the end of the class, I mentioned the other possibility of flexagons. The figures shown bellow were only two of them. Students were ready to explore them after school.

3 Conclusions

I have had an exciting experience of teaching through origami. During the two class periods, both teacher and students gained a lot. I noticed origami is a good way of motivating student and engaging them in learning. Hand-on task makes students concentrated on class activities. Video is good way of teaching origami; however it need to be noticed also that in the second class, the two simulations played very important roles. They revealed the key procedure of making the origami and the key moment of the moving of the craft in clear and precise animation ways. The student can thus understand what to do and why is the reason only some shape can flex. This greatly raised the level of students' cognitive objectives from memorizing to creating.

So we can deduct that without the support of technology, teaching origami can be very frustrating. Animation technology especially Geometry Sketchpad by KCP Company is easy to grasp tool for high school math teachers. We recommend even the students should learn to use this tool.

Technology of java has made remote learning origami feasible. The actual folding procedure can be very useful in help students making and understanding complicated structure and abstract math concepts. They even benefit in developing their cognitive level from lower memorizing level to higher level of creating.

This lesson plan covers a rich topics scope of algebra (cross product, group), folding geometry, topology, transformation (3D to 2D). There exist many other math related games or origami. This is a rich mine to be dig and developed.

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Challenges of Implementing ESD in the Education Sector; Experiences in Norway

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Abstract. This article presents and reflects on Norwegian experiences over a period of about 15 years with implementing the Norwegian national strategy for education for sustainable development (ESD) in the education system. We extract lessons about integration of ESD into education systems. After an introduction to central ideas of sustainable development and ESD, the article discusses the need for appropriate strategies and instruments. Key factors are collaboration to allow pupils and schools to actively contribute to a positive development locally and globally, interdisciplinary approaches to complex sustainability issues, and appropriate use of the ICT and other media. ESD programmes and activities should support school development and build the capacity of schools and teachers for integration of ESD.

Keywords: education for sustainable development, collaboration, school development, participation, media.

1 What Is Sustainable Development?

Sustainable development as a concept was introduced in 1987 the United Nations report ”Our Common Future” [1]. The report described the web of interconnections between environment and development, emphasizing that natural resources must be managed such that the carrying capacities of the systems involved are not exceeded. At the same time, resources must be distributed equitably among all those who live on the earth today and we must ensure that our descendents can also harvest of nature’s productivity. Greater insight into complex ecological interactions is needed, as well as systems of values, economy and politics that ensure that basic needs of all people are met. To ensure a worthy life for people, both today and in the future, it is also important to develop environmentally friendly technologies that use fewer resources in the production phase and pollute less when used.

Many earlier authors wrote about sustainability issues from 1950-2000, breaking the ground for the work of the World Commission. For example, Rachel Carson’s book “Silent Spring” [4] published in 1962, is considered a foundation of the modern environmental movement. Carson was one of the first to move away from a romantic view of nature. As a scientist she demonstrated that nature is fragile and that human beings are capable of damaging ecosystems and the ecological cycles life depends on.

The Norwegian philosopher Arne Næss wrote the book “Ecology, society and lifestyle” [5] in 1976. Næss’s message was that everything is interconnected. He made

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an important distinction between the superficial and the deep ecological movements. The superficial movement subscribes to technical solutions to the environmental crisis such as population policy, changed patterns of production and consumption and technological innovation to increase energy efficiency and reduce pollution. The deep ecological movement, on the other hand, seeks more complex answers which involve almost all aspects of society. Næss argued that a change of mentality was needed on both the personal and the political level. Rather than striving for a high material standard of living, we should strive for a high quality of life including caring for others and for the earth. Development should rest on a set of values in which our way of life respects the limitations of nature and distributes production equitably.

Susan George wrote several influential books in the 1980's and -90s about third world debt and the catastrophic consequences of the global economic system in terms of food shortage, unemployment and climate change. She was not a doomsayer, but rather emphasized the need for change in the world economic order.

Despite great efforts by many people and numerous studies, development continues today in an unsustainable direction and the debate about the real meaning of "sustainable development" also continues. Much time and energy are spent defining the message and communicating it in a way that can be understood.

A Norwegian report to the Parliament [2] in 1997 described how driving forces such as population growth, consumption, technology and trade create unsustainable development due to depletion of the resource base and pollution. These impacts on the earth's ecological systems impact productivity and human welfare both directly and indirectly. When citizens become aware of these relationships and impacts, attitudes and values are formed which may allow the driving forces to be steered in a more sustainable direction. For example, people may consciously change their pattern of consumption or governments and international bodies may develop policies favouring environmentally friendly technology or more equitable trade. Awareness of interconnections between ecology, economy and society and the formation of values in society are thus key factors for sustainable development.

The climate crisis and crisis in the world economy have made apparent, in recent years, the need for changes in the world economy as well as systems of production and distribution. The challenge will be to reach agreement as to what changes are necessary, and how these changes can be brought about in complex systems.

Senge discusses the challenges of creating a sustainable society in his book "The Necessary Revolution: How individuals and organisations are working together to create a sustainable world" [3]. The first prerequisite is to create a shared vision. We must know what we want to do and have a common understanding of what sustainable development means; a consensus must be built in order to carry out the actions that are necessary. This requires professional insight and the ability to construct realistic models and understand the larger systems of organisations, supplies, production units, geography which frame our economic activities. We need to understand how these systems interact and ensure that they function well over time. Quick and easy solutions may make the situation worse. Because the problems are embedded in complex systems, cooperation across sectoral and organisational boundaries is needed to solve them. People also need to become aware of their value system and develop a shared understanding of what is most important. Values and attitudes toward our fellow human beings are central in the work for sustainable development.

When describing how organisations and society in general can learn and develop, Senge recommends starting with a small group with a shared purpose but perhaps different ideas about how to achieve the goals. Through dialog and reflection, the group can make recommendations about what can be done and gradually involve more people in their organisations. Eventually there will be enough a strong enough consensus and will to carry out the necessary actions.

2 What Is Education for Sustainable Development?

Education systems are large, complex and have many levels. At the top level nationally we find the Minister of Education, who sets the premises for educational content in schools. The system continues all the way to the school and pupil level where educational activities are carried out in practice and the educational results are achieved.

Following the approach of Senge, the first step to successfully developing education for sustainable development is to create a vision of the role of the school system in sustainable development and to win acceptance for this vision both in the school system itself and in society at large. The vision should clarify what needs to be done at each level, such that education contributes to sustainable development in the short and the long term.

How can education develop each pupil's insight into the global challenges of today? This question spurs us to look at the way concepts are formed and the way pupils learn. Educational psychologists broadly agree that the purpose of learning and education in various subjects should have to do with developing various action competencies, expertise that pupils are capable of adapting and applying in various contexts. This concept stands in contrast to the more traditional goal of enabling pupils to answer questions quickly and precisely without necessarily understanding what the issue is about. One could say that this represents a shift in our view of what constitutes good education as well as what methods are most appropriate. The educational activities need to go further than what has traditionally been considered adequate, and they also need to include various approaches in order to acquire action competencies. This view of learning can be summed up as follows: it is an active, constructive, cumulative, self-regulated, goals-directed, collaborative and individually adapted formation of competencies including a range of concepts, skills and attitudes.

Competencies to be established in education for sustainable development are related thematically to basic concepts in fields such as economy, ecology, ethics and social science. However, the cognitive abilities need to reach further and include the ability to understand interconnections and understand specific issues as part of a larger and more complex picture. Knowledge will often be incomplete, and pupils will therefore need to learn to handle uncertainty.

Development of attitudes and values is central. How can pupils develop both the will and the ability to distribute resources equitably? Pupils should also develop a view of themselves as a responsible and active participant in society. This role in life requires knowledge and understanding, but also many other competencies such as the ability to communicate, to collaborate and cooperate with others, and to negotiate solutions in a context of diverse norms and value positions. More educational research is needed on how the participatory skills, values and attitudes that characterize high quality ESD can be developed effectively.

It seems that a deeper reorientation, re-thinking and restructuring of education is needed if school systems as we know them today are to produce the kinds of interdisciplinary and composite competencies described above. In particular, schools need to create innovative contexts for learning and new approaches to construction of knowledge. These new kinds of educational arenas and approaches will by necessity replace established classroom teaching methods to some extent. Creating new kinds of learning arenas means that the school and teachers will need to know how to cooperate effectively - both internally among the school staff, and externally with various actors outside the school.

It takes time to understand of all sides of an issue. To think abstractly and perceive patterns and interconnections requires maturity and reflection. It takes time to change cognitive habits. Schools are mandated to provide a learning path reaching over many years and which can be shown to develop the intended competencies. Yet at the same time they also need to provide room for pupils to participate in steering their own education and develop dynamic qualities. Schools and teachers also need to take into account that the pupils have different abilities and backgrounds. Some pupils are quick to understand, others need more time to develop a deeper understanding of issues.

Pedagogical experts have differing views and recommendations about the best methods to promote complex competencies. They do generally agree, however, that a wide variety of methods should be used and that the learner should develop concepts and principles on the basis of their own capabilities. The methods should include pupil activity, participation and debate. Pupils should be given tasks they find meaningful. New information should be linked to what is already known, deepening the understanding of things learned previously. Education should take place in a social context, and it should be aimed at understanding rather than memorization. The role of the teacher is to support and challenge pupils to gain new perspectives. In the learning situation, he or she must give the pupil enough time to practice and to reflect, and must also recognize that all pupils have different abilities.

Many models have been proposed for development of competence through a cycle of action learning. A Chinese proverb sums up the essence of action-based learning (translation ours):

"I hear and I forget, I see and I remember, I do and I understand." Action learning takes place on at least two levels: pupils' learning activities and the teaching staff who plan and evaluate the school's educational activities. The cycle starts with a concrete experience or action in which the learners are participants. The next stage is reflection on the experience and what was learned, followed by abstraction and extraction of lessons learned from the experience. The fourth stage is implementation or application of what has been learned, including knowledge and skills. In practice these stages are not discrete and the learning cycle is continuous and repetitive.

3 Strategies and Instruments for Education for Sustainable Development

National education authorities in every country are responsible for creating educational policy to support education for sustainable development. Many countries including

Norway have made strategies or plans for integrating sustainable development into education. Instruments which may be used to this end include integration of ESD into the national curriculum and teacher training, integration into school development work, establishment of arrangements for intersectoral collaboration and provision of school guidance and support.

In Norway the national curriculum includes a general section called the Education Act [6], a "Quality framework" and subject curricula. Goals for competencies to be acquired are stated in subject curricula and guidance about how educational activities are to be carried out is provided. The Norwegian curriculum thus strongly supports the methods of ESD and the diverse competencies which education for sustainable development aims to develop.

The Education Act, its regulations and the core curriculum state that the school and apprenticeship-training enterprises shall:

- give all pupils and apprentices/trainees equal opportunities to develop their abilities and talents individually and in cooperation with others *(Section 1-2 of the Education Act, Chapter 5 of the regulations, and the core curriculum)*
- stimulate the stamina, curiosity and desire of pupils and apprentices/trainees to learn *(Section 1-2 of the Education Act, and the core curriculum)*
- stimulate pupils and apprentices/trainees to develop their own learning strategies and critical-thinking abilities *(Section 1-2 of the Education Act, and the core curriculum)*
- stimulate pupils and apprentices/trainees in their personal development, in the development of identity and ethical, social and cultural competence, and in the ability to understand democracy and democratic participation *(Section 1-2 of the Education Act, and the core curriculum)*
- facilitate pupil participation and enable pupils and apprentices/trainees to make informed value choices and choices relating to their education and future professions/occupations *(Section 1-2 of the Education Act, Chapter 22 of the regulations and the core curriculum)*
- promote adapted teaching and varied work methods *(Section 1-2 of the Education Act and Chapter 5 of the regulations, and the core curriculum)*
- stimulate, use and further develop each teacher's competence *(Chapter 10 of the Education Act)*
- help teachers and instructors to be viewed as positive leaders and role models for children and young people *(the core curriculum)*
- ensure that the physical and psychosocial working and learning environments promote health, well-being and learning *(Chapter 9a of the Education Act)*
- facilitate cooperation with the home and ensure the co-responsibilities of parents and guardians *(Section 1-2 of the Education Act and section 3-2 of the regulations)*
- ensure that the local community is involved in the education in a meaningful way.

Norway's strategy for education for sustainable development describes the thematic contents of ESD and methods for organising and carrying out the educational activities. The strategy presents 12 themes covering not only environment but also the social and economic dimensions of sustainable development. The topics are: biological diversity, energy, consumption, resources and equitable distribution, outdoor life and nature experience, waste and recycling, health, indoor climate and school environment, conflicts of interest, climate and air quality, cultural heritage, natural areas and water resources.

Schools in Norway need concrete guidance in the area of education for sustainable development. The interactive website www.miljolare.no was developed to fulfil this need and is an important element of the Norwegian strategy for ESD. The approach of this website was developed based on the constructivist view of education described above. As of October 2009, 4943 schools and 7109 other participants were registered as contributors.

The learning activities on the website have been constructed based on the following principles:

- The activities are concrete
- Pupils and schools collaborate with each other and with research and management institutions who develop the activity and/or use the results
- The activities include suggestions for further work, discussion and reflection to develop insight and understanding
- Pupils enter reports and results in the form of text, data and photographs using templates and electronic forms on the website. The shared format and databases allows schools to study, discuss and compare their results and reports with those of other schools.

The natural sciences enjoy a time-honored tradition of field and laboratory work which are appropriate for reaching the learning goals for these subjects. Such teaching can be expanded to become ESD if one applies scientific technique to real-life situations in society rather than using hypothetical examples. ue. School education then becomes a "win-win" situation in which the results of pupils' learning are of public interest and –value. Pupils learn about science - but also about how society works with sustainability issues at the local, national and international levels. Both pupils and schools realize that they can contribute to society and sustainable development. A "science-in-collaboration-with-society" approach provides abundant opportunities to develop competencies such as democratic understanding, will to participate, and social- and communication skills.

One of the challenges of implementing the www.miljolare.no website has been to communicate adequately what kind of a tool it is and how it is intended to be used. It is a supportive framework which teachers can use to create an educational activity, not a traditional set of ready-to-use classroom materials. The educational experience cannot be prefabricated and delivered to the teacher. Both the educational activity and the learning outcomes have to be created through the work of the teacher, the pupil and any collaborating partners. The action learning cycle includes planning, carrying out activities, observing, questioning, analyzing, discussing, reflecting and reporting.

The potential for the work of pupils and schools to benefit society has been undercommunicated and needs to become more visible in ESD work. Pupils and schools can become active partners in and contributors to a positive and sustainable development.

4 Collaboration

Cooperation and collaboration are not simple matters, either internally at the school or between a school and external partners. Many organisations seem to believe that education can be preconstructed. Thus, they make instruction packages and send these out to schools to be used directly and reproduced by teachers and pupils. Our experience is that instruction aiming to develop wide competencies can only be reproduced to a small degree. Rather, we are convinced that educational activities, arenas and methods should be constructed and adapted for each class and setting, taking the local conditions and the abilities and interests of participating pupils into account.

If collaboration is well planned, education of youths and local work for sustainable development can be two sides of the same coin and both parts benefit. Both the school and the local actors collaborating with the school need to be motivated to enter the partnership. Schools produce results which they share with the local authorities or researchers. The partner reciprocates by ensuring that the information is useful and communication with the schools regarind how the pupils' work has been used. Good routines for the collaboration and communication need to be established and followed. The alternative is a more ad hoc form of cooperation, which often tends to be frustrating for both parties and is apt to be much less effective in developing the pupil competencies the school is aiming for.

Local work for sustainable development represents a unique learning arena for schools. Andrew Furco [7] observes that when the school's work of learning becomes a resource for the local community, students become producers of information rather than passive recipients of information. The collaboration provides an opportunity to develop a wider field of competencies than if one stays in the more familiar and safe learning arenas. When pupils, teachers, researchers, managers, municipal employees and others move outside of the everyday, secure work situations, they cross boundaries. The activities that take place in this new physical and mental learning zone challenge our understanding and our emotions, and have been shown to promote development of expertise [8].

For the school to become a resource in local sustainable development work, new kinds of routines for planning and collaboration will be needed. This creates a dilemma. It would be simpler to carry out the instruction at the school, following a "tried and true recipe" – but this will seldom succeed in developing the competencies and engagement which are the purpose of ESD. Peter Senge [3] advises against opting for the simple solution in "The Necessary Revolution."

There is no dearth of examples showing that education can make a concrete and direct contribution to sustainable development. For example, pupils can monitor species in a locality, save energy, measure water quality, change consumption habits, protect cultural heritage sites. The topics are by no means limited to the natural sciences, but also include the social sciences, humanities and fine arts.

It is possible to create a system or network of committed collaboration, in which pupils deliver socially useful products. However, schools and their partners may initially find it difficult to visualise the mutual benefits of such collaboration. The following examples illustrate that ESD collaboration can benefit both the school and the partner.

Example 1. Watershed investigations in Bergen municipality
Bergen Municipality initiated this project (http://miljolare.no/prosjekter/bergensvassdrag/) as part of its work to develop a management plan for watersheds. All schools were invited to adopt a portion of a watershed and record how the watershed is used, waste, biological diversity and cultural heritage sites.

Example 2. Protect a cultural heritage site
The project (http://miljolare.no/tema/kulturminner/ryddeaksjon/2009/) is part of a national effort by Norsk Kulturarv to engage children and youths in practical cultural heritage protection. Clubs, organisations, schools and others did a commendable job in engaging youths in clearing and protecting many cultural heritage sites.

5 Disciplinary and Interdisciplinary Approaches

Education experts are often concerned with the particular features and requirements of particular academics subjects and disciplines, and are apprehensive that an interdisciplinary approach will result in weaker subject competencies. We perceive no inherent conflict, but rather a positive synergy, between interdisciplinary education for sustainable development and the school's work to develop subject competencies. However, careful planning and cooperation among teachers is needed to link problem-based teaching to subject curricula.

An evaluation of several projects in the Norwegian network for environmental education indicate that that pupils' scientific understanding can be heightened when scientists and experts are involved in developing the educational activities [9]. More research is needed, however, about the learning outcomes and specifically how they are produced.

Based on experience in Norway, we believe that pupils actually do gain better insight into a topic such as energy, by actively monitoring the school's energy use and discussing how it can be reduced, than by reading about it in a textbook. Similarly, a scientific concept such as biological diversity will be easier to understand and remember if one has participated in registering species in a given locality and discussing preservation of biodiversity at that place. The same is true of the social sciences aspects of sustainability. What better way could be found for pupils to learn about how a democratic society actually functions, for example, than to investigate how their local and national political representatives follow up international regulations?

Each year, schools in Norway are invited to participate in a research campaign and in campaigns offered by organisations. The content is developed by researchers and the campaigns are affiliated with the Norwegian Research Council and research institutions. The campaigns held from 2002-2009 were: Protect a cultural heritage site, CO_2 on the way to school, RainCheck, SpringCheck, Water Quality in Norwegian schools, Road Dust, Indoor Climate and Keep Norway Tidy.

In 2009, the research campaign was carried out in more than 600 schools in Denmark, Sweden and Norway. Pupils investigated levels of CO_2 and mould in the classroom air using standard scientific methods. They entered their results online and compared their results with those of other schools using online analytical tools.

Schools often expanded the campaign to work with closely related issues such as health-, environment- and safety regulations, responsibility and routines for inspection, recommended limits for CO_2 and mould, health impacts and ventilation. The scientific results were both interesting and important information for the school owners. More than 50% of participating schools in Denmark and more than 20% of the schools in Norway found CO_2 levels above 1000 ppm, a threshold value often used for acceptable air quality.

This is an example of a win-win situation for education and for sustainable development. The schools have done a useful job by registering which classrooms have poor air quality. By carrying out the activity and reporting the results, pupils are introduced to scientific concepts and methods. They become familiar with democratic processes and the responsibilities of various actors in a democratic society.

Evaluations of this and other similar campaigns (such as the internal evaluation of the Rain Check campaign conducted by the Norwegian Ministry of Education in 2006) show that schools are encouraged when scientists react to their work and results positively. Education becomes situated in a meaningful and useful context. This inspires and strengthens the learning effect. Pupils and teachers say that it is particularly inspiring to feel that they are taken seriously and can do something useful for society.

6 Information and Media

Information flow to schools through the media has a strong impact on children and youths and can also influence schools' thematic agendas and priorities. The media compete for school time and schools often complain of an overload of information and offerings. Schools and teachers should be aware of a possibly conflict between the stream of simplified, superficial information and offerings received by schools, and the educational goal of schools to develop pupils' deep understanding of complex issues. It may be tempting to participate in simple, short activities that don't require much effort, rather than planning a learning path that embraces the actual complexity of the issue at hand.

The media will also reflect the political climate and thematic agenda both nationally and globally at a given point in time. School leaders are charged with developing schools continually and in a long term perspective, but are challenged by the tendency of the need of new political leaders to signal their priorities by allocating funds to short term, high visibility projects. These short-lived impulses from the media and the realm of politics can, however, be integrated into the school's development plan and used in ESD. It is the school that sets the agenda, makes plans and ties together various activities and themes into a whole. The school needs to ensure that themes arising locally and in the media reinforce each other and support the goals of the curriculum and the school's educational mission.

7 Further Innovation: SUPPORT and CO_2nnect

The central education authorities face several dilemmas when designing strategies and instruments for ESD. A so-called instrumental approach, in which one approaches schools with a ready-to-use materials and activities, will often appear to be quite visible and effective. More ambitious programmes requiring greater preparation or more class time may also be offered, but fewer schools and teachers are likely to carry out the activity, and it is likely to be viewed as ineffective and unsuccessful on those grounds. The dilemma is that "quick and easy" activities, *because* they are so easy, are apt to be less effective in developing the intended complex competencies at both the school and pupil level than more demanding activities that require more time, energy and initiative on the part of the school and pupil.

Wals et al. [10] contrast the learning impact of the so-called instrumental and the emancipatory approaches to ESD as follows: "Within the more instrumental approaches much time is spent on describing measurable outcomes in a SMART way in that they need to be Specific, Measurable, Realistic, Time-specified (SMART). To have an exhaustive list of indicatiora seems very handy for becoming SMART in working toward a more sustainable world. Ironically perhaps, working in such a way might take the learning out of moving toward a more sustainable world, which is the key element of a more emancipatory approach."

Indeed, developing diverse competencies in education for sustainable development is a complex task. It is equally challenging to measure or assess whether pupils have actually attained the learning goals and competencies expected from participation in a given educational activity or programme. Many kinds of skills, attitudes and values are by their very nature difficult to assess and develop progressively over time.

These issues were central points discussed by the SUPPORT consortium while designing the school campaign "CO_2nnect: CO_2 on the way to school." The school campaign is a central part of the 3-year, EU-financed Comenius Lifelong Learning network project "SUPPORT: Partnership and Participation for a Sustainable Tomorrow." Earlier experiences in Norway indicated that a free, ICT-based, international campaign based on school-school and school-research collaboration could achieve good results both in terms of pupils' learning and in terms of schools making a concrete contribution to sustainable development.

The SUPPORT partners were interested in finding out whether it was possible to promote ESD widely and reach many schools using such an internet tool. However, the tool should be such that it can be used both instrumentally (for schools with limited time or interest) and emancipatorily (for schools interested in developing high quality ESD through local collaboration and project work).

The "springboard" core activity in CO_2nnect is registration of pupil's and teachers' CO_2 emission from transportation to and from school. The activity in itself is instrumental by nature. Pupils investigate distance to school and means of transport, and enter these data into an international database. Analytical and map tools are offered to facilitate analysis, comparisons and discussion, and pupils can uploading their project reports, pictures, etc..

However, the SUPPORT consortium also wanted to encourage teachers and schools to use the tool in an emancipatory manner by adapting the activity to their school and locality. The tool thus also needed to be open to local adaptation and include materials that could help teachers take the more challenging path of local collaboration and interdisciplinary project work in addition to carrying out the relatively simple core activity.

The SUPPORT partners developed a set of thematic articles and educational guidelines to provide support for teachers as they adapt the CO_2nnect materials and activities to their own classes and localities. Step-by-step advice is given about how the work can be carried out, emphasizing that teachers should try to create the educational activities themselves by collaborating with actors in the local community and by adapting the activities to their pupils and local conditions. A series of short articles tells about various aspects of ESD methods than can be used. But it is up to the school to decide.

Schools enter ”climate ideas” and project reports in the database. More than 600 schools with 2000 classes from 38 countries have registered to participate. The entire website is translated into 16 languages. So far, more than 40.000 pupils have reported their CO_2 emissions on the way to school. In addition, more than 250 climate ideas and 1300 photographs giving a clear indication that many schools have carried out a range of ESD activities as intended. 40 comprehensive project reports have also been submitted online, and a number of these also show that schools are able to carry out high quality projects in collaboration with local community, using the ICT tool “CO_2 on the way to school” as a springboard.

As a final step, the teachers involved are encouraged to reflect on their experiences and results at both the pupil and school level in an online evaluation. 430 schools have filled out the evaluation, giving an in-depth picture of school activities and results from the campaign. Reports on the educational and scientific results of the campaign will be written based on information from participating schools.

8 Summary

Sustainable development is development founded on an understanding of the complexity and mutual interconnection of systems of economy, ecology and human values - and in which such understanding drives change both on the personal level and in social systems.

Education for sustainable development (ESD) aims to develop pupils’ insight into systems of ecology, economy and human values and their mutual interdependence. ESD develops the capacity and the will to create needed change and a more sustainable development at both the personal and societal level. Some of the key challenges in the development of ESD are to create a vision and policy framework for ESD in the education system, establish effective learning arenas through collaboration, develop the ability to communicate across disciplinary and sector boundaries, and adapt the instruction to the pupils’ individual abilities and local sustainability issues and needs.

Appropriate strategies and school support are needed for successful integration of ESD in the school system. In countries with national curricula, the curriculum must provide space for ESD practice in schools. Schools also need to have access to appropriate tools to guide them in the thematic contents and methods of ESD. Such tools must not take from schools their responsibility to organise teaching and learning according to the pupils’ premises and local needs.

Collaboration among schools, communities and research institutions is a key to creating education for sustainable development. The cooperation should be framed by a shared understanding of the purpose of the partnership and good routines for communication and reporting. Collaboration can help ensure that educational activities are embedded in local work for sustainable development. Schools and pupils benefit from using new kinds of learning arenas to develop their competencies.

An interdisciplinary approach to sustainability issues can reinforce development of key concepts and principles in the academic disciplines.

Media can strongly stimulate ESD work in schools but need to be used In accordance with the educational premises and aims of the education system.

Further innovation is needed for effective integration of ESD in education systems globally. Ad hoc activities and "readymade" projects will not necessarily lead to long term school development processes for ESD or produce optimal learning outcomes for either the pupil or the school. The CO_2nnect campaign is an example of a global ESD activity combining an instrumental and an emancipatory approach. CO_2nnect gives schools a concrete framework for ESD by offering concrete activities and a framework for ICT-based collaboration. It also provides schools with guidance about how they can play their role in creating ESD which is adapted to both the pupils' abilities and interests and to sustainability issues in the local community.

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Using Automated Assessment Feedback to Enhance the Quality of Student Learning in Universities: A Case Study

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Abstract. There are many different ways of providing university students with feedback on their assessment performance, ranging from written checklists and handwritten commentaries to individual verbal feedback. Regardless of whether the feedback is summative or formative in nature, it is widely recognized that providing consistent, meaningful written feedback to students on assessment performance is not a simple task, particularly where a module is delivered by a team of staff. Typical student complaints about such feedback include: inconsistency of comment between lecturers; illegible handwriting; difficulty in relating feedback to assessment criteria; and vague remarks. For staff themselves, there is the problem that written comments, to be of any benefit to students, are immensely time-consuming. This paper illustrates, through a case study, the enormous benefits of Automated Assessment Feedback for staff and students. A clear strategy on how to develop an automated assessment feedback system, using the simplest of technologies, is provided.

Keywords: Automated Feedback, Assessments, Students, Universities.

1 Introduction

The term *feedback* - originally used to describe "information about the result of an experiment" [1] – is now commonly used in academia to refer to any type of information given to students on assessment performance. It is generally accepted that the more meaningful, detailed and timely the feedback, the better that students can learn from their assessment experiences [2].

However, providing assessment feedback is easier said that done. To begin with, there is the tendency to categorise feedback as either *summative* or *formative*: the former refers to feedback that attempts to summarise the quality of a student's performance in an assessment (e.g. in the form of a grade or a mark), while the latter refers to feedback that attempts to aid learning. Summative feedback usually occurs in

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end-of-term assessments while it is more common to see formative feedback take place throughout term time [3], [4]. Even at this early stage of understanding assessment feedback, academics can be accused of over-simplifying assessment types through categorisation: for instance, it is highly unusual to find summative assessment that cannot be used to inform student learning. Indeed, there exist ample case studies to illustrate the inter-relationship between summative and formative assessment feedback [5]. Another issue is the multitude of feedback mechanisms available to university staff. These range from detailed written feedback, checklists, peer review, student self-assessment, electronic feedback, group feedback, to individual verbal feedback (to name but a few). Which one to use (or combination) under what circumstances?

This paper is more concerned with the practical issues of providing feedback to students: how to get staff to be consistent in their comments; how to ensure that feedback comments relate to assessment requirements; and how to issue students with clear guidance on what they have done wrong (and how to improve their performance) and what they have done right (to repeat good practice in future assessments). And how to do all this in a way that saves staff time and energy, particularly when dealing with large class sizes. This paper describes the development of an automated feedback system implemented to accommodate assessment feedback involving an undergraduate module with more than 500 students. The solution developed by the author is described in detail, highlighting key issues, including benefits for staff and students.

2 Automated Student Feedback: A Case Study

Staff teaching on the undergraduate module "Management & Organisations" were concerned about the amount of time it took to provide written feedback to students on their coursework assessment (students were required to produce a report on a business case study). There were over 500 students registered annually for this core degree module. Also of concern was the consistency and quality of feedback given to students: some staff wrote detailed comments, others offered brief responses; some staff gave advice on how to improve on future assessments, while other staff adhered to summative feedback; and so on. It was not only that different staff could approach the feedback in inconsistent ways, it was also recognized that there was the danger that the same member of staff could unwittingly be inconsistent in dealing with different students (e.g. in trying to think up different ways of saying the same thing, again and again, they could accidentally use a wrong or misleading phrase). It was decided to implement an automated feedback system. This seemed to offer a solution: if it worked, it should be easy to use and give students consistent and meaningful feedback and, hopefully, save staff time thinking up pertinent comments again and again [6], [7].

To begin with, which software package to use? The teaching team decided against purchasing an off-the-shelf software package, given the costs and inevitable mismatch between what the teaching team wanted and what the software could do, leading to the assessment feedback having to fit in with the software capabilities. The solution? Create a document in Word to store the marking template. Then, within Word, develop commands - called Macros - to allow the marker to retrieve, from a bank of previously stored feedback comments, feedback appropriate to a student's assessment performance. Lastly, when marking time was approaching, issue the feedback template to staff and give them the instructions on how to call up and insert the feedback comments onto their online marking sheet.

The first stage was to create the assessment feedback template. This merely replicated the current marking sheet (Figure 1). A (large) space was left at the bottom of the sheet for feedback comments, below the total mark.

Management & Organisations **Coursework Mark Sheet (2008-2009)**

Date: /03/09 **Student:**

Area/Criteria	Mark Allocated	Mark Awarded
A. Introduction	15%	
B. Introduction to chosen organisation	10%	
C. Main Body	40%	
D. Conclusion	15%	
E. Structure, Presentation & Writing Style	10%	
F. References	10%	
Total	100 %	

Fig. 1. Assessment Feedback Template

The next stage in the development of the automated system was to work out the assessment feedback comments (and work out how to call them up in the template). To ensure that the feedback comments were relevant to the assessment, the comments would link specifically to each of the assessment criteria below:

A. Introduction
B. Introduction to chosen organization
C. Main Body
D. Conclusion
E. Structure, Presentation & Writing Style
F. References

The problem then became one of what to write in terms of the specific comments. To spread the workload, and gain staff consensus, each member of the teaching team was asked develop the feedback for one of A-F above. This was not a straightforward process and proved problematic:

- The comments were inconsistent between staff.
- The same old problems arose. Some staff wrote detailed comments, stretching to over several paragraphs for each "comment"; some wrote down

one-word remarks (e.g. "poor", "satisfactory", etc.); the number of comments differed between staff; some staff included formative advice, others did not; and so on.

- Getting staff to complete the comments in time to allow the next stage to progress was a tricky process!

A key lesson learned from the above is that staff priorities are not the same as those of the developer. The developer has a plan and can (mistakenly) assume that everyone else, however theoretically supportive, will adhere to that plan. Colleagues have other demands to occupy their time: teaching, research, administration, consultancy, staff development activities, etc. The aforementioned can then impact on quality of input from fellow colleagues. Some of the comments were used as a basis for the feedback system, but the following approach was then adopted. Each of A-F would have 5 sets of comments. The first comment would reflect an Excellent pass (in that element); the last comment a fail; the middle comment a satisfactory pass; the second comment a Very Good pass; and the second last comment a Bare pass. However, on the whole the comments needed to contain a mix of summative and formative feedback. Below is an example of the set of feedback comments related to students' attempts at writing the Introduction to their report:

A. INTRODUCTION

Ctrl A1:	Excellent, you have written a clear introduction to your report, explicitly identifying the purpose of the report, the importance of goals and mission planning to organisations, ending with an informative outline of the scope and structure of the rest of the report.
Ctrl A2:	You have written a very good introduction, but you need to add more detail to improve the quality of your introduction.
Ctrl A3:	A satisfactory introduction to your report. However, you need to provide more information on the following aspects and better link them together: purpose of the report, importance of goals and mission planning to organisations, scope and structure of report.
Ctrl A4:	The introduction to your report only barely fulfils the requirements and more detail is required to enhance the introduction. Only partial information given on: purpose of the report, importance of goals and mission planning to organisations, scope and structure of report.
Ctrl A5:	Your report introduction seriously lacks detail and does not cover the remit. You should have provided substantially more information on purpose of the report, importance of goals and mission planning to organisations, scope and structure of report.

A similar approach was adopted for the other sections of the assessment feedback. Staff were then sent the complete set feedback comments (for each of the assessment sections A-F) and consensus was reached on what to include/replace, etc. After that process was completed, the actual Word Macros were created and embedded in the marking template document. The simplest way to call up the feedback comments was to use a combination of key depressions, e.g. Ctrl A1-A5 to retrieve feedback comment on comments related to the *Introduction*, Ctrl B1-B5 for comments on *Chosen Organisation*, Ctrl C1-C5 for comments on *Main Body* of report, etc. A set of miscellaneous summative comments were also added:

General Comments:

Ctrl G1:	A commendable effort, well done!
Ctrl G2:	Overall, a very decent effort. Good basis for future work.
Ctrl G3:	Not a bad attempt – need to learn to expand on topics though!
Ctrl G4:	A very basic submission, lacking in meaningful detail.
Ctrl G5:	Too descriptive in nature.
Ctrl G6:	Avoid use of first person singular (“**I** think…”)
Ctrl G7:	Conclusion is far too brief.
Ctrl G8:	You need to get to grips with referencing.
Ctrl G9:	You have written an essay, not a report!

How did the Automated Assessment Feedback system work in practice? The module team (9 staff) were sent structured questionnaires and follow-up discussions were held with some of the module team. What now follows is a summary of staff responses to use of the Automated Assessment Feedback system in the M&O undergraduate module.

Response 1. Prior to the use of the Automated Assessment Feedback system, all staff hand-wrote (or typed) their own comments on the student feedback form.

Response 2. All staff made use of the Automated Assessment Feedback system (it was an option and they could have continued with their previous non-automated approach if they wished).

Response 3. All staff agreed that, compared to the previous system of completing the coursework mark sheet, the automated system offered consistency of comment. All staff (bar one) agreed that, compared to the previous system of completing the coursework mark sheet, the automated system was less time-consuming. All staff (bar one) agreed that, compared to the previous system of completing the coursework mark sheet, the automated system was easier to complete. A typical view was expressed in the following response: “All the comments that one needed were there. Also retrieving the macros was really easy to do. If we wanted to include a comment of our own that option was there as well”.

Response 4. All staff (bar one) agreed that the automated system improved the feedback to students. As one member of staff put it: “the real benefit to students was the quality of consistent, detailed and clear feedback”. Another member of staff raised the benefit to staff as well as students: “…makes it more feasible to be able to return marks and comments to students in a tighter time-scale”. Another commented that “it improved through feedback being consistent [but] feedback comments could be refined”.

Response 5. In terms of suggested improvements, these were minor (bar one member of staff) and essentially “not huge changes, just developments”, such as more general comments on “key skills” (description v critical evaluation) or referencing (e.g. “Inconsistent referencing” and “too many quotations”).

Response 6. All staff (bar one) said that they would use the automated system. Only one member of staff (the same member of staff throughout) was uncomplimentary about the new system, suggesting that she spent too much time inserting her own comments. However, as one member of staff observed when asked for suggested improvements: "None, although I would comment that given such a large cohort [of students] it is inevitable that the prescribed comments are not always usable 'as is' and require personalized adjustment in a small number of cases. However, I do not believe that any set of fixed comments can cover every eventuality".

The overall consensus of opinion from the module teaching team on the usefulness of the Automated Assessment Feedback system is captured in one respondent's view that "it is a great improvement on what went before both for staff and students" in terms of "saving [staff] time and imparting graded comments on student performance".

An unexpected benefit (for the developer) was gaining a deeper insight on how to develop feedback comments (not as easy as it seemed from the outset) and the importance of careful, accurate phraseology that clearly linked feedback to assessment criteria. For instance, although a list of comments in one section may appear dull and similar (because of the qualitative graded approach), one had to bear in mind that it is only one comment that was being selected in each section, as the following Figure 2 illustrates:

Total	**100 %**	56

Comments:

Excellent, you have written a clear introduction to your report, explicitly identifying the purpose of the report, the importance of goals and mission planning to organizations, ending with an informative outline of the scope and structure of the rest of the report.

You have given a satisfactory description of the organization but not included full details on all of the following: background information, mission, goals and environmental factors.

Though meeting minimum requirements, your main body has a number of deficiencies. Theoretical discussion only touches upon key areas. The application to your chosen organization is nominally addressed, as is the impact of planning on your organization. You should provide more sources and take greater care when referencing.

A very good conclusion, covering main findings and key issues.

A satisfactory presentation that could be enhanced by more careful attention to structure, style of writing and report layout.

Very good standard of referencing throughout. Harvard style used with only occasional lapses. More variety of sources required to support discussions in report.

Fig. 2. Example of Assessment Feedback

3 Conclusions and Recommendations

Providing written feedback on student assessments is an area fraught with difficulties [8], [9], [10], [11], [12]: poor hand-writing; superficial comments; ambiguous remarks; too much concentration on negative aspects; difficulty of thinking up appropriate phrases; inconsistency of feedback between staff; time required to complete feedback sheets; use of grammar; and so on. In an effort to reduce many of these problems the author created an Automated Assessment Feedback system using Word macros for an undergraduate second year module: Management & Organisations. This module has over 500 students registered each year.

The stages of development of the automated system seemed straightforward in theory: decide on the software to use (off-the-shelf or bespoke?); design the overall structure of the automated feedback system using the same staff coursework marking sheet as before; work out the detailed comments to be available for staff use; develop and test the macros; use in practice; then evaluate worth of system. However, in practice there were some organizational and communication issues: deciding on which members of the teaching team would contribute to which area of the development process; and obtaining timely, meaningful and consistent information from the module team. Working out the actual comments was not too difficult, once the decision was made to grade the comments (and after much research on qualitative feedback was implemented!).

Was it worth it all in the end? Yes. The system, on the whole, did make life easier: it was quick and simple to use, giving consistent, and relevant, feedback to students on their coursework assessment. The undergraduate external assessor (an academic from another university) highlighted the Automated Assessment Feedback system as an example of good practice. It is not perfect – that is why there is still the opportunity to insert individual comments. The changes suggested by staff are easy to incorporate (some additional general comments). Nonetheless, a drawback of this study is that students were not asked about the quality of the feedback. This will be remedied in the future, through an email questionnaire to students.

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Lessons Learned from Deploying a Video-Based Web 2.0 Platform in an Executive Education Context

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Abstract. Although IT has been very successful in enabling distributed, collaborative learning and knowledge creation in open-source communities, its promise in other contexts is still an open question. In this paper, we describe the deployment of a video-based Web2.0 platform in an executive education context. The platform, which we developed, makes extensive use of video, profiling, game dynamics, agents and network visualizations in order to capture the attention and involvement of the learning community members. Our goal was to provide executive education participants with an attractive, interactive platform for extending their learning and networking beyond the classroom. This experience has allowed us to identify three main barriers to Web2.0 inter-organizational learning and collaboration in executive education: technological barriers, motivational barriers and the inter-organizational aspect itself.

Keywords: collaboration, executive education, inter-organizational, knowledge management, learning, video, Web2.0.

1 Introduction

While the concept of inter-organizational learning and collaboration is not new, what is new is the increasing predominance of virtual versus real interaction. More and more information technology is being used to facilitate learning in networks whose members are globally dispersed. However, this poses significant challenges in terms of issues such as “direct touch,” building trust, capturing member’s attention, and sustaining learning [1]. While IT has been very successful in enabling new forms of distributed, collaborative learning and knowledge creation in the software development realm (e.g. open-source communities), its promise in contexts other than software development is still an open question [2][3][4].

In order to address this issue, we developed a video-based online environment which supports knowledge exchange, learning and collaboration and which can be adapted to various domains such as competence development [5], innovation [6], and management training [7]. It has the key features of a typical Web2.0 system according to the McAfee’s SLATES paradigm [8][6], making extensive use of video, profiling, game dynamics, agents and network visualizations in order to capture the attention and involvement of the learning community members by generating three different types of user value: connection value, actionable learning value, as well as entertainment and

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instant gratification value [7]. It includes a Video Exchange Channel where members can very easily view, search, comment, rate and submit videos; a Network Visualization and Navigation Tool which helps members visualize and browse through the links between people, between people and videos, and between videos; a Profiles Space which encourages members to access information about other members, their interests, competences and networks; and a Game which proactively encourages users to access videos and connects users to each other. An important key concept underlying its design is that it also generates the necessary data (log files) to allow researchers to assess platform usage and to evaluate system benefits along the three user value dimensions.

In this paper, we describe a pilot study in which we deployed this Web2.0 platform in an executive education context. Our deployment goal was to provide executive education participants with an attractive, interactive platform for extending their learning and networking beyond the classroom experience, and in particular to:

1. Increase the proficiency level of their management competence and experience during and after the executive development programme.
2. Nurture and strengthen the cross-cultural cross-functional professional network developed while on campus.
3. Make it fun and simple for them to share their experiences of implementing ideas from courses in their company, keep up-to-date with new developments in relevant managerial topics, and keep in touch with each other.

2 Learning Community Deployment Context

The user group was the participants of the General Management Programme (GMP) at CEDEP– the European Centre for Executive Development. The objective of the GMP is to groom tomorrow's top leaders. Participants are executives with 8 to 10 years of management experience and with international and general management responsibilities. Learning focuses on understanding the strategic issues at stake, their business implications and how to optimise policy choices to capitalise business opportunities and meet the needs of various conflicting stakeholders. After the GMP experience executives should be better able to adapt company strategy, processes and organisational structure to an ambiguous and evolving environment.

The GMP is a six week on-site course given over the period of one year in three two-week modules P1, P2 and P3. We deployed our Web2.0 platform during P2. This is because during the six months between P2 and P3 participants are expected to devote some time to group projects while back in the office.

The 56 GMP participants had prior experience in a wide variety of business domains including change, communication, control, finance, general management, human resources, information technology, legal, logistics, marketing, production/operations, purchasing, quality, R&D, and sales. They were mainly men (80%). They ranged in age from 33 to 55 with an average age of 42. Twenty-two different nationalities were represented albeit with a large French and Belgian contingent (34%). Participants worked for 21 different companies and were located all over the world.

3 Deployment Design

We worked closely with the GMP Director to adapt our Web2.0 platform to the needs of the GMP participants. We called this adaptation GMPTube. Its main learning objective was to stimulate participants to continue cross-company collaborative learning while back in the office between modules P2 and P3. For example, by sharing experiences about putting the theory learned at CEDEP into practice, by providing input to one of the group project themes, or by participating in the EagleRacing collaboration simulation [9].

The three channels of GMPTube are: Subjects & Themes (about GMP Courses and Group Project Themes), Experiences (from participants about their experiences putting theory into practice in their companies) and Us (about people). We had professors make short videos about their courses for the Subjects & Themes Channel. In addition, we made a short place-holder video about each project theme for the Subjects & Themes Channel. INSEAD researchers and the GMP Director made videos about themselves and their role in the project for the Us Channel.

Fig. 1. GMPTube Channel Space

As the social aspect of GMPTube is crucial, we populated GMPTube with photos and profile information about all of the GMP community members: INSEAD researchers, CEDEP staff and GMP participants. CEDEP provided a file with the information about GMP participants which we were able to upload directly into GMPTube. Thus all participants were pre-registered in GMPTube and could log in and begin using it immediately. In addition, we also made initial "knows" relationships between members (i.e. all the INSEAD and CEDEP staff know each other, the participants all know the GMP Director, the GMP Coordinator, and the other members of their section (E1 or E2)). We also identified the business competences covered by GMP courses to modify the competences area of the profile.

We introduced GMPTube to the participants during a 2 hour workshop as a new way of experiencing collaboration online, adding value to group projects, exchanging experiences and trying out Web 2.0 trends, and gave examples of how similar platforms are being used to stimulate innovation in organizations as well as within virtual teams and communities. We spoke about the collaboration between CEDEP and INSEAD which is focused on learning innovations in inter-organizational contexts and elaborated on the value that GMPTube could add to the General Management Programme. We then demonstrated GMPTube. The last 45 minutes of the workshop was allocated for group work and included hands-on experience with GMPTube.

For the group work, participants were split into 10 groups based on their choice of Project Theme. Each group was asked to make a video explaining why their group is interested in the theme, which type of relevant input they would like to get from others, and why others should be motivated to do this. They were asked to spend the first 30 minutes preparing to make their video, and then go to the meeting rooms to produce their video during the last 15 minutes.

After the group work, participants returned to the amphitheatre to watch each other's videos. At the end of the session participants were given the following tasks to accomplish during the 6 month break between modules 2 and 3:

- Log into GMPTube briefly at least once every two weeks.
- Participate in the EagleRacing simulation by submitting a decision video in the next month.
- Submit at least 2 Experience Videos during the first 2 months, one related to your group's Theme, and one related to another group's Theme.

4 Discussion of Evaluation Results

The GMPTube evaluation plan is summarized in Table 1. Results from the GMPTube pre-workshop survey showed that the participants were very open to sharing experiences and giving feedback. However, they were not all avid users of IT. Many did not use social networking websites or even visit websites for pure relaxation purposes. Furthermore, many did not feel at ease in front of a camera and a show of hands in the GMPTube workshop indicated that none of the participants owned a webcam.

During the GMPTube demonstration, some participants pointed out that their company's firewalls would probably not allow them to access GMPTube from work. Some participants also noticed that there was a guest login. They did not like this and did not want unknown people or professors accessing GMPTube. They only felt comfortable sharing with other participants. In response to this, we immediately removed the guest login. One observer noted "I question whether the GMP is the right demographic? It seems like these guys may be a generation too old…They saw all of the hurdles right away and less of the opportunities".

The GMP Director collected feedback from the participants during an evaluation session at the end of Module 2. Overall, they found the presentation and concept interesting, but felt that holding the session in the evening was bad as people were tired. Only one video was filmed and submitted to GMPTube while the participants

Table 1. GMPTube Evaluation Plan

Evaluation Target	Source	Type of data	Timing
Context	CEDEP – interviews, documentation	Qualitative description of the CEDEP learning environment.	Before launch
Participants characteristics	CEDEP – Excel file	Quantitative and qualitative (age, nationality, job title, company, etc.)	Before launch
Participant information sharing and technology habits	Survey	Quantitative – 10 questions.	Before launch
Participant first impressions of GMPTube	Participant Module 2 evaluation (GMP Director)	Qualitative – participant comments about first GMPTube workshop	Just after launch.
Pilot management	Pilot implementers	Record of observations during pilot	From launch until pilot end.
Participant's use of GMPTube	Log files	Quantitative usage data	From launch until pilot end.
Quality/relevance of participant's contributions.	Videos, Comments and Discussion threads	Subjective assessment of videos and textual data by pilot implementers	From launch until pilot end.
Reasons underlying participant's GMPTube usage	Email, Interviews	Qualitative	From launch until pilot end.
Participant final impressions of GMPTube	ThinkTank (Workshop) & Participant Module 3 evaluation (GMP Director)	Qualitative – participant comments about GMPTube experience	Pilot end.

were still on campus - an amusing video of participant's singing in the bar filmed with someone's phone entitled "musical collaboration". In addition, one funny (to Westerners) musical cartoon video was uploaded - "Experience Saudi Arabia".

The professor sent an activation email one week after the workshop, when they had returned home, reminding participants about GMPTube and inviting them to participate in the EagleRacing simulation. Although one participant immediately logged into GMPTube and had a short online chat there with the professor, no participants were interested in playing the EagleRacing simulation online once back at the office. Not one participant submitted an Experience video between P2 and P3.

Analysis of the GMPTube log files showed that once participants left CEDEP and went back in their companies, very few participants watched and rated videos, and no participants shared experiences (e.g. submitted videos, documents and links) or engaged in social exchanges such as commenting and discussions.

Two months after the workshop, about midway between P2 and P3, we sent them an email to collect their feedback. In particular, we asked them (1) if they had encountered any barriers preventing them to access GMPTube, (2) the main reasons why they are not bigger users, and (3) the main reason why they had never submitted a video. In answer to these questions they mentioned a number of technical and non-technical barriers. Technical barriers included the company firewall, Acrobat Flash Player not allowed on company desktops, incompatible software and lack of a webcam. Non-Technical barriers included no time, no good reason to use yet as there was a lack of a defined group project, the group project was just starting, and no new input from classmates, lack of experience with technology, lack of interest in networking tools, and a dislike of being filmed.

Once they were back on campus for P3, the executive education participants were not interested in pursuing the GMPTube experience. Improving their learning experience was not a compelling enough business objective; instead they requested that the professor speak about emerging technologies and their impact on business. Therefore, we did not hold a final ThinkTank session to collect their opinions as planned.

5 Conclusions

This experience has allowed us to identify three main barriers to Web2.0 inter-organizational learning and collaboration in executive education: technological barriers, motivational barriers and the inter-organizational aspect itself. First of all, many executives were unable to access the platform from their companies. This is a major barrier. Organizations can't expect to profit from Web2.0 tools if they forbid access to them, and we cannot expect managers to spend time doing something which is not rewarded. The fact that our platform is video-driven posed a problem both with company firewalls, and with the need for managers to use webcams to share experiences as most participants did not have one.

Motivation is key. If they were motivated, participants could have bought a webcam and accessed the platform from home. However, there are many more pressing demands on the participants' time once they have left the campus and are back in their companies and families, and our platform was not "fun and simple" enough. There are easier alternative ways to collaborate and keep in contact with classmates such as email and LinkedIn that are not video-driven. In addition, the participants' very short experience of the platform in class was as a place to exchange knowledge about group projects; however, as these were disbanded, participants' saw no good reason to use it for that purpose either.

Finally, the inter-organizational aspect is a barrier because of confidentiality issues. It is one thing to share an experience in class, and quite another thing to have some lasting proof that you said something about your company that you should not have. How much can you safely say about your experience implementing ideas from executive training in your company to people in other organizations? Even people used to face-to-face inter-organizational exchanges hesitate to extend this to an online environment.

Interestingly, although the short exposure to GMPTube did not trigger the desired learning-orientated motivation, executives from three large companies in the biopharma, media and industrial sectors have expressed interest in applying it internally in their companies as a way to connect marketing people, creative people and IT professionals respectively, rather than using it to exchange knowledge with classmates.

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Improving the Scholarship of Teaching and Learning through Classroom Research

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Abstract. The scholarship of teaching emerged in the last decades as a fundamental concept to the development of good teaching practices in Higher Education and, consequently, to the enhancement of the quality of student learning. Considering that scholarship comprehends a process as well as an outcome, research on teaching and learning should be viewed as one important aspect of the scholarship of teaching. The goal of this essay is to illustrate how the scholarship of teaching and learning can be enhanced through the development of classroom research rooted on students' questioning, conceived and implemented by both university teachers and educational researchers. Valuing and stimulating students' questions offers an innovative dimension to science education as it puts students at a central role in the learning process. This way, encouraging students' questioning also strengthens teaching-research links by bringing teachers and learners together in a community of inquiry.

Keywords: scholarship of teaching and learning; scholarly teaching; linking teaching and research; inquiry-based learning; questioning; higher education; science education.

1 Introduction

The quality of teaching and learning in universities has received much attention over the past two decades and there has been much debate about what kind of teaching stimulates effective learning. Lately, however, the focus has moved from just teaching to teaching as scholarship [1], [2].

As reported by Trigwell et al. [3], the scholarship of teaching privileges the work of knowledge creation with students and assumes a learning partnership, instead of an instructional relationship.

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Thus, the project of defining and promoting scholarship of teaching should take place concurrently with the movement towards the creation of more learner-oriented universities. This way, the development of the scholarship of teaching in Higher Education is essential to deal with diversity in students and challenges that institutions are facing when taking the Bologna process seriously.

However, most teachers face several difficulties when trying to improve their teaching practices. Universities are advised to provide training services on a voluntary basis to teachers who are interested in improving their learning skills [4]. On the other hand, Paulsen [5] emphasizes that conducting classroom research is the most relevant way to engage in the scholarship of teaching and learning.

Bearing this in mind, this paper focuses on the promotion of the professional development of university teachers through their involvement in action research projects, as well as on the development of the student questioning competence.

2 The Scholarship of Teaching and Learning

In is landmark study, *Scholarship reconsidered: Priorities of the Professoriate*, Boyer [1] released a potentially powerful concept into the academic community: *the scholarship of teaching*. Boyer's concern was to put teaching and research at the same level, since universities tend to value research and disregard the importance of teaching. This way of seeing academic work appeared to offer the prospect of proportional and appropriate status for teaching alongside research, and, through greater respect for teaching, increased potential for enhancing the quality of student learning, emphasising the importance of student-centred learning and, ultimately, putting scholars in the role of co-learners.

Boyer's initial proposal for a scholarship of teaching left open what exactly a scholarship of teaching should be. Consequently, scholars around the world have interpreted the concept in various ways and proposed a large number of definitions of scholarship of teaching and learning. We concur with Rice [7] that proposed that the scholarship of teaching is based on the development and application of its several distinct elements: '*content knowledge'*, '*pedagogical knowledge*', and '*pedagogic content knowledge'* (p.125).

Pedagogic content knowledge can be considered as the knowledge that establishes the connection between content and pedagogical knowledge. It portraits an unique combination of the two. Pedagogic content knowledge enables teachers to take risks, to adapt approaches that appear not to be working, and to adopt different approaches when class dynamics are different.

Sharing and disseminating teachers' experiences and practices is also essential for the improvement of the scholarship of teaching and learning. Shulman [7] describes teaching as community property and sees communication as a key element.

According to Boyer [1] and Trigwell and Shale [8], a concept of scholarship of teaching will be powerful only if, at his heart, it reflects what it is that is valued in teaching and what it is that is worth defending – a student-focused teaching practice. Increasing emphasis upon a learner-centred vision of university teaching demands student scholarly autonomy being the outcome of well-planned active learning experiences that help all students to develop as independent thinkers, and promote lifelong learning [1].

2.1 Strengthen the Scholarship of Teaching and Learning through Classroom Research

Prosser [2] states that the main point of engaging in the scholarship of teaching and learning in higher education is to work towards improving students' learning, enhancing scholars' pedagogical content knowledge. Scholarly contributions to pedagogical content knowledge can arise from the practice of, reflection on, and codification of teaching [9]; faculty evaluation and development [10]; and through conducting research on teaching and learning, including both traditional research and contextual classroom research.

Here, we are interested in the latter form of contribution to the creation of pedagogical content knowledge - conducting research on teaching and learning. Paulsen [5] mentions that conducting classroom research is the most relevant way to integrate content and pedagogical knowledge to create pedagogical content knowledge. Kreber [11] also emphasises the significance of classroom research as a way to engage in the scholarship of teaching. But this author refers specifically to the introduction of collaborative action research programs in which professors and faculty developers explore teaching and learning in specific disciplines.

Schön [12], also underlines that the new categories of scholarly must take the form of action research: '*If teaching is to be seen as a form of scholarship, then the practice of teaching must be seen as giving rise to new knowledge*' (p.31). According to Gray [13, p.373], action research symbolizes much of what modern research is about '*analysing the world but also trying to change it'*. It is equally concerned with changing individuals, in the one hand, and, on the other, change '*the culture of the groups, institutions and societies to which they belong*' [14, p.16]. Somekh [15] emphasizes that action research breaks down the binary between research and practice: '*designed to bridge the gap between research and practice'* (p.340).

3 Classroom Research about Student Questioning

Two research projects aiming to promote student-centred teaching approaches (through the development of students' questioning competence), and ultimately to enhance the scholarship of teaching and learning, are being developed in science and engineering courses at the University of Aveiro, in Portugal. One of the projects is being developed in a 1st year chemistry course and the other in a master photogeology course. These action research projects are being developed in full collaboration between an educational researcher from the Education Department, a professor from the Chemistry Department, and a professor from the Geosciences Department.

The main purposes of these projects are twofold. It is possible to distinguish aims more clearly related with the students' learning process and other aims associated with the teaching process. Those more closely related to the teaching process are as follows: i) to identify the main obstacles to the pedagogical changes suggested by the Bologna process; ii) to make teachers aware of the potential of students' questions; iii) to develop (to conceive, to produce, to implement and to evaluate) teaching and learning strategies to promote active learning, based on student questioning; iv) to develop (to conceive, to produce, to implement and to evaluate) appropriate assessment strategies aligned with the teaching and learning strategies, promoting active learning and higher order cognitive skills (with emphasis on student questioning); v) to work with academics in documenting their case for disseminating their teaching practices; vi) to contribute to the development of knowledge susceptible to guide pedagogical practices aligned with the demands of the Bologna process.

Those aims associated with student learning are as follows: i) to examine the use of students’ questions in the learning and teaching of undergraduate chemistry; ii) to examine the use of master students’ questions in the learning and teaching of photogeology; iii) to categorise conceptual questions asked by students during the course of all classes; iv) to describe students in terms of their disposition to ask different kinds of questions; v) to investigate the kind of questions raised by 1st year chemistry students and photogeology master students; vi) to identify and characterise chemistry students’ approaches to learning; vii) to identify and characterise photogeology students’ approaches to learning; viii) to study the differences found between 1st year chemistry students and photogeology master students approaches to learning, and ix) to relate students’ questioning styles to their approaches to learning.

3.1 Why Promoting Students’ Questions?

The act of questioning encourages learners to engage in critical reasoning. Given that asking questions is fundamental to science and scientific inquiry, Zoller et al. [16] argue that the development of students’ abilities to ask questions, reason, problem-solving, and think critically should become a central focus of science education reform.

Students’ questions result from a gap or discrepancy in the students' knowledge or a desire to extend their knowledge in some direction. Students’ questions may be triggered by unknown words or inconsistencies between the students' knowledge and the new information, which then engender *‘cognitive disequilibrium’* [17, p.525].

Student-generated questions are an important element in the teaching and learning process, and play a significant role in motivating meaningful learning. Students’ questions activate their prior knowledge, focus their learning efforts, and help them elaborate new knowledge. Questions raised by students are also helpful to teachers, since they have the potential to: (i) help the teacher diagnose students’ understanding; (ii) evaluate higher-order thinking; (iii) stimulate problem-based learning and project work, and (iv) incite critical reflection on classroom practice.

In spite of the clear potential of students’ questions both for learners and teachers, according to Graesser and Person [18, p.105] it is well documented that ‘*student questions in the classroom are very infrequent and unsophisticated*’, and it is also known that students tend to ask fewer questions in higher-grade level classes.

3.2 Strategies to Enhance Students’ Questioning

With innovation for improvement in mind, the teaching of chemistry and photogeology is being subjected to innovation to implement student-centred approaches. The classroom research projects started at the 1st semester of academic year 2009/2010 and will continue along this year. The development of the courses involves shifts in practice, protocol and emphasis suggested to, and sometimes by, students.

The students are invited to raise both oral and written questions on and around the subject matter. Oral questions are prompted across all classes, immediately responded and valued by both teachers. However, written questions are also encouraged, especially if students did not feel confident or comfortable enough to raise oral questions. Written questions can be submitted through an online forum on both courses. Students were also asked to write their questions on a sheet of paper during photogeology classes, and deliver them to the teacher at the end of the class. All the students involved understood the nature and aims of the research project, and the approaches being adopted to collect questions, and provide answers to these.

Several teaching and learning strategies are also being designed by the teachers with the support of the educational researcher and implemented by the chemistry and the photogeology teachers. These strategies have different focuses and characteristics in order to create distinct stimulus to promote students' questioning. These strategies include, among others:

(i) *chemistry practical laboratory sessions* where the students have opportunities to a) identify the main objectives of the work; b) identify and overcome any conceptual and practical difficulties encountered; c) plan and execute the work involved; d) record and discuss the results and observations in their lab book, e) suggest practical alterations and improvements, and f) raise written or oral questions.

(ii) *chemistry mini-projects* where the students are given the opportunity to develop a small project on a chemistry topic suggested by the teacher. In the meetings with the teacher, students should have the initiative to question their topic and the teacher will only provide appropriate feedback, orientation and guidance for students to identify and answer their questions. Later, each 'project team' presents the projects to the other students and to teachers. Each presentation is subjected to questions from both peers and teachers.

(iii) *chemistry lectures with small pauses* to encourage students' oral questions. The teacher stops lecturing for about 2-3 minutes, and invite the students to think about or to discuss the class topics with their colleagues. At the end of the pause, students have the opportunity to raise questions to the teacher.

(iv) *photogeology field trip* where the students are given the opportunity to find answers in the field to questions that they have raised previously. These questions are asked departing from the analysis of maps and photos of the areas that they are going to visit during the field trip. These questions should be published on an online platform. Likewise, after the trip, the students should post the responses to their questions on the online platform. The questions and answers of each student are visible to the whole class.

All the chemistry and photogeology classes are audio-recorded. An educational researcher, who is present at all classes, completes observation grids for every class. At the end of the 1st semester 10 students from each course were selected for being interviewed. The educational researcher also interviewed both teachers.

What comes out from these classroom research projects is that it is possible to create a questioning environment where asking questions and receiving answers becomes an integral part of everyday transactions between teachers and learners. In general, students will ask questions when their questions are seen to be valued. Ultimately it is the teacher who holds the key to providing an atmosphere that encourages or discourages students' questions. To nurture the spirit of inquiry in students and cultivate questioning as a habit of mind, a central role for any teacher, therefore, is to foster a classroom environment where it is intellectually, socially and academically rewarding for students to pose thoughtful questions.

4 Enhancing the Scholarship of Teaching: A Summary

The kind of research described above does not correspond to the traditional university research. As stated by Schön [12], the scholarship of teaching requires an alternative epistemology to that generally acceptable in research universities. Thus, teaching must be seen not only as a setting for the transmission and application of knowledge, but also for its generation, leading to the implementation of classroom research projects.

Fraser [19, p. 169] states that '*action research can be the most appropriate, most effective and least threatening strategy when evaluating curriculum innovations*'. Moreover, Moller [20] advocates that genuine action research breaks down the binary between research and practice, and that useful action research is documented, published and scrutinised by peers.

Designing and implementing action research projects aiming to develop students' questioning competence and that involve faculty members with diversified backgrounds is a way of creating and enhancing dialogue and cooperation between university teachers and educational researchers [21], known currently to be weak [22]. This seems to be a potentially useful and meaningful way to strengthen teaching-research links, to promote a scholarly teaching, to enhance the scholarship of teaching and finally to improve students learning.

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Which Are the Determinants of Online Students' Efficiency in Higher Education?

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Abstract. International literature shows that the positive effect on students performance from the adoption of innovations in the technology of teaching and learning do not affect all teaching methods and learning styles equally, as it depends on university strategy and policy towards Information and Communication Technologies (ICT) adoption, students abilities, technology uses in the educational process by teachers and students, or the selection of a methodology that matches with digital uses. This paper provides empirical answers to these questions with data from online students at the Open University of Catalonia (UOC). An empirical model based on structural equations has been defined to explain complex relationships between variables. Our results show that motivation is the main variable affecting online students' performance. It appears as a latent variable influenced by students' perception of efficiency, a driver for indirect positive and significant effect on students' performance from students' ability in ICT uses.

Keywords: Efficiency in Higher Education, Students performance, E-learning, Structural Equations.

1 Introduction

The diffusion of ICT infrastructure in higher education has induced important changes, not just on the pedagogic sphere, but the incidence has also reached administrative and organizational areas. The desired result of this changing process is the improvement of students' achievement and performance.

This paper will try to provide answers to these questions with data from ongoing training and data from an experimental set-up performed within the eLene-EE project[1]. The analysis is based on data collected from on line students of the Open University of Catalonia (UOC).

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[1] *Creating models for the efficient use of elearning. Introducing Economics of elearning – eLene-EE*. European Comission (EAC/23/05 SE001). Directorate General for Education and Culture. Participants: University of Umeå, CANEGE (University of Nancy 2-Vidéoscop, University of Nancy, University of Paris-Sud), UOC, METID-Milano Polithecnic, Maria Curie Sklodowska University (Polish Virtual University). Main researcher: Mikael Sjöberg (University of Umeå). February 2006-July 2008.

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Hence, this paper is divided in five sections: after this introduction to the topic we want to analyzed, in section two we explore the international literature focused on the study of the relationship between ICT uses in higher education and students' performance; in section three research hypothesis are stated and the methodology used is explained; section four is devoted to the specification of the empirical model and the overview of the data collected from students; and, finally, in section five we outline the main results obtained and the more important conclusions of our analysis.

2 Theoretical Framework: ICT and Student Performance

During the last decade, there has been an emergence of economic papers analysing the impact of instructional ICT-based innovations on student performance. These works can be divided in two different groups, depending on the methodology used in the analysis of digital effects and on the conclusions about the efficiency of online courses.

On one hand, those studies that conclude that on line students perform worse than their face-to-face counterparts [2] [3]. Works in this group do compare on line with on-campus courses and share a common trait: they use to define on line courses as an homogeneous good, without a detailed specification of the methodology and technology used in teaching and learning processes; this constrain do not allow them to capture differences in performance for different complementarities of teaching method, ICT uses and students profile.

Within this group of empirical evidence about the worse performance of students enrolled in on line courses, we want to remark two papers. Firstly, empirical work of Brown and Liedholm [2], in which can be observed that students who are enrolled in an on line course have better characteristics than face-to-face students. It seems a contradiction, but the authors defend that these results reflect the benefits and the importance of the direct student-teacher interactions that occur in on-campus courses, concluding that the difference between performances of the two methods is significant.

And secondly, the work of Coates *et al.* [3], which results also show that students in on-campus courses use to score better than their on line counterparts, but this difference is here no significant. This difference is due to the relation between achievement and students' profile through the effects of self-selection on students' outcomes. The inaccurate selection leads to biased and inconsistent estimates in education production functions and may result in misleading inferences regarding "no significant difference" between on line and face-to-face instruction.

On the other hand, some works defending the idea that the discussion about whether to use or not use technology in higher education courses no longer concern because the real significant issue is in what manner technology is used at university, teachers and students' level [12]. In other words, the benefit for students performance from the adoption of innovations in the technology of teaching and learning do not affect all teaching and learning methodologies equally, because it is based on a necessary equilibrium between institutional policy towards ICT adoption, students abilities, technology uses in the educational process by teachers and students and the selection of a methodology that matches with digital uses.

In defence of this second group of works, it must be pointed out that the new forms of instruction in higher education are consistent with the potential of digital devices' uses. The new dominant forms of active learning in many fields of higher education are explained by the pass from a teacher-based to a student-based model [1], in which methodologies must be customised to students' needs and study style. The analysis of the effects of these methodological and technological innovations on students' attitude towards the learning process and on students' performance seems to be evolving towards a consensus that an appropriate use of digital technologies in higher education can have significant positive effects both on students' attitude and achievement [13]. In this sense, Hoskins and van Hooff [6], found that dialogue method, via an on line learning environment, has a positive and significant influence on student achievement. Complementary results about the main characteristics of e-learning environments were obtained by Navarro [10]. His results show that teachers consider that on line students perform as well or better in an on line environment. The explanation to this finding can be found in a increase of the professor-to-student contact, a higher degree of student participation in discussions, and in some individual traits of on line students: they are in average older students and often seem more motivated and self-directed.

This conclusion links with another important set of variables related to *students profile*. Within this area, it is remarkable the work of Dutton *et al.* [4].The results of their analysis indicates that the characteristics of students taking an online course differ from those related to students taking the same course in a lecture format in several important respects: as Navarro [10], they confirm that on line students are older, less likely to be enrolled in traditional undergraduate programs and more likely to be lifelong learning students, more likely to have job and/or childcare responsibilities and longer average commutes to campus. In addition, the authors show that on line students attendance to class conflict with work, reducing commuting time; therefore, flexibility in studying formats is more important to them in their choice of course format than do lecture students. Dutton *et al.* also examine differences in performance levels for the two class formats. Their results confirm the hypothesis that on line students made significantly higher exam grades than lecture students.

Further research made in this field has been able to prove that students' characteristics like ability or prior experience affect his/her performance. Benefits of technology may not be uniform across students' characteristics (ability, gender, or prior experience). Brown and Liedholm [2] use the concept of "cognitive styles" to explore the role of differences in student abilities, past learning in the subject, attitudes, and aptitudes make in the explanation of learning achievements. These authors argue that a student's having a cognitive style is analogous to the student's having a production function for learning, and indeed, the cognitive style determines the underlying shape of the learning curves or the student's production function for learning.

3 Hypothesis and Methodology

According to the theoretical framework, we are willing to verify the following hypothesis:

H1*: Motivation is the main variable in the explanation of on line students' achievement, as it is a critical trait in net-based higher education's efficiency.*

H2: *The ability in ICT uses improves on line students' performance.*

There exist in the economic literature four alternative methodologies to specify the relation between educational inputs and outputs: production functions, frontier production functions, structural equations and minimization of investment costs' approaches. Between them, production functions [4] and parametric [8] and non parametric [7] frontier analysis have been the most usual estimation methods to analyse students efficiency in higher education. Nevertheless, we have selected a structural equations model because this methodology allow us to go beyond the main constrains in defining a technical production relationship in education, multi-product and endogeneity problems, through an equations model useful to identify and estimate relations between explanatory variables and between these inputs and complex outputs. As far as we are concerned, despite of their potential benefits, structural equations has been rarely used in studies of economics of education [9].

4 Empirical Model and Data

The structural equations' model we have defined has been based on the identification and measure of some relevant explanatory variables under the different stated categories. With these variables and the grade obtained by students as the dependent variable, we have specified the original model. The variables and its measures are shown in table 1.

Table 1. Explanatory variables and measures in the original model

Explanatory variables	Measures	Characteristics
	Students profile	
Sex	1= Male 2 = Female	Binary
Age	Years old	Numerical
Schooling	Number of years studying before starting at UOC	Numerical
Work experience	Number of years holding a job	Numerical
	Students ability and attitude	
Experience at UOC	Number of semesters studying at UOC	Numerical
Grade average	Grade point average in previous education levels	Numerical
Ability	Own efficiency estimation	Numerical
Time spent studying relevant bibliography	Hours per week	Numerical
Time spent studying (not relevant bibliograpy)	Hours per week	Numerical
Motivation perception	Extent at which students have been motivated during the course	Numerical
	Teaching and learning methodology	
Feedback intensity	Valuation of personal feedback during the course	Numerical
ICT-based methodology	Number of hours using UOC's platform	Numerical
	Uses of ICT tools	
ICT uses	Perception of ICT uses' ability	Numerical
	Latent variable	
	Motivation	

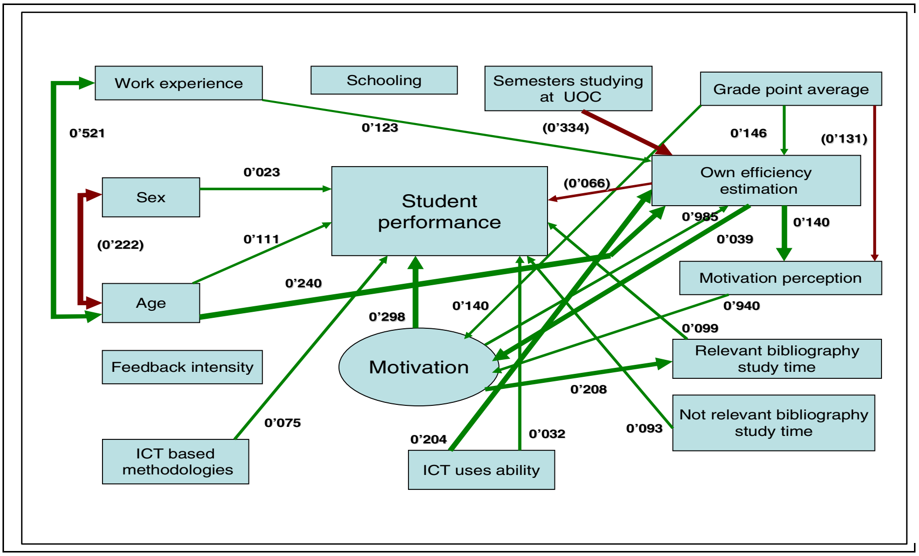

Fig. 1. Final model results[2]

Table 2. Sample's distribution among subjects

Subject	Number of students
Introduction to Financial Accounting	56
Introduction to Mathematics	37
Principles of Microeconomics	34
Total sample	127

From the original model, and after adjusting for non-influencing explanatory variables (schooling and feedback intensity), we have developed our final operational model in which all theoretical relationships are defined (see figure 1).

In order to achieve our objective, we have collected information from students enrolled in three on line introductory courses of the *Business Bachelor* at the Open University of Catalonia (UOC), an on line university founded by the Catalan Government in 1994. The courses selected are *Introduction to Financial Accounting*, *Introduction to Mathematics* and *Principles of Microeconomics*. The data has been obtained through a questionnaire sent in an electronic format[3] to a total number of 850 students enrolled in *Introduction to Financial Accounting*, 750 in *Introduction to Mathematics* and 675 in

[2] Green lines express a positive effect and red lines a negative one. Thick lines reflect a significant relationship, while thin lines show a negative incidence.

[3] The selection of this format does not imply self-selection bias, as all students in all UOC's courses are online students; therefore, digital devices are the only channel of students' communication.

Principles of Microeconomics. The total of respondents has been of 830, and final valid answers of 127, after adjusting for missing and wrong values (see table 2)

5 Results and Discussion

The estimation of the original model (with all explanatory variables considered) has revealed a first relevant result: unexpectedly, schooling, measured as the number of years spent in previous education levels, and feedback intensity, measured as the valuation of personal feedback from teacher in the course, have no influence in the structural equations' model. The reasons maybe the difference in teaching and learning methods between online courses at UOC and previous on-campus education for schooling variable, and the lack of appropriate measures to capture the effect of feedback as a critical e-learning empowered methodology. Therefore, we have to go further in this field in order to identify new variables and/or measures that allow us to compute these two important parameters in the analysis.

The analysis made through our final model (excluding schooling and feedback intensity as explanatory variables) has allow us to quantify the relationships between the different explanatory variables and between them and student's achievement, using Generalized Least Squares estimation. It has a Chi-square value of 57,770, with 47 degrees of freedom, showing a significant solution for the whole model[4].

The results obtained let us verify our hypothesis. The effect of motivation on students' performance has the largest standardized coefficient value (0,298), confirming the importance of this variable as a source of education's efficiency. Moreover, this coefficient is the only one with a significant effect on the dependent variable (p=0,006) at the 0,01 level (two tailed).

Motivation is a latent variable created from students' own efficiency estimation (with a positive and significant coefficient value of 0,039), what it means that those students that believe they are well prepared for online higher education are more motivated to follow a course. Own efficiency estimation, in turn, receives a positive and significant effect from age (0,240) and ICT uses' ability (0,204); this result shows that older and higher ICT-skilled students are more likely to be confident about their capabilities to succeed in online higher education studies. In addition, it must be remarked that own efficiency estimations has also a negative and significant effect from the number of semesters studying at UOC (0,334), maybe showing that experienced UOC students have got the evidence about the difficulties of reaching an equilibrium point between flexibility and time availability. And it also receives a positive influence from motivation (although without significance), possibly drawing a kind of virtuous loop between motivation and efficiency perception in the explanation of students' performance.

Finally, it is also interesting to remark that a higher level of motivation has a positive and significant effect on the study effort, and, concretely, on the study of relevant bibliography (0,208), what could have, in turn, some benefits in terms of achievement (in our model this relationship is not significant).

[4] The GFI measure is equal to 0,924, as values closer to 1 are preferable [11].

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On the Utility of ICT in the European Higher Education Area: The Bologna Process and Its Implications in the Innovation of the Teaching and Learning Process⋆

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Abstract. Europe is pursuing a real union and one of its milestones is education. The appearance of the European High Education Area (the *Bologna Process*) supposes a major change in the teaching process at universities from the knowledge-based to the skills learning-based. It is a common belief that ICT could be the driving force in this change of paradigm. However, ICT itself is not the exclusive solution to the education problem; although it is part if the solution since it is very innovative further considerations have to be taken into account. In this paper we discuss the adoption of ICT in the *Bologna Process* focused on the particular case of Spain. We provide the current state of the art, discuss some drawbacks and point out some possible solutions.

1 Introduction

Since the last decade, there was a great commitment among all states of the European Union to improve the competitiveness of university education which was formalized as the European High Education Area (EHEA, and more commonly known as the "*Bologna Process*"). The EHEA plan tries to overcome the plethora of different educational programs into a single University degree in the whole European Union. Each academic year is split into different subjects whose basic academic unit is the European Credit Transfer System (ECTS). The main difference between the former plans and this new plan is that we switch from an environment where teaching is based on knowledge acquisition to a learning-based environment. This new context makes students to obtain a set of competences or skills as well as the development of new teaching and learning techniques [1]. On the one hand, teachers are not the only ones acting as knowledge repositories and, on the other hand, students are not merely knowledge *recipients* but active actors whose role is to contribute with further information or discussion, among others, in all the activities involved in the learning process. Although several European countries have chosen 180 ECTS as the number of

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credits needed to obtain a degree, Spain has opted for 240 ECTS that is equivalent to four academic years. The reason for this are two fold: it satisfies the Bologna Process; and, it also merges with other University systems of great concern to Spain such as USA, South America and Asia [1].

The European Union students' and workers' mobility plans demand specific communication and skills tools such that the teaching activity can be carried out inside or outside the context of the classroom no matter whether they share the same physical space. Here it is where Information and Communication Technologies (ICT) do make sense as they have been used as an alternative and valid tool for learning activities during the last recent years [2]; these tools perfectly fit into the user educational needs as it provides an effective, flexible, accessible and attractive way of learning. In this paper, we discuss, based on results previously presented in the literature, the role and usage of ICT in the area of higher education applied in the context of the European Higher Education Area (EHEA). The rest of the paper is organized as follows: Section 2 reviews current goals of high education in Europe (i.e., the *Bologna Process*) with a special focus on Spain. Section 3 offers our point of view in the evolution of the teaching and learning process in the high education and the incorporation of ICT to them. Finally, conclusions end the paper.

2 State of the Art

The European Council, in accordance with the goals that society give to education and formation, sets up a development strategy at different levels either individually, socially and academically that led up to the well-known *Bologna Process* [3]. This strategy of three levels evolved into three strategic goals that aim to a worldwide leading educational system: enhance the quality and efficiency of the educational system; ease the global access of individuals to the educational system; and, make the educational system worldwide accessible. These goals were firstly suited for the higher education environment in the *Bologna Process*. This process defends a shift from the passive learning, where there is a knowledge transmitter (professor) and a receiver (student), to another model based on the skills acquisition; this represents a real challenge for the academic institutions but it also represents a chance for refactoring and internationalization. The evaluation of the faculty staff has to take into account this fact if a real European convergence is pursued. Actually, not only research activities have to be considered (which are of great importance in the development of the society) but it must be also considered the time, effort, dedication, availability devoted to the change and innovation implied by the *Bologna Process*.

In this work we will strength all our arguing with data derived from recent research works done in the Spanish and Portuguese Universities [3,4]. They are currently evolving and adapting the distance education techniques so that teaching activities are dynamized. The use of electronic portfolios based on ongoing research activities to organize the evaluation and motivation of students; this is intended to provide a direct impact in the personal and professional evolution of students. Getting in touch with and visiting technology centers, museums, theaters, national parks and other cultural institutions. Encouraging students to collaborate in seminars, workshops, conferences, expositions, research projects or socio-cultural events. These changes were pointed out in [3] as a consequence of the *Bologna Process* in the development of different courses. The biggest change was outlining the desired profile of graduate students and its proper adaptation to the real needs of the job market. Furthermore, the proposed ECTS were positively evaluated with regard to the length of the courses. Other innovative aspects are the participation of Universities in local, national and European projects or the development of work insertion projects for students. In the case of Spanish Universities, we will summarize some of the factors that most influence the students' performance [4] nowadays such as if they work or have scholarships, barriers for degree admission and grades obtained in the previous semester : current work position; motivation and dedication to study; the availability of scholarships; prerequisites for accessing to the University degree; previous academic degree; and, grades obtained obtained in the last semester. Although current use of ICT is less than expected mainly due to the fact that the innovation process presents challenges and transformations affecting everything [5,6], it is believed that ICT will be the milestone of the Spanish universities evolution.

There is a great variety of ICT applications and tools that let professors and students interact. Just to mention one ICT tool, we will refer to SAKAI as it has been used in the next academic institutions: Cerritos College, Marist College, University of Michigan, Kapio'lani Community College, Stanford University, Rhode Island School (RIDE) and The University of North Carolina at Chapel Hill. This tool has received positive feedback for all parties involved in the teaching process: professors; students; and, support staff. A flavor of SAKAI has been implemented in our University not less than half a year ago. As times goes by, we will expect to have some data about its use that will let us infer with a more in depth analysis. Other set of developed ICT tools in the context of multidisciplinary learning have been used at CAI Taiwan [7]; TI:GE at Georgia Institute of Technology; University of Emory [5]. With the advent of the cloud computing technology, the University of Stanford has proposed CourseCloud and CourseRank, the latter as an add-on the former, as course schedulers [8,9] that have been successfully used by students as a management tool for their studies with the aid of faculty and technical support staff. The amount and variety of these ICT tools are concurrently rising along with their usage at universities worldwide. Tasks, files and support exchange platforms, apart from easing the relationship between professor and student, they also facilitate the flow of information and improve the learning process. On the other hand, the literature, aside from introducing the technology and results, emphasizes the need of using ICT tools throughout all educational levels. In general, it is reflected that there are more barriers at the first stages of education whereas fewer ones at University, mainly due to the qualification and skills at different ages.

Training enterprise games is another useful and successful methodology used to train professionals with a simulation of the real environment where the firm deals with [10]. They have lost the influence in the Collaborative project-based learning (CPBL) methodology with the advent and increasing popularity of ICT. This didactic methodology organizes the teaching and learning process in such a way that the professor proposes the students one or several real-world cases. Students must work cooperatively in groups to seek solutions to the cases. In this way, collaborative active learning takes place, students learn to learn and to apply the theory to practical situations. Given the characteristics of this methodology such as [11]: its associated didactic complexity; performing real tasks; an open teaching and learning context; independent learning; and, the acquisition of higher-level cognitive skills. We can consider CPBL with the help of ICT as an evolution of former training games as a modern and effective methodology, specially best suited for the *Bologna Process*.

According to [4] there will be no effective adoption of a ICT-based teaching and learning process until some requirements are fulfilled like the cost reduction of hardware and professor training. This will only occur when a new generation of teachers, those educated in the context of ICT, enter into all range of educational institutions. If there are no well trained teachers then the usage of ICT will not be effective in the teaching and learning technology, specially if we are talking about University education. It has been stated in [12] that it is needed that teaching and learning strategies at High School are focused on providing the required skills at the University. Form the students' point of view, they finish their studies with the proposed knowledge assimilation but they lack of some skills like oral expression, the presentation of a work, proper searching and filtering of information. Hence, working on these transversal skills have a close relation with future success in the University.

In [6], it is claimed that the teaching innovation process based on ICT merely consists in reviewing current methodologies and promote innovative experiences in the teaching and learning process in Universities, by relying on ICT and emphasizing in teaching, the communication and distribution channels of learning materials. The author also states that emphasizing ICT availability and potentiality is an error to be avoided if it does not come in hand with an integration and collaboration with other institutions that globally affect the teaching activity. On the other hand, and according to [4], teachers are, in general, unwilling to change to any technology that does not ease the goals imposed by the education system. Hence, it is clear that ICT usage must be one of the key points in the education system. Although, most of the students go to University just to pass the exams and, hence, learning becomes a secondary goal. Professors go to class and present a given content and at midterm or at the end of the semester, they must prepare an exam where students must obtain a certain mark to pass the subject. This presents a scenario with low motivation for the introduction of innovative techniques in the teaching and learning process. In order to overcome this situation, in [13] it is proposed a change in the working habits, merely due to the introduction of ICT, of faculty staff with special training programs so that they can become comfortable with the new technologies and adapt their courses to the use of ICT within them in the teaching and learning process.

3 Discussion

The *traditional teaching model*, understood as a frame in which professors hold knowledge and students attend classes as mere information listeners, is no more acceptable. If our aim is to educate people to be able to solve problems, the learning process must be sustained in a collaborative group which preforms an activity or solves a problem together, coordinately and along a concrete period of time [11]. The *Bologna Process* sets out the need of instructing autonomous and engaged professionals who are willing to live in a multicultural society and accept its coexistence rules. All the issues stated previously are in line to the strategic option defined by European Union at Lisbon Strategy in 2000, in the sense of becoming by 2010, into a 'knowledge economy', a more competitive and dynamic economy [14].

It must be *shifted* the syllabuses of existing degrees into one single four year-degree followed by a master. Thus, some former degrees will be shortened whilst others not in the adaption to the *Bologna Process*. This is one of the key process in this adaption process in Spain along with the different degrees' map, i.e. how different degrees are merged or join while being still compatible with the rest of syllabuses from the rest of Europe. Keep in mind, that this new syllabus is oriented towards the acquisition of skills needed by the graduated student to be successfully applied in his future professional activities. Note that the Spanish University system, even after the *Bologna Process* started, is insisting on putting more relevance to the research side of the faculty instead of taking care of adapting and modifying the contents of certain syllabuses to a higher quality ones that ensures better knowledge acquisition by students [12]. If this issue is added to the fact that the Spanish university system is reluctant to changes on that side [15]. We have that now students must acquire skills that they will needed for their future professional career in a changing environment that needs continuous formation and will make this knowledge and skills as valuable items in the job market for their careers [6]. Thus, according to [15], *it is a must a change in the form of teaching a learning* to adapt to EHEA.

We really do think that it is needed a working environment like CPBL or the one already used in training games [10] along with ICT, and some degree of mobility and willingness to collaborate on the side of students. So the question that rises is why should we adopt ICT for the teaching and learning process? There are three main reasons: it has been shown that improves the students' performance; it is a skill highly appreciated in the industry; it is a modern tool that permit to satisfy the expectations arisen from the *Bologna Process*. ICT must be used in the student-based teaching process [13], the understanding of this technology must require new evaluation techniques. The OECD institution [13] goes one step further and suggests that ICT-based learning brings out a radical change: the development of skills and interdisciplinary activities that are better suited for real life activities. The success of students is tightly coupled with *the pedagogic quality of their education* [12]. Again, it is important to highlight that students are not highly motivated on learning nor used to utilize and interpret information [4]; however, we must provide an answer to the next question so that we can find the best solution: is this attitude a cause or a consequence of the problem? From our point of view *students' lack of interest and his indifferent attitude* is a direct consequence of the education system we are offering to them; thus, their behavior is a result of the problem. We can strength our reasoning by stating that *faculty staff do not manage ICT tools* and, as a consequence of this, it is not used in facilitating the teaching nor learning process [4,6]. There are some explaining factors about the lack of ICT usage on the teachers' side due to their lack of knowledge of basic tools [4]. It is essential to employ more and better innovative teaching processes in order to improve the students' results; for instance searching for resources or information in the web [6,13]. *ICT can be used in the teaching process* if the government provides means, like the non-negligible investment in the ICT teachers' training process and, mainly, if teachers change the way they teach in order to use ICT tools to provide skills to students. The usefulness of ICT for teachers comes in hand with its complexity, dependability and cleanliness in the presentation of contents in the classroom. This can be best seen in schools with a higher number of computers offering a high number of ICT tools to teachers [6]. *The teachers' training formation* is also significant at the University level [4]. Actually, the major change is the usage of the e-mail as an ordinary communication channel between a professor and his students. There are other factors that speeds up the adoption of ICT like external pressures, unsatisfied professors and another coherent alternative presented as an strategic plan [6]. The challenges that the space-time dimension brings out are that a professor develops learning activities and they imply an internal change at the institutional and staff level. The professor leaves, a little bit, his role as the source of all knowledge and takes the leading role as an students' guide; i.e., as a manager of the learning resources and as an orienter where all learning resources take the relevant role. Finally, we think that instead that professor should not be motivated by the number of students that pass a given course and, in the same way, students should not be motivated by simply passing a given course. Instead, it should be directed to properly teach and learn with an attractive and innovative methodology such as the effective usage of ICT tools where all the community gets involve.

4 Conclusions

The Bologna Process, being understood as a convergence plan, in an ambitious plan due to the importance and meaning of actions carried out to innovate the way the teaching and learning processes are done. European education convergence is planned as a single knowledge unit that permit its citizens to move and work around with a set of common skills and this fact constitutes one of the strongest points to pursue this change and to adopt ICT as the main tool for its development. Changes will come as time goes by, provided that all parts involved in the process play their role accordingly. The adoption of ICT technology will depend on the join effort among administration, students and teachers. The most notably role modification is on the teachers' side as they will become mediators on the learning process of students while students become information users. Finally, changes in the methodology must come along with an equilibrium balance between teachers and students and taking into account the flexibility that ICT features.

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Computer Programming: Fail Fast to Learn Sooner

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Abstract. Computer programming is not only to know about the languages or the processes, it is essentially to know how to do it. This involves a constructivist approach in learning. For a newbie in computer programming it is hard to understand the difference between know-about disciplines and the know-how-to-do-it ones. This leads to failure because when they understand they aren't able to solve a programming problem it is usually too late to catch all the time meanwhile lost. Our solution is to get them to fail soon enough. This way they still have time to recover from an eventually bad start.

For an average student to realize a failure it is required a failed examination. This is the fourth year we are adopting automated weekly tests for fast failure and consequent motivation for study, in the university first year discipline of computer programming fundamentals. The results are convincing.

Keywords: programming education, learning and teaching computer programming to novice students, constructivism.

1 Reasons for Failure

The literature identifies several reasons for students failure when learning to program [1], some address the curriculum, others focus on methodologies [2], resources or the best first programming language to use [3]. The inherent difficulty of programming [4], [5] and controlling what kind of mistakes students are more likely to make [6] are also addressed.

However, a well known truth about teaching programming is that a motivated student needs little guidance so he will succeed no matter how bad are the overall conditions, teachers included; also a student not motivated to spend some weekly hours practicing will fail no matter what the teacher says or how well the teacher explains all about computer programming.

Another conclusion our teaching experience lead to is that many students do not have a realistic idea about their effective study performance.

- Some think that understanding the solutions presented by the teacher or book is enough. They will probably try to solve their first problem during the assessment itself.
- Others go a little further and do some exercises but stop training as soon as they reach a solution for a certain kind of problem. However, being able to solve a

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ten-minute problem in a couple of hours is far from sufficient and probably the student is not even sure how the solution works.

- A more insidious kind of problem emerges with students that always study in a (same) group. Frequently, what happens is that although everyone follows and contributes to the solution, it is always the same student that performs the first step from the problem statement. The others just follow the lead and genuinely believe they can alone solve the problem from the very beginning.

Papers about difficulties in computer programming learning can be found in the literature [7]. In [8], these difficulties are divided in categories.

In this paper the main concern is to address the need to persuade students to critically analyse their study methodology and progress over the semester. So the focus is on failure reasons that can be overlapped by tuning computer programming methodology of study.

2 Constructivism in Education

Constructivism is a learning theory in which Jean Piaget argues that people (and children in particular) build their knowledge from their own experience rather than on some kind of information transmission.

Later, based on Piaget and others' work with the experiential learning paradigm, important works have been developed, such as Kolb's Experiential Learning Model [9], which reinforces the role of personal experiment in learning and systematizes iterations of reflection, conceptualization, testing and back again to new experiences. A rich set of works about constructivism in education can be found in [10].

Meanwhile the discussion was brought to the computer science education field claiming that real understanding demands active learning on a lab environment with teacher's guidance for ensuring reflection on the experience obtained from problem solving exercises. Passive computer programming learning will likely be condemned to failure [11], [12], [13]. Indeed, constructivism can even be used to explain the problem of weak students and be part of the solution [14].

3 Why Weekly Assessment

An interesting study that crosses students' individual cognitive level with the types of errors made [15] suggests the need to adopt innovative strategies in order to counter the seemingly perpetual rate of failure and at the same time increase the intensity for students with better cognitive level.

Whatever the reason, the ultimate truth is that a lot of things can go wrong when learning computer programming, especially in undergraduate courses.

So it is virtually impossible to prevent them all, mainly because students tend to overestimate their own understanding [16] and usually they are not very open to follow your good advices, especially if following those advices means more work.

This leads to the only winning strategy we have found so far: fail fast to learn sooner. If frequent assessment opportunities are given to the student, no matter the reason why he is eventually performing badly, two important goals are immediately achieved:

- there is still time to change student's study methodology and
- the teacher finally gets some real attention from the student to his good advices.

Even for students who do not need to fail to correct eventual study errors, we observe that weekly assessment is an extra motivation for not postponing study and consequently they will also attend next class better prepared [17].

Other medium term issues related with tuning the discipline from year to year are also addressed by weekly assessment. The ordering of different concepts by difficulty [18] can be inferred from final examinations or by directly asking students and teachers, but if we have automated weekly assessments this kind of data is all over. So it is easier tuning the classes' distribution along the year, dedicating more time and exercises to those issues we know students need more time to assimilate and eventually to concentrate easier subjects in less classes.

4 How Weekly Assessment

Weekly assessment involves several dimensions. First we need a methodology and then implementation resources. For the methodology we have a set of supposedly good advices and tutorial support during classes but in this context it is enough to focus on the method the students need to follow each week.

4.1 Our Method

Our learning methodology includes a method of weekly work composed of the following steps:

- **First read the book:** The students should always read the main reference of the course before attending the class. This is a well known way of preparing the brain to the concepts that will be discussed in class. It is not intended or expected that the students understand everything but they will have a precious idea of the main concepts of the current week.
- **Participate in the class:** In the subsequent class concepts will be contextualized, examples will be given and expected difficulties will be addressed. Although students need to practice to learn to program, they should leave the class with the concepts well known. They now know-about, they have an idea of how-to-do-it, they are prepared to go on and try to do it by themselves.
- **Try everything:** Then go back to the book and class notes and believe nothing – code everything and experiment in the programming environment. Revisit everything that was read and said, always coding it. Introduce changes in the exercises and check if the outcome matches the expected result. Solve and run the associated exercises. The biggest problem is not understanding the basic concepts but rather learning to apply them [16].
- **Use the laboratorial classes to self assessment:** A special set of exercises is weekly prepared for the students to perform a self assessment. The laboratorial class is usually used for that purpose.
- **Assessment:** Finally, the weekly assessment gives feedback to the student about the effectiveness of his work that week. This is very important for several reasons

such as avoiding study relaxation, creating a timely alert to students' ineffective study and pinpoint the parts of the syllabus that require revision by the student.
- **Tutorial guidance:** With the feedback provided by the assessment it is crucial to discuss the success of each student so far. Computer programming is in some extension a yes or no competence. This means that grades near zero and grades near hundred per cent are usually normal. So in the first weeks, grades bellow 80% should be carefully analysed – what happened that justifies that the student did not reach 100%? Not enough study? Not enough experimental practice? Should he study not more but better? The role of the laboratorial teacher is crucial at this point. There are different students' capabilities and the teacher must have answers to all of them even if they are spread by different levels of Bloom's taxonomy [19]. He must diagnose and address the personal difficulties of each student giving him guidance and self confidence.

Besides the already mentioned advantages from each step of the method, the whole set addresses main constructivism claims since provides systematic progressive interactions with the same concepts with teacher's guidance and consequently facilitating students' reflection and apprehension.

4.2 Self Assessment

Students have a weekly *project* composed of exercises similar to the ones in the weekly assessment. Once their weekly study is done, and only then, they try to solve all the questions in order to self assess their knowledge.

In case of difficulties they should go back to the book or ask teacher for guidance.

The resolution of the *project* is submitted to teachers for control purposes.

4.3 The Weekly Assessment

The weekly assessment is not just a weekly assessment – it is a weekly assessment with weekly feedback, i.e. the main goal is not just to put some pressure on the students. It would not be the same if the students did weekly assessment but only obtain the grades at the end. An important feature is that each student has immediate feedback and can still correct in time his study methodology.

Unfortunately it is incredibly simple for a very well intentioned student to diverge from the success path without notice.

We are dealing with novice first year undergraduate students and it is never too much to stress that we are dealing with novice first year undergraduate students... This means an extra charge of distractions aside from the inherent adaptation issues.

Completely out of that path of success is the temptation to stop studying after understanding a problem's solution, but before knowing how to do it himself. Even if the student gets to the solution of a kind of problem he must consider the time that was necessary to do it – it is still a long way (ok, maybe not always that long) between the points I-can-solve-it and I-can-solve-it-fast-enough.

It is also not rare that students study a lot and know very little, just because they are not doing it well. For instance, a student can spend daily hours studying syntax issues, solving problems and theoretical questions without really solving any problem himself... big mistake!

Nevertheless, if by any chance an already rare student perceives or suspects of flaws in his study methodology the normal tendency will be to postpone eventual corrective measures even if he knew one and generally that is not the case.

But even worse than that is the situation of a student that has the chance to have an attentive teacher that diagnosis one of those described issues and gives the student guidance and concrete corrective measures... nevertheless the standard student will not trust the teacher's diagnosis.

All this issues can be solved in time if you give the student the opportunity to fail fast if something is going wrong. This opportunity is called weekly assessment and is the main secret that allows the student: (*i*) to perceive that there is an issue to address, (*ii*) to believe the issue should be addressed, (*iii*) to believe the issue will not disappear by itself, and (*iv*) to address it in time.

Weekly assessment will give the student the opportunity to correct whatever may be wrong without having to wait till next (year or semester) edition of the course.

4.4 Implementation Resources

Some authors [3], [20] agree on the merits of frequent assessment but have a small enough number of students or a big enough number of hours x teachers.

We do not have such resources and have almost two hundred students and only a laboratorial teacher. Nevertheless, a third factor in the equation may be automated testing of the problems solved by students.

5 Our Outcomes with Weekly Assessment

Since we introduced weekly assessment the number of retained students was dramatically reduced.

However, this is not possible without some extra resources. In the case we choose to invest in automated assessment.

A first and strong indicator of the weekly assessment success is the evolution of the percentage of students that stay till the end, i.e. that do not drop at the middle of the semester.

Table 1 shows this evolution for the last five years. The reading of this table is not completely linear because some other factors changed meanwhile. However, the evolution is quite clear and shows that the efforts in increasing the assessment frequency resulted in greater percentage of students that stick till the end of semester.

In 2004/2005 a small project was quarterly assessed; i.e. there were two assessment points per semester.

Table 1. Students that stick till the end of semester percentage evolution

Year	%	Notes
2004/2005	48	Quarterly assessment
2005/2006	63	Laboratorial monthly assessment
2006/2007	64	TP weekly assessment + L quarterly assessment
2007/2008	76	TP weekly assessment + L monthly assessment
2008/2009	77	Weekly assessment

During 2005/2006 small problems resolution in computers' lab were added to the assessment on a monthly basis.

In 2006/2007 a weekly automated theoretical-practical (TP) assessment was implemented and complemented with a quarterly laboratorial (L) assessment.

During 2007/2008 the frequency of laboratorial assessment was increased to monthly.

Finally, 2008/2009 was the year when the whole assessment was automated and weekly performed.

The ratio of approval is also growing – 4% in 2005/2006, 2% the year after, 1% in 2007/2008 and finally a huge 13% jump last year with the weekly fully automated assessment – a 20% total improvement in five years! It should be mentioned that this evolution was achieved neither by shrinking the syllabus nor by decreasing the level of rigor imposed to the course over the years.

Another important indicator is the number of students being able to succeed the discipline on first attempt or better said the number of attempts a student needs in order to succeed.

For Table 2 construction we considered the division success-before and success-after weekly assessment implementation.

Table 2. Percentage of approvals in first, second and third attempts

	First attempt	Second attempt	Third attempt
Till 2005/2006	48%	38%	14%
Since 2006/2007	68%	22%	10%

Achieving success in first attempt is very important for several reasons. There is an associated cost for the student which is both monetary and functional. For teachers and university second attempts represent an increased complexity in resources and management.

Consequently, a twenty per cent increment in first attempt success is a very positive result.

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Experiential Collaborative Learning and Preferential Thinking

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Abstract. The paper presents a Project-Based Learning (shortly, PBL) approach in a collaborative educational environment aimed to develop design ability and creativity of students coming from different engineering disciplines. Three collaborative learning experiences in product design were conducted in order to study their impact on preferred thinking styles of students. Using a thinking style inventory, pre- and post-survey data was collected and successively analyzed through ANOVA techniques. Statistically significant results showed students successfully developed empathy and an openness to multiple perspectives. Furthermore, data analysis confirms that the proposed collaborative learning experience positively contributes to increase awareness in students' thinking styles.

Keywords: collaborative learning, thinking style, project-based learning, collaborative design.

1 Introduction

Project-Based Learning (PBL) is an effective way for students to learn design by experiencing design as active participants. It is a form of experiential learning where design projects motivate and integrate learning, and is considered a major innovation in design pedagogy (Kolodner et al, 2005). PBL experiences can be used to improve the ability of student designers to work collaboratively, to develop communication skills and to design thinking – all of which embraces the heart of the design process by highlighting the creation, assessment, selection and realization of ideas (Dym et al., 2005).

In this work, we present a PBL experience approach for collaborative product design learning. This approach is designed to help the development of students' ability. It is acknowledged that students will all come from different engineering disciplines and will be characterized by different thinking style profiles. These factors will affect their ability to work collaboratively during a PBL experience in an educational environment. The approach follows the idea that creativity will arise through the knowledge-sharing and synergies which are created through having many student designers

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working with a virtual group and a team coordinated by a teacher who plays the role of concept design manager[1].

After reviewing the theoretical background and methodology, this paper reports the results of a survey on 202 design students undertaken whilst the students engaged in a PBL experience. Statistical analyses confirm that PBL experiences increase the overall diversity of students' self-reported thinking style preferences. Such variation is found to be in contrast with much of the thinking style literature where styles are thought to be relatively fixed and difficult to change.

2 Theoretical Background

Design problems are understood from different perspectives, thus a collection of differently skilled designers can, in principle, go beyond individual knowledge and reach new concept ideas (Ivanitskaya et al., 2002). For this reason, manufacturing companies often embrace collaborative approaches in product design processes by involving experts from different disciplines in sharing knowledge, performing the design tasks and organizing resources. This approach assumes relevance and importance in the early stages of product design process (otherwise known as the concept design phase) where intensive collaboration among designers is necessary to create a shared understanding of the product concept. This then creates a formal description of the form, function and features of the product (Volpentesta et al, 2009).

Many researchers affirm that thinking style diversity between individuals involved in a collaborative work will be fundamentally responsible for tension leading to conflict, however this can also provide the most effective creative solutions (Kirton, 2006; Dorthy and Swap, 2005). Under an educational perspective, one problem is to establish if and how experiential collaborative learning might affect thinking style (or rather thinking style preferences) and thus create diversity between student designers.

Design is both a practice and a way of thinking, so experiential design in education gives an opportunity to engage learners and explicitly guide their intellectual process. When student designers work collaboratively, not only do they learn technical content but they also develop intellectually in order to communicate their creative ideas and collaboratively apply that content in meaningful ways (Atman et al., 2008).

Designers' creativity and diversity play a crucial role in collaborative processes. This is readily apparent when one considers that most creative pursuits in industry involve many individuals with various competencies working together to develop a product concept that cannot be created by a single individual alone (Mamykina et al., 2002). Using creativity therefore leverages the intelligence of different designers to tackle the complexity and uncertainty of generating a product concept. Many studies have looked at the issue of diversity as playing a key role in the collaborative development of a new product concept. Types of diversity frequently studied relate to gender, ethnicity, years of experience, technical discipline, Myers-Briggs type, and communication media (Hammond et al., 2005; Agogino et al, 2004; Reilly et al, 2002), but very few studies have specifically regarded thinking style diversity between designers engaged in product concept generation.

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[1] Detailed definitions of *group, team, virtual group* and *virtual team* can be found in Volpentesta et al. (2008).

The theory of reality construction is a general theory that under-emphasizes the principles of societal or mental self-government and focuses on dimensions of dependence, inquiry, multiple perspectives, autonomy and imagery (Sofo, 2005). The Thinking Styles Inventory (TSI) emanates from a theory of how people create their reality through their thinking and measures reported preferences for stylistic aspects of intellectual functioning. In the Sofo's TSI (2008) fives styles are considered referring to how a person likes to accept, make sense of, and react to information, people and tasks. The theory maintains there are at least five mental styles (see Table 1) used in combination as a profile of styles in social interaction and in problem solving within different contexts. The relative response scores on each of the five styles produce a thinking style profile relevant to the particular individual.

Table 1. Summary of the five thinking styles on the TSI (Sofo, 2008)

1.	Conditional	Accepting what others think and say without questioning them
2.	Inquiring	Asking questions to improve understanding of message or information
3.	Exploring	Looking for alternatives and difference
4.	Independent	Allocating priority to one's own thinking
5.	Creative	Thinking in pictures to get a sense of the whole

A person with a particular preference in one circumstance may have a different inclination in another situation which means that people may be flexible and adaptive in their thinking. This also suggests that style of thinking is at least partly socialized because the environment can influence the style that a person prefers to use (Sternberg, 1997; Zhang and Sternberg, 2006).

3 The PBL Approach

Following the constructivist approach, an educational environment is a micro-world where students and teachers meet to work together, interacting with each other, using a variety of tools and sources of information that allow them to search for learning objectives and activities in order to solve problems (Dym et al, 2005; His and Agogino, 1994). For creating a PBL experience, the following roles are taken into consideration in the educational environment: *Concept Design Manager* (CDM), played by the teacher; *Creative Designer Group* (CDG), formed by some students in the classroom; *Evaluation Designer Team* (EDT), formed by all students in the classroom. Members of the CDGs are required to work independently on the creative problem-solving task. Members of the EDT interact face-to-face and work together in collaborative sessions to evaluate ideas and solutions developed by CDG members. To better manage and control activities and student performance within the educational environment, there should be a limit of 20 students interacting at any one time. The PBL experience comprises a cascade of four stage-gates:

1. defining concept visions (i.e. generating product concept visions (CV) in response to a request forwarded by the CDM to the student),
2. functional schema (for each CV in input, a functional structure (FS) of the product is generated i.e. macro system components and their interactions),

3. functional layouts (for each FS in input, a functional layout (FL) is generated, i.e. mutual position of each sub-systems and their possible volumes), and
4. construction solutions for a digital mock-up of an innovative product (e.g. a device).

Each stage is composed by five sequential steps. In step 1, one or more requests for proposal (ideas or solutions) are transmitted by the CDM to the classroom. Each request contains the specification of the concept vision (for the first stage) or of one of the successful proposals selected by the CDM as output of the previous stage (for the stages after the first). In step 2, the requests are received by way of input; for each of them a CDG can be formed, thus each CDG consists of the student designers who autonomously choose to work independently on the same request for proposal. The output of this step is the set of original ideas/solutions that can be submitted by each student designer to the CDM. Generating ideas and solutions is a divergent thinking activity aimed to stimulate creativity of independent student designers in order to obtain the larger number of innovative proposals. Such proposals are thus collected by the CDM during step 3 and assessed in a collaborative session, "evaluating ideas/solutions", by the EDT. To stimulate convergent thinking during this session, the EDT evaluates proposals collected by the CDM using De Bono's (1990) *six thinking hats critical thinking method* and submits the evaluations to the CDM. During step 5, the CDM, on the basis of the evaluations of the previous step, ranks the proposals and selects the most suitable ones for successive development (the next stages) or for final teacher-student evaluation (Volpentesta et al., 2009).

4 The Survey Design

The two research questions for this study are:

1. Can a PBL experience affect the diversity of student self-reported thinking style preferences?
2. Can the student's involvement in some design situations induce a variation in components of their self-reported thinking style preferences?

In order to answer these questions, we conducted a survey research on a sample of 202 student designers. All students were enrolled in engineering degree programs delivered at the University of Calabria and they attended blending (virtual and traditional) learning classrooms. The students were surveyed using a version of the Thinking Style Inventory (Sofo, 2008) specifically tailored to collaborative product design learning and subsequently titled the *CD-TSI*; an extended and detailed version of such inventory can be found in Volpentesta et al. (2009). The purpose of conducting the survey was to analyze students' self-reported changes in their thinking style preferences following the PBL experiences. To do so, pre-delivery and post-delivery data were collected and reported for each student in attendance.

Three PBL experiences where designed according to the proposed PBL approach; each experience consisted of selected activities developed over the course of a week-long intensive course and delivered to blended classrooms of 20 student designers. Each classroom was regarded as an educational environment where product concept design has been developed, thus the teacher played the role of CDM and concept buyer/user, while students acted as CDG/EDT members (Volpentesta et al, 2009).

4.1 Survey Results and Discussion

To study reliability of the CD-TSI, a Cronbach α analysis has been conducted on the raw data applied to each of the five styles. As shown in Table 2, the alpha levels were in the modest to very good range for all subscales except the exploring and independent ones which were in the low range in the pre experience, 0.46 and 0.443, respectively. First implication is that results on these subscales need to be interpreted with caution. More important is that higher values of alpha coefficients on all subscales for post-experience can indirectly confirm the increased awareness of students in their thinking styles after exposing them to a collaborative PBL experience.

Table 2. TSI subscale Cronbach α coefficients

Subscale	Items	Pre-experience	Post-experience
Conditional	1a to 10a	0.642	0.854
Inquiring	1b to 10b	0.543	0.79
Exploring	1c to 10c	0.46	0.562
Independent	1d to 10d	0.443	0.631
Creative	1e to 10e	0.765	0.837

In order to answer the first research question, pre-experience and post-experience means, standard deviations and range of given values for each component of the thinking style profile have been calculated. ANOVA shows no statistically significant differences between the pre-experience and post-experience means on the five thinking styles, thus indicating similar average profiles for both the pre- and post-experience data. Results highlight that the thinking style profile of the design students can generally be described as a high preference for seeking multiple perspectives and asking questions (as the exploring and inquiring preferences returned the highest means). The scores on preferences for independence and creativity were also similar while the least preferred thinking style was the conditional style, indicating that students least prefer to conform to existing models and principles when doing design work.

Overall, results of statistical analyses of pre- and post-survey data show an increase of diversity of thinking style preferences in terms of relative standard deviation from the mean value of each thinking style in the CD-TSI. This finding is therefore deemed to affirmatively answer the first research question.

For the second research question, analysis has been conducted on all items of the CD-TSI in order to reveal any changes in the preferences of thinking styles during particular design situations. ANOVA tests reveal a change in the preferences of thinking styles reported by students engaged in PBL experiences. Statistically significant differences were found on 5 of the 50 CD-TSI items tested and related to two of the ten proposed situations. ANOVA confirms that these differences are significant at $p<0.05$ (see Table 3).

Table 3. Differences in thinking style preferences (pre and post experience)

How do you think when…				
Situation	**Thinking preferences**	**Pre-experience Mean value**	**Post-experience Mean value**	**Sig.**
How do you think when clarifying a design task?	I define and offer my personal idea on the task (independent)	4.17	2.09	.03
	I accept others' proposals (conditional)	2.01	3.74	.0164
How do you think when debating and evaluating ideas/solutions?	I offer my personal evaluation (independent)	4.42	1.75	.049
	I ask questions to better understand idea's meanings and others' evaluations on it (exploring)	2.17	3.73	.0248
	I tend to be affected by others' evaluations (conditional)	2.33	3.42	.031

The close clustering of significance is interesting since statistical significance occurs at both ends of the design process, the clarification and evaluation phases. The academic instructors emphasized the critical importance of the beginning and concluding phases of design stressing that they are the critical moments or tipping-point opportunities for significant creativity to occur. In particular, De Bono's (1990) six thinking hats strategy was employed consistently during these stages of the simulations to ensure an emphasis on multiple perspectives.

5 Conclusion

The results from this study do not necessary imply a change in student thinking style profile, but they do show that a PBL experience where students act as real designers during a collaborative design project can contribute to increased awareness of their thinking styles. The results are therefore in contrast to other published literature which suggests that thinking styles are relatively fixed and difficult to change. In this study it became clear that students were able to adapt their style of thinking during two key phases of a learning simulation under the care of instructors who were able to provide feedback and encouragement to think in different ways. Whether the same students can transfer this learning to a real work situation where there are different pressures and generally the absence of a mentor or teacher to encourage them to think laterally at key points, is a question for further study.

The results from this study show that a PBL experience can help the meta-cognitive process of highlighting personal thinking styles during design. This initial exploratory study gives optimism for the education of design students as it points to some success in teaching openness to multiple perspectives and the cultivation of an open mind as the basis for creativity. A future study could evaluate the creativity of the design products of students who have experienced creative simulations with the products of a control group.

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Computer Sciences Applied to Management at Open University of Catalonia: Development of Competences of Teamworks

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Abstract. Teamwork is considered one of the most important professional skills in today's business environment. More specifically, the collaborative work between professionals and information technology managers from various functional areas is a strategic key in competitive business. Several university-level programs are focusing on developing these skills. This article presents the case of the course Computer Science Applied to Management (hereafter CSAM) that has been designed with the objective to develop the ability to work cooperatively in interdisciplinary teams. For their design and development have been addressed to the key elements of efficiency that appear in the literature, most notably the establishment of shared objectives and a feedback system, the management of the harmony of the team, their level of autonomy, independence, diversity and level of supervision. The final result is a subject in which, through a working virtual platform, interdisciplinary teams solve a problem raised by a case study.

Keywords: teamworks, skills, assessment, collaborative work, learning.

1 Teamworks

The current competitive environment requires organizations to accelerate business processes for the creation and application of knowledge to their business. In this sense the work teams are a key figure in the business organization, providing flexibility and creativity to the process [1]. Work teams can harness the talents of workers to create, share and use information as part of the firm's competitive strategy [19]. A work team is defined as a collection of individuals who are interdependent in their job tasks and share responsibility for the results. These are teams with a time limit, which produce results once and carrying out work involving the application of knowledge, discernment and expertise in solving a single problem [2].

To address these needs academia has increased the use of case study methodology in a collaborative manner with the aim of enhancing the development of teamwork skills [13]. This type of training, through capacity building and cooperative work skills, helps to achieve better results in knowledge generation processes in the context of work teams in enterprises [5]. The course CSAM is part of this context.

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The team's work process consists of interactions among members and that influence their effectiveness. The aspects that define the work process are the level of autonomy, team size, diversity and level of supervision [13]. Marks and others (2001) have been grouped these processes into categories of activities that can occur at any time in the life of equipment. In this sense define three groups of processes: Transition processes, action processes and interpersonal processes. The transition process refers to those activities related to the specification of the mission and objectives and strategic planning. Action processes are those activities directly related to the achievement of tasks such as monitoring the ongoing work, assistance to team members and the coordination work. Interpersonal processes include those activities related to conflict management, creation of confidence and emotion regulation of members.

Teamwork allows members to plan, organize and coordinate the team's activities in relation to achieving the objectives. The literature shows that the teams involved in these activities are more efficient. These investigations have focused on the relationship between cooperation and performance, conflicts and performance level, between processes and effectivity and finally between task processes and efficiency. The efficiency of a work team is a multidimensional construct that includes several outcome measures such as objective measures of the outcome of the group, attitudes and subjective measures of satisfaction and results of computer components development. The objective measure of the output of the team includes the degree to which the team achieves the objectives of the project. Several studies in various industries find that the presence of goals the team has a positive impact on its outcome.

One of the critical elements in improving cooperation and creating work teams is to have a common vision and goals and higher order goals that focus on key results [14]. Among the main factors that characterize the work teams with a high level of performance highlights the fact of having a common purpose, taking clear the importance of teamwork, open communication for sharing information and producing significant results in relation to success factors.

Objectives shared are relevant and important in shaping the team and must be completed with an evaluation of the results providing feedback in real time. Rosenthal [15] identifies five key factors for successful work teams. Among them is the challenging targets agreed to have measurable results in order to improve the vision of them and develop a strategy to provide information to the system. Researchers like Neubert [12] have demonstrated empirically that teams base their work on established goals and feedback systems outperforming teams that focus their business only in the objectives. In addition, working in conjunction with feedback systems objectives facilitates interdisciplinary teams. The measures of feedback can be based on the results of the team or work in progress used to achieve the desired results.

Group composition influences the discussion and decision process which, in turn, influence outcomes [8][10]. We can define the diversity of a team as the level of heterogeneity of the demographic characteristics and knowledge of its components. Different contributions in literature have focused on identifying differences between types of diversity. Some authors such as Cummings and others [3], Jackson and others [7] and Tusi and others [16] have suggested ways to categorize different types of diversity. A very common distinction is based on easily observable or detectable attributes such as age, race, gender, ethnic background and diversity in relation to other less visible or underlying attributes such as education, technical skills, and career in the organization, functional background, socioeconomic status, personality characteristics, or culture.

Three elements that define teamwork are the harmony of the team, their level of conflict and crisis between different computers [18]. The harmony in the team is produced when two or more people make the same or complementary tasks simultaneously [4]. The concept of harmony in the team means that the inputs of a set of interdependent members are planned jointly, the members are outstanding members, follow the rules, understand the objectives of the work and responsibilities and respect the other members of the organization, so that the team's work flow efficiently and smoothly. Watson and others (1993) conclude that the more consistent team composition will be more production, ie, improve productivity team. Members that are similar to work together more easily and with better communication between them based on trust. Likewise attributes such as job training and work experience accumulated normally determines the approach to the activities involved. There are two types of conflicts in the task force: relationship conflict and task conflict. Researchers such as Amason [1] and Jehn [9] conclude that while relationship conflicts based on differences in personality and interpersonal dislike are bad for the team's functionality, conflicts of tasks based on differences in relation to specific content are beneficial in many situations. In turn, the characteristics of information (availability of information and professional know-how) and demographic characteristics are likely causes for conflict of tasks from the time when the focus of disagreement is the task and not the relationship or interaction between individuals.

2 Course Presentation and Objectives

In this section we will analyze the relationship between the defining elements of teamwork and efficiency in CSAM course design.

CSAM is a shared course in Economics and Business Studies and Computer Engineering at the Open University of Catalonia. Its main objective is to simulate a real situation of teamwork between business management professionals and computer specialists. Planned measures include a case study in which digital technologies appear as a business opportunity or a tool for management improvement. The team has to conduct a decision-making process cooperatively through the resolution of various milestones of the case. Trying to encourage interdisciplinary discussion and teamwork as a learning tool, and acquire the ability to relate concepts of different disciplines.

The interdisciplinary team work appears in the literature as a key professional skills which can improve the decision making process by promoting an atmosphere of harmony [5]. To achieve this environment rules are made to be respected by all members of the team, thus regulating the operation of the computer as organized unit.

3 Resources for Learning: The Case and the Collaborative Work Platform

The two key elements in the development of the subject are the case study and collaborative work platform.

The case study presents an actual application of digital technologies in business practice. Digital technologies are an important opportunity to generate new business and to improve the processes of current activities. Its format is Web, also available in Mobipocket and ePub.

The material is configured as follows. First, it makes a presentation of the issue, succinctly, accompanied by a whole series of annexes providing details of the situation. Then fine points of the different milestones of the case are presented. The case work is structured following the outline of a project that sets out certain landmarks that lead to its final resolution. Each milestone has a little introduction, objectives, description of the methodology of work with the activities necessary to achieve the objectives and exercises that will result in a paper to be one of the *inputs* for evaluating the work of team. Finally the case is complemented by the documents necessary for the resolution of activities.

The second key element in the course is the collaborative work platform. This platform is called BSCW (Basic Support for Cooperative Work) and is a cooperative software package developed by the Fraunhofer Society. It is a platform that allows work collaboratively, using a shared space on the Internet. This space allows you to store and retrieve documents, share information between a workgroup and establish asynchronous conversations. In addition also includes a mechanism for planning activities with the rest of team members.

4 Methodology

The working method is as follows. First we must consider that teams are composed of students from two different areas of knowledge. For this reason, the case has readings that establish a common language to facilitate teamwork. These documents provide insight into the case presented from the perspective of computer science students for business students and an economic outlook for computer science students.

The team's work is divided into milestones, usually between four and five. The first is an individual work and aims to understand the problems presented. The rest of objectives are worked in teams. The teams consist of five to six members. They are interdisciplinary, with students from business and computer science students. The training of the teams follows two key stages. First, every one of the students of the course make a presentation for all the students detailing their personal details and availability, team learning objectives (expectations, high standards to team members, dedication, commitment, motivation, interest ...) and social aspects. The second step is to find teammates. To do this students must contact other partners to make the team's training proposal and discuss with stakeholders to establish the basic rules of operation, agreed operating rules of the group, organization and planning work.

To assess the work done by each of the work equipment is used the continuous assessment methodology. The activities to be evaluated are all actions aimed at solving the case and may be preparing documents, interim and final conclusions and the definition and design of knowledge management tools used. All contributions made by individual team members are recorded in the BSCW collaborative work platform, so the teacher can track the work for evaluation. This evaluation has two parts: summative and formative assessment. In summative evaluation the teacher performs an objective assessment of each of the milestones based on the exercises, activities, documents, reports submitted and the discussions. This mark covers 80% of the total mark the milestone. Formative evaluation includes the process of learning and teamwork that have been carried out to students throughout the resolution of the case. In each of the milestones the teacher evaluates the operation and team behaviour.

More specifically, the teacher assesses the following aspects: First the individual participation of each team member, in relation to their contributions in the resolution of the highlights of the event. Secondly, teacher analyzes and evaluates the flow of communication among team members, with special emphasis on the attainment of any roles assigned to each of the members.

Third and lastly the teacher assesses the skills and principles of collaboration and interaction used by each of the components in the collaborative resolution of each milestone event. All this information is contained in a performance report of the group which the group packs and delivers along with the outcome of each of the milestones. Therefore, for each of the milestones each team make two deliveries which consist of a specific document of the landmark resolution proposed in the statement and a report evaluating the operation of group work as a team. The purpose of this report is to make the team members reflect on the cooperative work that have been conducted to analyze their behaviour (participation, contribution, motivation ..) and try to improve it. Once the teacher has issued a note for the group, each member of the group shall propose the note that believes he deserves for himself and for each teammates. Furthermore this document contains a list of specific tasks of the landmark whose resolution has led the student and a summary of their collaboration in other tasks. This self-rating is for guidance to the teacher. Students receive as a result an individual rating in private. Due to the different dynamics existing within each group, the individual note may differ between members.

This final report, assessed by the teacher, has two important aspects: a self-evaluation consistent in a critical reflection on the case made and their involvement in teamwork and team evaluation, assessing the work and operations done. The final grade for the course is the combination of the note of the evaluation of each milestone, adjusted by the assessment of self-assessment final report.

5 Conclusions

The course CSAM has been designed in order to enable students to develop team work efficiently. This was taken into account the main aspects that influence the efficiency of cooperative work and have been presented in the first part of this work.

In the CSAM course, the level of autonomy of the team respect to the teacher is very high. Given some basic indications of teamwork, are the same constituents who establish rules of operation, assuming leadership roles for specific tasks on a rotating basis. Respect the size, work teams consist of five members. It is a dimension that can be defined as optimal regarding the methodology of cooperative work [6]. Regarding to diversity, students who make up the work teams have a similar socio-cultural profile: average age 34, familiy responsibilities, previous studies and full-time work. In contrast, it exist diversity in relation to their knowledge since it is an interdisciplinary team with students of computer engineering and business studies students working cooperatively. The fact that group membership is based on a similar socio-cultural profile and heterogeneity in the academic and professional profile tends to reduce conflict within teams [18].

Finally, in relation to the level of teacher supervision, the teacher operates resolving conflicts that may lead to the breakup of the group as well as specific assistance in matters of content. In this sense the teacher has different inputs that allow you to appreciate the teamwork and the individual contribution of each member. More specifically with the outcome of each project milestone, the report of the group and each student's personal and work reports of the collaborative work platform. Thus, the teacher has evidence, whether performance-based goals and subjective elements of the student based on information and developments. As we have seen, both elements appear in the literature as key to assessing the work [14].

The final result of the task of supervision of the work is a team feedback that improves their efficiency. Complementarily to these aspects, Wen-Chih and Chen-Chang [18] set the criterion of harmony as a key concept in achieving a certain level of efficiency in the cooperative work of a team.

In the case presented, the rules of operation of the equipment itself guarantee that by reaching an agreement, harmony work is consistent. The basis of this operation is the establishment of roles, with leadership spot in the work done.

The BSCW collaborative work platform ensures fluency in information exchange and transparency in relation to the participation of each piece of equipment, thereby enhancing harmony in the cooperative work. In this way the computer more easily raises common objectives to achieve the main objective that is the resolution of the case. This aspect, along with receiving feedback from the teacher appears as the key to optimum equipment efficiency [14].

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From Workshop to the Web: Reflections on the Journey in Producing Vidcasts to Enhance Student Learning

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Abstract. As part of its evolving e-learning programme, the pedagogic value of vidcasts is currently being explored at Glasgow Caledonian University. The vidcasts are accessible on the internet and embedded links refer back to the Effective Learning Service's website to offer users the option of additional clarification if necessary. They aim to encourage and enhance students' learning in higher education, particularly in relation to academic writing. The vidcasts have been available for use during academic year 2009/2010 and have been accessed by over 1,000 individuals. Research on their use is ongoing and has provided valuable data for future developments.

Keywords: Elearning, vidcasts, students' learning preferences, mobile learning.

1 Introduction

This research project on producing vidcasts was devised and is being coordinated by two members of Glasgow Caledonian University (GCU) staff; a Lecturer in the Effective Learning Service (ELS) and a Learning Technologist who was originally based in the Spoken Word Team and now is based in the University's Learning and Teaching Academy. Spoken Word Services based in GCU has extensive experience in producing podcasts to support teaching and learning and exciting, interactive material. Moreover, their unique collaboration and legal deposit agreement with BBC Information & Archives allows them to make use of audio and video programmes from the BBC's extensive archive for teaching and learning purposes (Wallace & Donald, 2008). The Re-Engineering Assessment Practices in Scottish Higher Education (REAP) Project, for example, applied video podcasts as a driver for change, replacing a one hour weekly lecture with a 15 minute video podcast which included a blend of a lecturer's narration, BBC audio and video clips, that were related to the topic and lecturer's PowerPoint slides (REAP, 2007). It therefore seemed a logical partnership that ELS would collaborate with Spoken Word and collaborative working commenced in 2007, in the production of vidcasts to support students' learning.

2 Theoretical Background

A Vidcast or vodcast, contains audio and images, either moving or fixed (Traxler, 2008). The research project on their use has been shaped and informed by several

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theoretical perspectives on pedagogy, technology and lifelong learning (LLL). According to Clark and Walsh (2004 cited in Pandy 2009) listening is instinctive, whereas reading and writing requires to be learned. However, the Informal Mobile Podcasting And Learning Adaptation (IMPALA) (2006) project acknowledged that students had to concentrate and apply active listening when using podcasts for educational pursuits, rather than merely listening, as one does to music. Podcasting, therefore, clearly appeals to auditory learners and with the addition of visual prompts, the vidcast can also support dyslexic students with alternative strategies for engaging with and retention of information. Increased access to learning may also be achieved for users with visual impairments, who can select to listen solely to the audio element and can download the material on to their mobile device. Students can also choose when and where they wish to engage with the vidcasts and this approach enables students to revisit the material at their own pace, all contributing to self – directed learning opportunities. This approach takes account of Grabinger's (2009:237) assertion, that learners are part of a '... continuum, with all students needing or preferring different kinds of instruction.'

On the other hand, Coffield et al., (2004) carried out a detailed study evaluating the usefulness of learning styles theory, arguing it does not explain the complexity of lifelong learning (LLL). They argue instead that learning styles categorisations have limited value. Rather than a narrow, reductive focus on identifying styles of learning, they contend a more pertinent question concerning LLL, which is why some learners disengage with learning or even feel barred from the higher education establishments. In recognition of this complexity and the wider socio – cultural dimensions impacting on LLL, we drew on academic literacies theory and practice. This takes account of the '...broader and more socially [derived] uses and meanings of literacy,' (Leung & Safford, 2005: 320) in the context of HE study; so facilitating an asynchronous method. We have focused on the deconstruction and demystification of the language and discourse applied in university, in order to facilitate students' learning in accessible and empowering ways.

3 Nature of Research Problem and Outline of the Methodology

Action based research, employing a collaborative; problem solving approach has been utilised (Cohen et al., 2007). The research problem which we are exploring is how to replicate in complementary and engaging ways, workshop learning experiences online via a browser based website, and offline, as a vidcast, downloaded to personal mobile device.

Specifically, we are aiming to evaluate the extent of the contribution of e-learning technology to enhance learning and teaching practices, and particularly the possibilities it affords HE students to develop generic academic writing skills. This is with a view to embedding materials within and raising awareness of subject specific academic writing practices. This also aligns with academic literacies theory and practice as discussed.

The research site is based in a new university in Glasgow, Scotland and gained university status in 1992. GCU has a student population of 16,770, 61% female and 39% male (HESA 2008). Of those, 69% study full-time across six academic schools, which deliver programmes with a strong vocational orientation. Glasgow Caledonian

University's (2015) Vision statement is to '…become a distinctive, socially entrepreneurial University, led by our values, and focused on delivering our goals and promoting social good' (GCU, 2009). In essence the university aims to '… use [their] skills, facilities and knowledge to make a positive contribution to society.' (GCU, 2009)

The impetus for producing vidcasts was directed by earlier research that examined students' attitudes about the problems of accessing material from workshops that had been run by the ELS. In 2008, the ELS team designed a survey questionnaire which was distributed to a purposive sample of 300 students attending a range of context based workshops. The questionnaires were completed by undergraduate and postgraduate students and reflected a range of subject disciplines, course work and exam requirements (McAllister & Shapiro, 2009). Students were asked about the overall relevance of the session they had attended. The majority of responses rated the sessions 'highly' or 'very relevant'. Similarly, they responded that workshop materials and their preparation for undertaking specific assignment rated highly.

Nevertheless, it is impractical to expect that every student can attend the workshops, for us to repeat sessions or for students to meet with ELS staff face to face. Reflecting this, many students access ELS materials on line (4,595 used support guides on line 2008/2009) (Table 1) Moreover, many students commented that they wanted to access workshop material at a later date.

Table 1. Academic Year 2007-2008 - ELS usage statistics

Total number of student appointments	**Total number of face to face appointments**	**Total number of on line appointments**	**Total number of face to face workshops**	**Number of users online support guides**
1,747	1,553	295	182	4,595

Table 2. Academic Year 2008-2009 - ELS usage statistics

Total number of student appointments	**Total number of face to face appointments**	**Total number of on line appointments**	**Total number of face to face workshops**	**Number of users online support guides**
2,111 (+20.8)	1,677 (+7.98%)	481 (+63.5%)	191 (+4.94%)	7,375 (+ 60.47%)

We wanted to develop vidcasts, which replicated the experience of the workshop in real time, aiming to accommodate individual learning needs and make the session explicit and accessible, in keeping with an academic literacies pedagogic practice. We also wanted to give students options, including when they could engage with the vidcasts and have different ways of accessing the material that could be accessed on computer and on students' mobile devices.

It is clearly evident that large numbers of students were using the ELS service's online support in that there was an increase of 60.47% recorded by Google Analytics from 2008 (see Table 2). This would suggest that students were comfortable about accessing material online. This is supported by Trinder et al., (2008:6) who examined the use of e-tools in students' learning practices, both formally and informally, namely that, 'Students have shown that they are adaptable in their use of e-tools to support their learning.' An auditory approach supported by visual content was selected, with the intention of bringing the workshop into the learner's individual learning space, thus accommodating students' self directed learning approaches (Fox & Ronkowski 1997).

4 Research Problems Identified in the Initial Stages of the Project

In the initial stages of developing the vidcast, the lecturer was videoed delivering a workshop on essay writing to students. However, once the video recorded output was viewed, the lecturer's presence detracted from the recording, rather than adding to the pedagogical value. (Figure 1) It was also apparent that additional features appeared which were not anticipated, such as the visibility of students working outside the room. This meant too many non-essential visual cues were appearing at the same time. Moreover, as no prepared script had been drawn up, this meant that at times there was either too much or insufficient oral content which did not clearly 'fit' with the PowerPoint presentation.

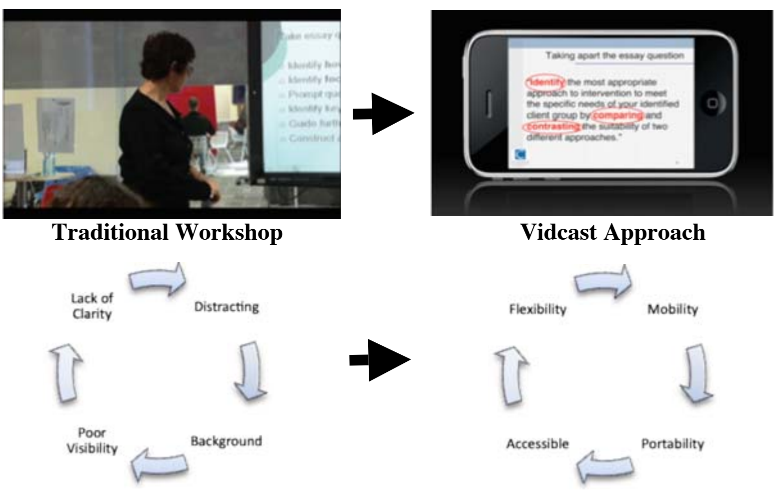

Fig. 1. Factors for Intervention

In light of these issues, the decision was taken to design and produce a 20 minute vidcast that would use the Power Point slides from the essay writing workshop with oral voice and links to the ELS website (Fig. 1). This was informed by Lee and Chan (2007) who highlighted that by mobile learners using iPods, this allows accessing of information at self determined times.

The PowerPoint slides were supported by further links to specific areas of the ELS website to give additional information. Two formats were used: one for on line access embedded within a webpage using a flash based video player, and one for students to download for use with their iPod/mobile video device.

5 Results from Research in Progress

Views from a small number of students were sought using a focus group approach. This enables users to express their views and individual interpretations (Cohen et al., 2007). Students with diverse learning needs (dyslexia, English as a second language) were purposively sampled, coming from a range of programmes and levels (U/g, P/g). The views of one member of ELS lecturing staff were also sought. The students and one staff member were also asked to complete a questionnaire and meet for informal feedback. Adding useful and critical insights on the vidcast, were also 45 academic staff, representing learning and academic development units from all Scottish Universities. Their attendance at the biannual Educational Learning Advisors Scotland Forum provided opportunity for critical discussion with a wider audience of informed practitioners (Shapiro & Johnston, 2008).

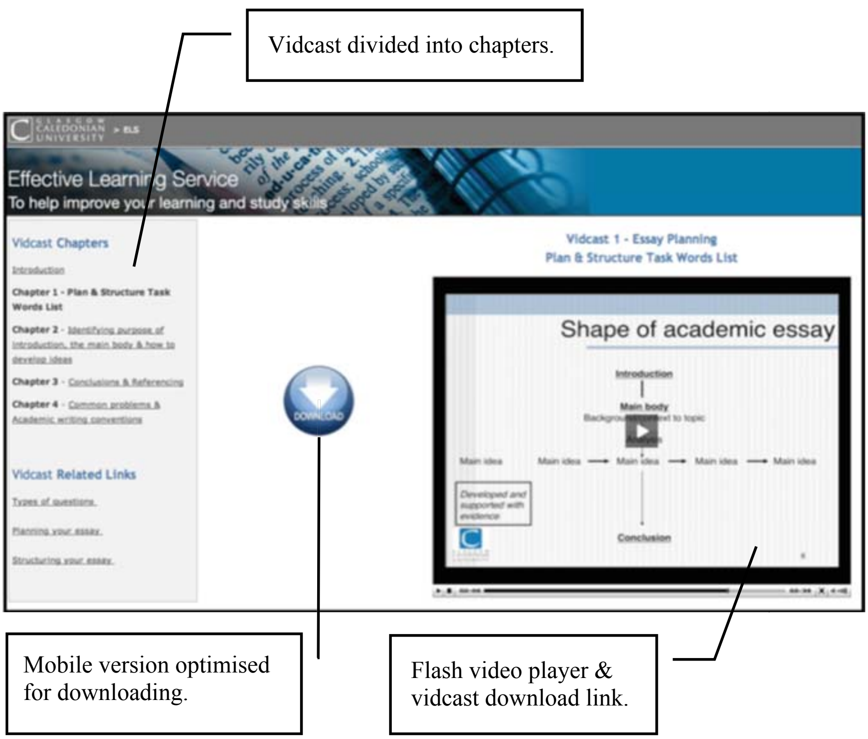

Fig. 2. Screenshot of an ELS vidcast webpage

In essence, the responses indicated that the vidcast language and content was useful, but respondents preferred shorter sections; they did not want web links if viewing on mobile devices, but they did want the opportunity to fast forward to particular sections rather than having to watch and or listen to the complete vidcast. Even when students downloaded the material onto their iPods, they still preferred to access university course material when they were in their ‘studying zone’ rather than accessing the material ‘on the move’. The majority liked using iPods for an overview but preferred to download the vidcasts on to PC’s. Lee and Chan (2007) also found users in the main accessed podcasts by manually down loading them by a web browser. Over 72% of their sample preferred to use a laptop computer. In our project, we especially wanted to encourage students to continue in self directed learning and we believed that by referring them back to the ELS website this would encourage deeper learning. Future research will focus on whether this is a widely represented view.

The feedback subsequently prompted several changes. The download on to the iPod does not include the links to the ELS website. The PowerPoint slides are in chapters, supported by further links to specific areas of the ELS website to give additional information. Two formats are being used: one for on line access embedded within a webpage using a flash based video player and one for students to download for use with their iPod/mobile video device.

The vidcast can be fast-forwarded and the user can also select to watch the vidcast with or without sound. Three vidcasts have now been posted on Glasgow Caledonian University’s Effective Learning Service’s website; the first is Technical Writing for final year Engineering and Building and Natural Environment students and the other two are Essay Writing and preparing a Literature Review. The first two vidcasts were

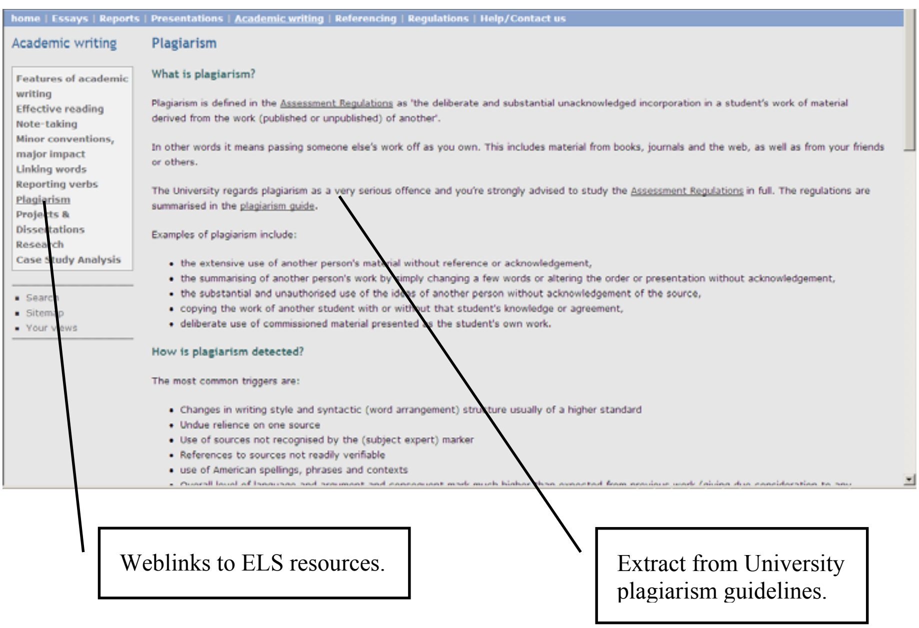

Fig. 3. Screen shot from the ELS website

placed on the Effective Learning website in September 2009 (http://www.gcal.ac.uk/els/vidcasts/index.html) Figures 2 and 3 demonstrate screenshots showing the power point slide and the link to the website.

The third vidcast was put online in November 2009 and is on the subject of preparing and writing a literature review. Information derived from Google Analytics has indicated that over 1,000 individuals have accessed the vidcasts up to January 2010.

We then decided that it was inappropriate to continue producing vidcasts without obtaining feedback from users. In addition to tracking use, we have devised an online questionnaire which we placed on the website in December 2009. The next stage will be to add new subject specific vidcasts and review the on line feedback.

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'Virtual Learning-by-Doing' Teamwork KSA: Strategic Management Simulation as an Effective Tool

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Abstract. The objective of this paper is to evaluate the effectiveness of strategic management simulations as a learning-by-doing tool, that is *they can enhance their knowledge, skills and abilities for effective teamwork*. We have carried out an analysis of the effect of business simulation on the teamwork KSA with a group of undergraduates of the Business School. The results show that the teamwork KSA can improve and that the initial knowledge of those teamwork KSA, at the individual level, is the only factor which conditions their learning. Initial knowledge of the teamwork KSA and the spread of this knowledge within the team, are not a determinant influence on the individual learning-by-doing. Neither are features such as intelligence, personality, attitude to teamwork and teamwork self-efficacy.

Keywords: learning-by-doing; strategic management simulation; teamwork knowledge, skills and abilities; team stock of knowledge.

1 Introduction

Frequently, strategic decisions need to be taken by a team. In this way, students' training requires not only the transmission of knowledge of strategy, but also an emphasis on teaching team decision making. It is important to know how to coordinate with a team for a specific task and, it is also necessary for each student to have the knowledge, skills and abilities (teamwork KSA) which favor or facilitate the making of strategic team decisions in any situation [1, 2]. In spite of the fact that for many years the effectiveness of a team has been associated with the learning of a task [3], nowadays the necessity for individuals to be able to work in teams has been clearly shown, independently of the task to be performed and of the firm in which it is developed [4, 5]. Stevens and Campion (1994), after a far-reaching revision of the characteristics necessary for teamwork, identify the knowledge, skills and abilities (teamwork KSA) which convert an student into an effective member for working in any team, which have a double nature: they are interpersonal and self-manageable.

The recent works of [6, 7] clearly show the benefits of encouraging "virtual learning-by-doing" for strategic decisions making. Thus, the objective of our work will be to evaluate the impact of business simulation on the acquisition of the teamwork KSA for the students of a team when they have to make strategic decisions.

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2 'Virtual Learning-by-Doing' Using Business Simulation

Learning-by-doing refers to a learning in which the individual confronts problem-solving by means of the process of trial and error [8]. Through this kind of learning the individual generates iterative search cycles, the generation of alternatives and selection, in such a way that, each time this cycle is repeated, the behavioral gap is reduced and the knowledge gap [9].

Within the learning-by-doing techniques, strategic management simulations are considered suitable for the objective of learning to make team strategic management decisions. Strategic management simulation involves the use of a software program with which several teams compete against each other within an industry as each team was a firm in the real word. Then, it gives the student the possibility to make strategic decisions and, furthermore, to learn to make these decisions in a team [10,11].

Learning-by-doing in this context of the strategic management simulation is equivalent to the term used by Pisano [8] 'learning-before-doing' or 'virtual learning-by-doing', since the teams make decisions which have no 'real' effects in 'real' firms and, therefore, they learn, before joining the job market, to make 'real' decisions.

This technique encourage the abilities and skills of each team member in order to convince the rest of the members of the team of his/her ideas [6] and boosting the abilities and skills of each team member in order to connect their ideas and experiences with the decisions which the team has to make [6]. Furthermore, the students who belong to a team learn to make decisions by concentrating on the essential characteristics of the information which they receive and on the central implications of the decisions which they must take [12]. On the other hand, with the techniques of strategic management simulation, the students think about how knowledge within the team should be distributed [13], about the need for discussion and communication within the team [14, 15] or about the type of experience and knowledge which each member must share with the rest [15, 16]. Other than that, strategic management simulations encourage the skills and abilities of each member of the team for drawing up conclusions and describing the phenomena which are produced by the making of team decisions [6].

Consequently, this 'virtual learning-by-doing' technique allows students to go on improving their global teamwork knowledge, skills and abilities. This argument allows us to formulate our first hypothesis:

H1. The teamwork knowledge, skills and abilities (teamwork KSA) of students will improve after participating in a strategic business simulation.

In the same manner, the way in which knowledge is distributed within a team has an influence on how this knowledge will be distributed [17, 18]. If the students perceive different levels of knowledge, skills and abilities concerning how they have to work in the team, they will have a greater need to share knowledge [19].

Teams with members who lack the type of knowledge, skills and abilities to work in a team will be less effective in whatever learning process [15, 16]. This statement is based on the fact that the team members will not be able to get the knowledge which they need in order to learn to work in a team [20, 21]. In consequence, the second hypothesis is proposed:

H2. The teamwork KSA of students have the potential to increase; the less dissimilar is the prior teamwork KSA among members.

3 Methods: Course Design and Variables

In the vein of numerous research studies which have used a similar methodology to design the strategic management simulation [15, 22], we conducted a quasi-experiment (because random assignment was not feasible). To evaluate the hypotheses, we used a treatment (team strategic management simulation students, n=45) and a control group (n=24) and administered both pre- and post-test measures to determine if the strategic management simulation made a significant difference in teamwork KSA. Specifically, an untreated control group design was employed. All students were involved in the same corporate strategy course. The students of the control group were only contacted for both the pre- (Time 1) and post-test (Time 2).

Following the suggestion of [23] we did not allow teams of more than four members, since it was considered the ideal size for the practice. In this way, potential opportunistic behavior among the members of the team is minimized and team learning is enhanced. Once the teams were formed, we start the real "game" with the students and ten weeks elapsed between the arrangements of the teams until the end of the strategic management simulation.

A widely accepted strategic management simulation software program *–The Business Strategy Game* 6.0.- was used [24]. This business simulator confronted each team of students with the 'virtual strategic management simulation' of a multinational firm devoted to the highly competitive business of sports shoes, requiring decision-making related to different areas of the firm: production, finance, marketing and labor.

Next, we describe the measurement of the variables use to estimate our model.

Teamwork KSA: The measurement of the teamwork KSA was carried out by means of the Teamwork KSA Test designed by Stevens and Campion [2]. Internal consistency reliability (α) estimates were 0.68 at Time 1 (*KSAi1*) and 0.75 at Time 2 (*KSAi2*), which are consistent with the values reported by Stevens and Campion. Test-retest reliability, based on data obtained from students in the control group was 0.72.

The evaluation of the prior knowledge of the full team about teamwork KSA was carried out with the aggregation of the team members' data as recommended by [25], so prior knowledge of the team was measured with the average of the teamwork KSA – $\overline{KSAt1}$. To evaluate the dissimilarity of knowledge among members of the team, we use the standard deviation of the teamwork KSA *–σKSAt1.*

Control variables: As control variables, we used the characteristics of the individual which, traditionally, the literature considers affect the students' learning [5, 26]:

- The intelligence of the students was measured by means of an IQ test – *INTi1*-.
- The personality of the students which was measured on five variables by means of the Saucier cognitive skills scale [27].

Two students motivational features were taken into account, given that they have been shown to be relevant in explaining individual learning processes [5, 28]:

- The attitude of the students which was measured with the scale of attitudes to teamwork –*ATTi1* – proposed by [5].
- The perception regarding the teamwork self-efficacy – *USEFi1* – which was measured using the scale proposed by Ebby and Dobbins [29].

We also controlled for the characteristics of teams, specifically, we consider:

- The average level of intelligence of the team – *INTt1;*
- The average type of personality of the team –*AGRADt1, –CONSCt1, –EXTVt1, –EMOTi1, –OPENt1;*
- The average attitude of the team towards teamwork –*ATTt1;*
- The average perception of the team about the teamwork self-efficacy –*USEFt1*.

4 Results

With the aim of verifying our first hypothesis (H1), we proceed to a Paired Samples T Test carried out on the 45 treatment group's students both in Time 1 and Time 2 (no significant differences were found between KSAi1 in the treatment and control group in Time 1). The results support H1: students improved their teamwork KSA (the average value of the *KSAi1* before the simulation is 20.57 and the value after taking part in the business game –*KSAi2*-is 21.78) with a significance of 0.005 (Table 1). We were surprised by the decrease of the teamwork KSA of the students in the control group. A possible explanation is that students in the last year of their studies tend to be more individualist than previous years because they are about to go to job market.

Table 1. Summary of mean group differences on teamwork KSA

VARIABLES COMPARED	Mean	N. students	t (sig. 2-tailed)
Treatment group			
KSAi1 *KSAi2*	20.57 21.78	45 45	2.92 (0.005)
Control group			
KSAi1 *KSAi2*	21.46 17.33	24 24	-2.93 (0.005)
Treatment and control group			
KSAi1 (*Treatment group*) *KSAi1* (*Control group*)	20.57 21.45	45 24	2.68 (0.106)
KSAi2 (Treatment group) *KSAi2 (Control group)*	21.78 17.33	45 24	50.14 (0.000)

We evaluate the second hypothesis (H2) regarding the importance of teamwork KSA knowledge distribution within the team ($\sigma KSAt1$) in the student's learning process (Table 2). Model 1 explained 44.6% of the variance of final teamwork KSA (F=3.393). Results do not support H2: student's prior knowledge (β=3.03, p<0.01) was found to have a significant positive impact on the learning process of teamwork KSA, however neither the average prior knowledge of the team – $\overline{KSAt}1$ - (β=–1.47, p>0.1) nor its dissimilarity within it –*σKSAt1*- (β=0.79, p>0.1) have any significant influence on the student's learning. That is to say, it seems that the composition of the team relative to its prior knowledge has no influence on the student learning process.

In Model 2 we controlled whether the prior features of the team (*INTt1; AGRADt1, CONSCt1, EXTVt1, EMOTt1, OPENt1, ATTt1* and *USEFt1*) had influence on the student's learning process (Table 2). The results of the regression analysis (R-square=0.539, F=1.228) demonstrate that the prior conditions of a team do not condition the student's learning process.

Table 2. Repeated measures multiple regression analysis beta weights

Dependent variable: *KSA*i2	Model 1 Without control variables		Model 2 With control variables	
*KSA*i1	3.03 (0.004)	***	3.07 (0.004)	***
$\overline{KSAt}$1	-1.48 (0.148)		-1.19 (0.243)	
σ*KSA*t1	0.79 (0.433)		0.70 (0.488)	
USEFt1			-0.04 (0.970)	
INTt1			-1.60 (0.119)	
ATTt1			-0.02 (0.984)	
AGRADt1			-0.89 (0.377)	
CONSCt1			-0.04 (0.965)	
EXTVt1			-0.03 (0.972)	
EMOTt1			0.54 (0.591)	
OPENt1			0.05 (0.962)	
C	3.37 (0.002)	***	1.72 (0.095)	*
N	45		45	
Test F (p-value)	3.39 (0.027)		1.23 (0.308)	
R-squared	0.45		0.54	

Note: t-values are presented in parenthesis. Significance levels: *** p<0.01, ** p<0.05 and p<0.10.

5 Discussion

The learning-by-doing techniques prove to be very useful for getting students not only to develop the cognitive part of their learning but also the behavioral features. In the case of the learning of teamwork KSA, these types of quasi-experimental techniques are particularly appropriate. Thus, making the students learn to work in a team while working in a team allows them to get to know the *best practices* from the mistakes and successes of the team.

One advantage of this type of learning is that the decisions taken by the students were not binding on a real company and, therefore, the learning did not place at risk the survival of any firm. A second advantage is that the students were immediately able to observe the negative consequences for a firm of making decisions which were not coherent with the resources and capabilities of the firm and with the environment in which it operated. The third advantage is that the students had to make team decisions and, therefore, they had no choice but to operate as a team, resulting in a process of learning of teamwork KSA.

Thus, the results of our study indicate that the teamwork KSA can be learnt and, moreover, the technique of strategic management simulation appear to be appropriate so that this learning takes place quickly and effectively. Equally, the student's learning process is highly dependent on their prior knowledge. At the same time, it is shown that the features of the student related to their personality, intelligence or motivation are not decisive in this process; neither can they be considered as restricting the learning process. Further, even the characteristics of the team in which the student performs his activity do not turn out to be obstacles for the student's learning process to take place.

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The Digital Board in a University Setting: Two Real Cases in Europe and East Africa

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Abstract. Usually the digital board is thought of as a tool that can only be used beneficially in the context of primary school, secondary school or in a situation of learning handicap. In this case study we want to highlight how the new tools can be used in more broad settings such as teaching in scientific and technical universities. The easy adoption of all useful software on the market to the use of these tools makes them an innovative element in the teaching techniques of the future.

Keywords: Digital whiteboard, advanced teaching tools, repository.

1 Introduction

The paper explores the use of advanced innovative technology in the classroom for effective teaching and learning. The digital whiteboard tool is a flexible and powerful didactic instrument that can greatly enrich the experience of both the learner and the teacher. This paper presents one completed real case in Italy and a work in progress case in Kenya.

2 The Project

The initial aim of this project was to show the advantages of adopting a new set of tools for classroom teaching, in particular, teachers explore the use of interactive whiteboards and associated software to evaluate the true effectiveness in terms of improvement of training specifically aimed at students with disabilities. The number of students attended to by the University Disability Service of the University of Modena and Reggio Emilia is equal to about 1% of total students enrolled, which makes it even more significant when compared to the national average of 0.5%. This fact was also an incentive for trying to increase the quality of service provided.

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A further objective was to introduce a major technological innovation in the teaching of university courses, usually associated with fairly rigid patterns of presentation that hardly suit the needs of disabled students and more generally a little weak in supporting learning.

In particular it was decided to introduce new teaching aids such as digital whiteboards which can also store additional content during the frontal exposition by the teacher, store the teacher's classes, usually in Microsoft Power Point or non-editable PDF format.

The project was implemented according to previously established implementation steps and in particular:

1. Identification of appropriate technology.
2. Identification of the classrooms to equip (2 for each Faculty)
3. Drafting the contract
4. Construction of classrooms
5. Initial training targeted at each faculty with groups of up to 20 people
6. Continuous training based on the presence of certified internal trainers
7. Creation of an automatic repository for distribution of material to facilitate the distribution of digital lessons. (Developed by the Computing Center of the University)
8. Direct control of the distribution policy and manual submission of the material in the classroom by the teacher in order to maintain control over what you want to distribute
9. Export this experience to other universities or contexts, in order to increase understanding about the benefits in more real life cases

The first stages was reached by a close collaboration between Faculty Teaching Coordinators, Disability Services Office for disabled students, and technical staff responsible for supporting new technologies in order to identify classrooms to equip according to the usage and the practicability of an installation that is non-invasive to traditional teaching. The goal was to introduce a new method and not to replace one considered obsolete by some and yet for many still much more effective.

It was thus decided to use both by placing the digital whiteboard next to the standard board to allow gradual use.

To avoid the setting up of the PC for each use, the machines were installed in the vicinity of the digital whiteboard, wall mounted in armored cages without adding peripherals such as mice or keyboards. If need be, wireless keyboard and mouse could be used.

The decision to put two digital boards in the same faculty was made because of the following purposes:

i. *Fault Tolerance:-* To have continuous operation in event one encountered technical problems (that has not occurred since).
ii. *To encourage the use of the tool among teachers:-* It is known that in the introduction of new technology there is always an initial exploratory phase in which the first steps are made with a little fear into the tool, and then begins a stage more "competitive" between the instrument and its user. This was in

addition to creating a desire to share the experience with colleagues as the stage of insertion is typically more delicate.

iii. Having two large enough classrooms with digital whiteboards enabled the sharing of these resources with no initial conflicts in timetabling between teachers involved and creating curiosity and interest to those who had not yet approached the instrument.

After the drafting of the contract, the Computer center immediately began the analysis and implementation of the Repository in order to have the application up and running at the same time that the classrooms were equipped and ready. The repository was structured to create a folder for each faculty and dividing the contents of each in sub-folders, one for each course curriculum.

Access is via authentication using the credentials of the student. In this way a student has access only to the course materials related to their curriculum.

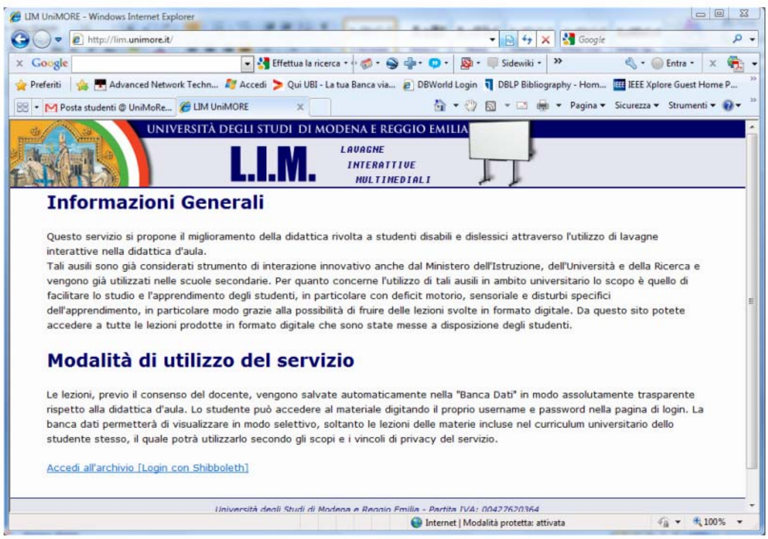

Fig. 1. Web page of the L.I.M Repository http://lim.unimore.it

To do that it was necessary to ascertain the specifications of the machine suitable for digital whiteboard and their location. Also it was necessary to ensure that no one could access the system without authorization, and that access to the new technologies does not require the assistance of a technician.

University technicians tied the use of the dedicated machine to the presence of a "certified" flash to the whole system's USB port. At the point of inserting the flash disk, the unit turns on automatically and the saving of the lessons presented in a specific folder either for publication or not are sent to it.

The idea of associating the serial number of the USB key (unique for each device produced in the world) was born to automate the writing and saving files in a simple way by the teacher and without adding information or work to the technicians to catalog all files in a second time before placing them in the database of lessons. On saving the lesson(s) on the network drive, the teacher has permission to publish the saved file directly in the folder of the course he/she teaches relevant to the rights they have, as explained in the description of the repository.

The identification of the user has an additional advantage in terms of transparency of the instrument: it is known that the PC market provides different operating systems, each of which must not be neglected to avoid having the initial disaffection towards the use of the instrument by the teacher.

To remedy this, the project was implemented using different virtual machines on an Apple system.

In accordance with the preference of the teacher (associated with the serial number of the key) an operating system is selected automatically at the start-up according to the request of the teacher certification made at the time of the key registration.

Enabling-disabling the key is the only operation required of the technician (one from each faculty) in addition to the normal operation of the equipment present. This happens in a few minutes using a simple program specifically implemented by the university's computer center.

3 Training

The training was custom designed for each option so that only 20% of initial training (about 3 hours total) was used to familiarize with the new tools and how they can

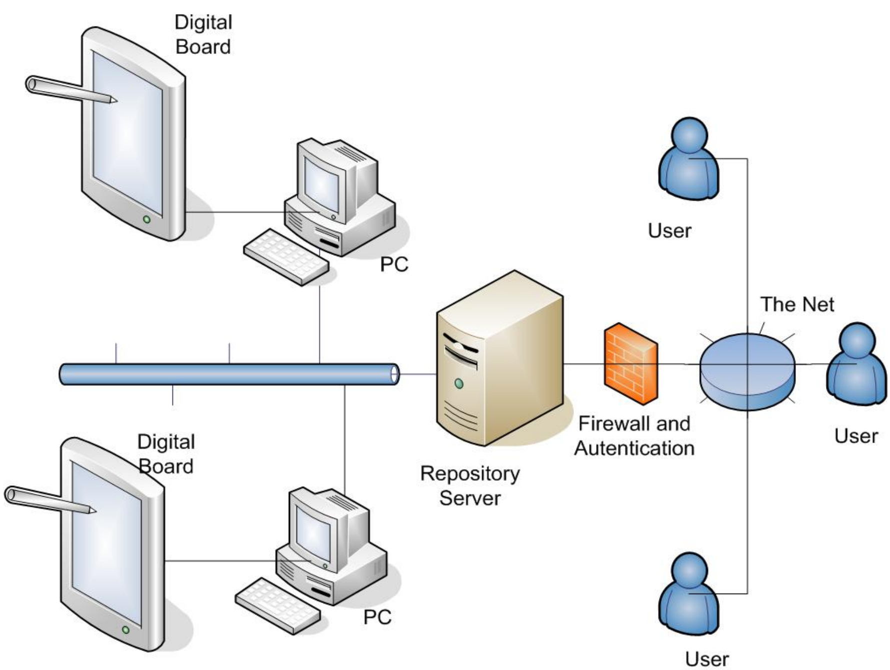

Fig. 2. Representation of the system devices connections: from Digital Board to the End Users

publish the lessons. The rest was used to adapt innovative teaching to the needs of the teacher in explaining the topics. After an exploratory phase of the instrument was done to familiarize and techniques through learning-by-doing with the most valuable applications for the 'teaching of the interested parties, passing from the traditional to the one with standard software programs and then reach the 'use of multimedia such as movies or audio files.

4 Innovation

A strong innovative content was found when it was noticed that teachers would have wished in some cases to avoid using the digital whiteboard in the usual way or by means of presentation, going over to use the whiteboard linked to technical software like CAD or simulation programs by integrating the possibility to take visual notes, along with diagrams, and notes due to the flexibility that the digital whiteboard provides.

An example can be seen in Figure 3 where the notes were made directly in the classroom during training and off-line.

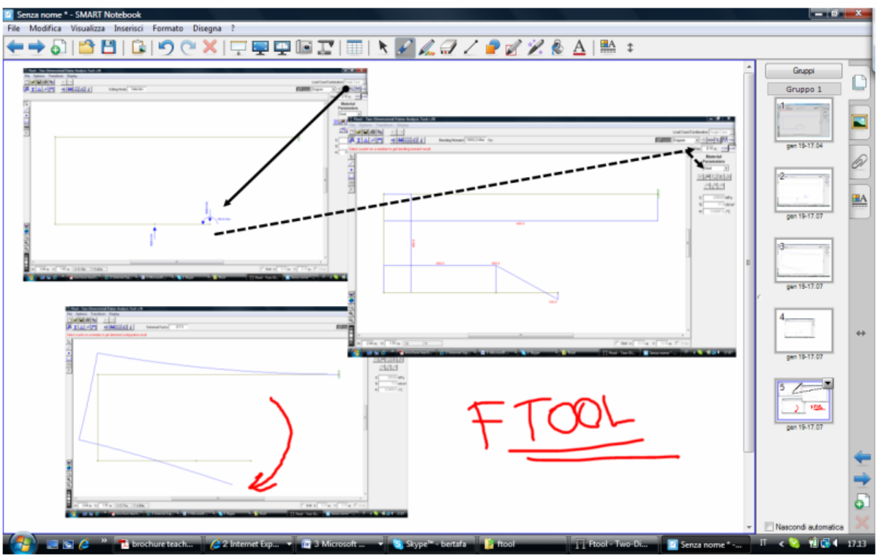

Fig. 3. Summary of a little storyboard of a specific engineering software (FTool). The digital whiteboard increases the teaching effectiveness and becomes an enhanced interface to explain and discuss with the classroom in an interactive mode about real cases and examples.

5 Conclusion

What had been thought for 1% of the students brought a benefit across the board. Several teachers have gradually begun to use new educational materials not only to improve the focus and effectiveness of instruction, but also stimulate a strong demand by students of the course material so obtained which allows a more complete reading

Fig. 4. A typical digital whiteboard installation: note the presence of the traditional blackboard and the installation of the PC fixed to the wall on the left

of the topics addressed in the classroom. The increased motivation of students is palpable and some lessons on a trial basis were also made with audio support. All this was achieved without the presence of a technician in the classroom to support the new technology.

The introduction of new technologies in education requires a careful assessment of the impact it has on the teaching itself: the need for easy accessibility and easy use of new tools must take priority over everything. A teaching tool that is placed before the teacher that is invasive, impacts negatively on the performance of the teacher and hence on the quality of his teaching.

Finally, both the initial training that the subsequent training support for using advanced instrument should not be generalized but tailored to the needs and the use to which it is put.

6 Future Work

The passion and strong interest in new advanced techniques of instruction in addition to cooperation agreements between the University of Modena and Reggio Emilia and Masinde Muliro University of Science and Technology in Kenya, the staff of the two universities will evaluate the possible implementation of the project at the Kenyan university. In this case the benefit will be even greater as it will help reduce the cost in the use of white printable paper in this region. That can be avoided by sharing the lessons in softcopy by mailing list or USB flash disk.

In addition, Kenyan University registers a dismally low enrollment of the disabled pursuing higher education. This instrument might be used as a boost to having an improved presence if it is used across the board notwithstanding the level of learning (i.e. primary, secondary, tertiary) institution.

To make the fastest possible integration of the digital whiteboard in MMUST as expressed by their interest on the instrument, a staff member of Modena was hosted by the University in Kenya to find the best strategies and implementation modalities in the introduction of the new technologies.

E-Learning across Cultural Boundaries: A European Perspective on Technology Acceptance

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Abstract. This study starts by questioning the e-learning transfer between countries by merely translating the text into a different language. We apply and thus verify the Unified Theory of Acceptance and Use of Technology (UTAUT, [1]), which has not yet been sufficiently empirically validated [2]. Our bi-cultural sample encompasses N = 732 undergraduate and graduate students aged under 30, from Romania and Germany. As a first result, we offer empirical evidence for UTAUT on a wider basis. Secondly, we extend the UTAUT model by the moderator geographic location; the acceptance mechanisms appear to be different in the two sub-samples. Thirdly, a cluster analysis confirms the intercultural differences in the technology acceptance variables. Finally, we conclude that the transfer of e-learning concepts and contents from the old to the more recent EU member countries requires much more than simple translation; acceptance factors are a first aspect to consider.

Keywords: Technology acceptance, UTAUT, intercultural factors, e-learning.

1 Introduction

A social and political phenomenon as large and complex as the extension of the European Union, which took place around the year 2000, induces changes in the learning culture of the involved countries. Amongst numerous aspects, e-learning concepts, models and especially commercial contents are transferred from Western countries, where they had been developed and evaluated, to the new EU countries. Often, this is done by merely translating the contents from one language (mostly English) into another. This poses the question whether such a transfer is legitimate from a psychological and educational point of view, or if the difference in the geographical location and culture may interfere with the desired effects of e-learning. A particular aspect that is susceptible to change with the cultural context is the learners' acceptance.

To analyze the acceptance of learning technologies, we use the Unified Theory of Acceptance and Use of Technology (UTAUT) as formulated by Venkatesh and colleagues [1]. The empirical evidence is, according to Straub [2], not yet sufficient to

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validate the UTAUT model, so the first aim of this study is to base the UTAUT on a representative sample. Further, our sample is situated in two cultural contexts, i.e. in a Western European country, Germany, which is a founding member of the EU, and a Southeastern European country, Romania, which joined the EU in 2007. Thus, the second aim of the study is to search for differences between the two countries in respect of the learning technology acceptance. The geographic location will thus be an additional moderator variable that may be integrated into the UTAUT model. If there is evidence for significant intercultural differences within the acceptance factors, then we may conclude that the transfer of e-learning concepts and contents must be based on more than a simple language translation.

We begin with a presentation of UTAUT and its predictors of the technology acceptance. Subsequently, we discuss some particularities of the large-scale adoption of computers in the Romanian higher education, and its possible effects on the technology acceptance factors as drawn in the UTAUT. The empirical part of our study includes the validation of the UTAUT model on a relatively large, international sample by means of multiple regressions and cluster analysis. Relying on significant differences between the Romanian and the German sub-sample, we conclude that the transfer of e-learning models and contents has to first consider the intercultural differences in the acceptance mechanisms.

2 Acceptance Theories and the UTAUT

Technology acceptance theories refer to users' decisions to adopt or refuse new technologies; this further comprises developing a positive attitude towards technology, developing the intention to use, and finally using the technology in question. The roots of these theories lie in the social psychology. One of the most influential theories explaining technology acceptance is the social cognitive theory [3], according to which individuals can learn both from their own and from others' experiences. Individuals' self-efficacy judgments related to experiences with technology are likely to sustain their positive attitudes and their use of technology [4]. The vicarious experience of successful technology use may influence others either by means of direct observation or through mass media [2]. The compatibility between attitude and behavior is focused in the theory of reasoned action and its expanded version, the theory of planed behavior [5]. According to this, human action is guided by three factors: beliefs about likely consideration of the behavior (behavioral beliefs), beliefs about the normative expectation of others (normative beliefs), and beliefs about the presence of factors that may help or hinder the behavioral performance (control beliefs). In combination, the attitude toward the behavior, the subjective norm and the perception of behavioral control lead to the behavioral intention. The more favorable the attitude and subjective norm, and the greater the perceived control, the stronger the person's intention to perform the behavior in question should be. Given a sufficient degree of actual control over the behavior, people are expected to carry out their intentions when the opportunity arises.

The application of these theories in the context of technology adoption resulted in several theories, of which the most frequently studied in educational settings is the Technology Acceptance Model (TAM, [6]). TAM explains the individual attitude towards technology use as a result of the perceived usefulness and perceived ease. Further, attitude determines the intention to use, and the usage of technology. Teo [7] suggests, however, that the attitude construct does not contribute to the overall variance in usage, and may thus be unnecessary for the TAM. Venkatesh and his colleagues [1] criticize all the previous acceptance theories as being fragmented and lacking a cohesive model that accounts for the numerous acceptance factors. They formulate their Unified Theory of Acceptance and Use of Technology (UTAUT) as a synthesis of its predecessors, and explain thus approx. 70% of the variance in the behavioral intention and technology use behavior.

UTAUT postulates that three direct variables (performance expectancy, effect expectancy, and social influence) determine the behavioral intent of technology use. Besides, the facilitating conditions directly influence the usage behavior. The model integrates four moderating factors (gender, age, experience, and voluntariness of use) having varying influence on the primary constructs.

Performance expectancy is the degree to which a student believes that using technology will help to accomplish the various academic assignments at an average university. Venkatesh and colleagues [1] assume that performance expectancy is the strongest of the four constructs in his model. Complementary, the *effort expectancy* expresses the ease (or the difficulty) associated with the use of technology. *Social influence* measures the degree to which a student perceives that important others believe that s/he should use technology. *Facilitating conditions* are defined as the degree to which an individual believes that an organizational and technical infrastructure is accessible and supports the use of technology. As suggested by former studies, Venkatesh et al. [1] examined the role of self-efficacy and computer anxiety [3, 4] in the UTAUT model and saw them as being already present in the performance and effort expectancy, therefore excluded them. Being concerned with technology acceptance in Romania, we decided however for reasons explained below to examine computer anxiety as a potential additional predictor, too.

UTAUT is built mainly on the meta-analysis of previous studies, and on four studies carried out in various organizations with a total sample size of N = 215. According to Straub [2], “the UTAUT is still a relatively new model” and “has limited use in the research literature since its publication. Further validation and replication of the UTAUT model is essential.”

3 A European Perspective on the Acceptance and Use of Technology

For this study, we adopted an intercultural perspective based on the assumption that technology acceptance – as an attitude, i.e. sum of beliefs about technology – depends to a large extent on the experiences of individuals (themselves or their companions, in the sense of vicarious learning, [3]) over a longer period of time. Further, the quality of individual experiences will be influenced by the economic conditions. Economic wealth will substantiate in a sound technology infrastructure and a supporting environment; high performance, low effort, supporting social influence and good facilitating conditions will lead to higher technology acceptance. On the contrary, scarce economic resources will probably produce a deficient infrastructure and a hostile social environment; low performance, high effort, technology indifferent (or negative) social influence and poor support will lead to lower technology acceptance.

Being concerned with differences of technology acceptance between Romania and Germany, we observe the two countries as different contexts of potential or actual use of learning technology. (For the time being, we are leaving aside the differences in norms and values, which are directly determined by culture; these will be the subject of a further study.) Our target group consists of undergraduate and graduate students under the age of 30, i.e. born after 1980. Hence, the students from the Romanian subgroup developed under strongly different conditions as compared to the (Western) German subgroup.

As a former communist country, Romania suffered from poverty and isolation, which implied a restrictive access to technology. After 1990 the economical and social-political situation changed. Computers and the Internet were introduced in schools and universities, as well as in private life, so that in the 2000s a significant part of the younger Romanians – the students being primarily from this group – became familiar with information technology and probably e-learning, too [8, 9]. For example in 2004, 97% of the university students used computers and 95% used the Internet either at their university or at home. Besides, 70% of all the Internet users (aged between 15 and 35 and located in seven major cities of Romania) used it to communicate via e-mail, 68% to learn and 48% to search for study-related information. As key-qualification necessary "to get a good job", the computer skills were ranked in third place, closely behind the knowledge of foreign languages and the professional qualifications.

Among scholars, e-learning research became a point of interest, both in the computer science and in the educational sciences [9] in the late 90s. Thus, the large gap between Romania and Western Europe was reduced. However, there are, even now, persisting differences in the individual income, in the technological infrastructure of institutions (especially schools and state universities) and consequently in students' access to technology and e-learning. Considering these differences in the context of the UTAUT acceptance factors, we expect to find (a) small or no differences in the performance and effort expectancy, due to the proliferation of knowledge about the use of computers in new as well as in older member countries of the EU and (b) larger differences in the facilitating conditions, and computer anxiety, due to the remaining inequalities and the infrastructure problems.

Few available studies offer empirical evidence about the acceptance differences between countries (e.g. Great Britain vs. China in [10]). We are not aware of any intercultural studies on the entire UTAUT model. UTAUT is, however, relatively new, and empirical evidence is still necessary to validate it [2]. Especially intercultural data – needed to answer our initial question on transferring e-learning concepts between countries and cultures – is still lacking.

4 Research Model and Hypotheses

Our study aims at validating the UTAUT model on a large, international sample, and examining intercultural differences. Hence, we propose the following hypotheses:

H1: The variables performance expectancy, effort expectancy, social influence, and facilitating conditions have a positive influence on behavioral intention and use behavior. The variable computer anxiety has a negative influence on behavioral intention and use behavior.

H2: The geographic location (Romania vs. Germany) moderates the influence of the acceptance predictors (performance expectancy, effort expectancy, social influence, facilitating conditions and computer anxiety) on behavioral intention and use of learning technologies.

H3: The learning technology users can be classified in clusters that differ in terms of acceptance and its predictors. The clusters will correspond with the two countries, in which the study was conducted. Romanians are lower in facilitating conditions, and higher in computer anxiety than their German counterparts.

5 Results, Conclusions and Future Work

We studied a relatively large sample of N = 732, balanced in terms of gender and profession, consisting of graduate and undergraduate students aged between 19 and 30. We tested the UTAUT model on a German (N = 493) and a Romanian (N = 239) subsample, searching for intercultural differences. The research instrument consisted of a Romanian and a German translation of the questionnaire proposed by Venkatesh et al ([1], p. 460). Aimed at surveying students' general intention towards technology as known from their previous direct or vicarious experience, the questions were generally related to "the computer as a learning tool", not to a more specific technology. In Romania, the survey was partially conducted online, partially using pen-and-paper forms; in Germany it was done entirely online. The participation in the survey was voluntary.

Our results confirmed all three hypotheses and, at large, the UTAUT model; the five predictors could explain however only approx. 40% of the variance in the behavioral intention and 15% of the variance on the use behavior (H1). As a first extension of the theory, we conclude that the UTAUT does not only apply for the use of specific, but also for generic learning technologies. This may be a reason for the relatively low explained variance; we expect this to become higher when specific technologies are questioned.

A second extension of the theory resides in the international validation of the model. UTAUT was verified for the entire sample; at a closer look, the two subsamples displayed different acceptance mechanisms (H2). The social influence and was the only predictor with a roughly similar influence on technology acceptance in both samples, other factors were different. The strongest acceptance predictors were the performance and effort expectancy for the German participants (which corresponds with the findings of Venkatesh et al. [1]), while the facilitating conditions and the computer anxiety mainly determined the acceptance of the Romanian participants. Therefore, we propose to extend the UTAUT by also including computer anxiety as a fifth predictor with a direct influence on the use behavior (similar to the facilitating conditions).

The cluster analysis confirmed the hypothesis H3 by classifying the Romanian and German participants into different clusters. This reinforced the intercultural differences presented above.

Returning to the initial question, whether e-learning models and environments developed and evaluated in Western countries can be transferred to other countries and cultures by merely translating their contents into a different language, our answer is no. We found empirical evidence that the acceptance mechanisms are very different from country to country. Even if the mean values of the acceptance factors may be everywhere the same with young people, there may be nevertheless persisting, essential differences with older learners. This requires careful consideration of the cultural differences when designing e-learning.

Future work includes the further analysis of the collected data with a focus on the original moderators of the UTAUT model (i.e. gender, age and computer experience). Further, we continue the study on a similar sample, however, with older participants, in order to explore the mediation of the UTAUT interrelations by age in interaction with the geographical location and gender. Finally, the UTAUT variables will be observed in correlation with detailed cultural data collected from the two countries.

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Using Collaboration Strategies to Support the Monitoring of Online Collaborative Learning Activity

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Abstract. This paper first discusses the importance of online education and highlights its main benefits and challenges. In this context, on the one hand, we argue the significance of monitoring students' and groups' activity in an online learning environment. On the other hand, we analyze the informational needs that should be covered by any monitoring information system. Finally, the paper goes a step further by proposing the use of collaboration strategies as a manner to improve monitoring and learning processes in computer-supported collaborative learning.

Keywords: Monitoring Online Learning, Collaboration Strategies, Computer-Supported Collaborative Learning.

1 Introduction

Online learning platforms provide useful possibilities in the new educational paradigm in which students are the active and the main responsible of their own learning process. Among other possibilities, students can use these learning platforms to obtain the course core materials, to carry out self-assessment tests or to perform individual and collaborative learning activities. Moreover, these online platforms offer further complementary educational resources and interactive ways of communication. Accordingly, teachers and instructors are responsible for designing the courses, guide and provide assistance to the students.

Online education offers some significant advantages both to students and instructors. For instance, it allows students to freely fix the learning timetable according to their time limitations and requirements, have a flexible schedule and be also part-time students. They are encouraged to develop their autonomous work with all educational resources available in the platform [4]. It also favors a more interactive communication among students and between students and instructors. Consequently, collaborative and working-group activities are encouraged. Moreover, it promotes continuous evaluation processes through self-assessment tests, individual and group activities and projects, etc. [10]. Finally, e-learning technologies contribute to the

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development of technical skills and provide multiple representation of information, while technologies can help to significantly reduce the gap between theory and practice [13].

At the same time there are some important challenges and difficulties associated to the use of online learning platforms. On the one hand, there may be different levels of online and Internet skills among students of different age [6]. Consequently, students may have technical difficulties to properly follow the course [16]. The authorship veracity of the assignments and tasks developed by the online student is also a relevant problem [13]. On the other hand, online learning programs present higher dropout rates than face-to-face education programs [17]. Consequently, interactive communication needs to be facilitated and continuously encouraged by instructors. Moreover, instructors should provide just-in-time guidance and assistance to students' activities as well as frequent feedback and assessments on these activities [8]. This paper focuses on the latter issues.

2 Why Monitoring?

As some authors have pointed out [14,15], in face-to-face learning environments instructors are able to obtain feedback on students’ learning experiences throughout face-to-face interactions with them, which facilitates a continuous evaluation of their teaching activities and programs. Thus, monitoring activities involve observing students’ behavior in the classroom and evaluating the effectiveness of pedagogical strategies throughout a continuous and visual feedback. However, in online environments this informal monitoring process is not possible and, therefore, instructors must look for other ways to obtain this information. To a great extend, this explains the growing interest in the analysis of the data collected by web servers in e-learning environments. On the one hand, monitoring online students’ and groups’ activity can help anticipate problems such as students not participating in the proposed learning activities or even dropping out the course [8] as well as possible internal conflicts in groups with unbalanced distribution of tasks [7]. Also, this process provides clues to instructors about how to improve courses’ website, materials and even the communication process among all participants [1,2]. On the other hand, students can also benefit from this monitoring process, since they can have periodical feedback regarding their performance level as compared with the rest of the class [8]. These monitoring reports can have a significant and positive influence on student motivation as well as a positive impact on the final performance [7, 12].

Though the development of an information system for monitoring students’ and groups’ activity in an online environment is not a trivial task., it is a necessary endeavor, since it is otherwise very difficult and time consuming to have a clear vision of each student academic progression during the course.

3 Critical Information

A first critical step in developing a monitoring information system is to determine which information should be available for each potential user. According to [14], it is possible to distinguish different actors as well as different information requirements:

- *Information oriented towards instructors*. Instructors should get more objective feedback in order to evaluate both the structure of their online course and its effectiveness on the learning process. Doing so, they can achieve better learning outcomes [1,2], such as find both the most effective and ineffective tasks; classify students into groups based on their guidance needs and their performance; personalize and customize courses as well as establish specific learning paths for each student or group of students; and, anticipate students with problems or even students at risk of dropping out the course.
- *Information oriented towards students*. Students receive recommendations about good learning experiences and specific suggestions based on their own previous activities and tasks or on the ones of their peers with a similar profile. Also, students should have access to reports regarding their performance as compared to the average group or class level [8]. Some empirical evidence has shown a positive influence of periodical feedback in student motivation and their final performance [10] as well as in the rate of dropouts [7].
- *Information oriented towards academic managers*. The purpose here is to have parameters for improving courses' quality in the mid- and long-term. This information should help educational institutions to gain a better organization of human and material resources, and to improve the overall quality of their academic offer.

After identifying the different agents and their informational needs, the information that should be provided through monitoring is classified according to three general criteria: background data, academic activity (access data and use of learning resources) and academic performance:

- *Background data* offer personal information about each student profile. Part of this information can be known previously such as gender, age or academy background, while other can be obtained through a short survey when the course starts (internet and computer skills, time availability, etc.).
- *Academic activity* collects all the information about the access data and the use of different learning resources. Online platforms usually record data about students' actions and interactions into log files and databases [14]. Students' usage statistics are often the starting point for evaluation and monitoring in an online e-learning environment [18]. During the online course, students carry out different activities: they post or read notes in forums, send or read e-mails, upload or download documents, send reports, complete self-assessments, etc. Each of these activities can be considered as an event of a certain type which has been carried out by a particular student at a certain time and web space.
- *Academic performance* is closely related to the web-base assessment. [11] suggested that assessment in online learning environments should integrated to instruction, be continuous and maximize feedback. Also, online assessment might help students in taking ownership of their learning and offer immediate and effective feedback to them. Then, online assessment systems could have more potential than paper-based assessment systems in terms of access and flexibility for students as well as for instructors. On the other hand, many online learning processes include team assessment task such as presentation,

projects, case studies, reports, debates, etc. An issue in collaborative learning is to improve fairness of team assessment, which is essential to improve students' learning from team tasks [5]. Consequently, if group leaders and group non-participant members could be identified, it could be possible to offer different rewards for different contributions in the team assessment.

Regarding the characteristics and requirements that this information should meet, we consider the following basic principles:

- Information should be relevant and easy-to-understand for instructors and students. Use of visual graphs and figures could provide immediate and easy interpretation of the desired information. In some cases, however, a more deep statistical analysis using data mining techniques may be needed.
- Information should be generated and transmitted personally and automatically by the system without any additional efforts from instructors.
- Information should be obtained just-in-time (e.g., weekly reports or after each assignment) and it should be directly sent to instructors and students by the system (email, RSS, etc.). Otherwise, it will not be possible to react on time and to find solutions to problems in advance.
- Information should be personalized according to individual profiles (e.g., students may receive a personalized feedback regarding academic activity and performance), link aggregated and individual information and easily contact an individual student or group with similar characteristics.
- Information must be useful for both instructors and students, e.g., for making decisions. As for instructors, information should allow them to look for students at risk, with low activity levels and underperformance results, and for groups with unbalanced distribution of activities and tasks, and provide them just-in-time and personalized guidance. A course analysis could provide a quick detection of possible problems. As for students, information should let them know their performance level as compared to the average class level and possibly to the other groups that participate in the same online course.

4 Monitoring CSCL

An effective monitoring and evaluation approach of Computer-Supported Collaborative Learning (CSCL) should include both the collaborative learning process and its individual and collective outcomes. The first one is considered as the most laborious and demanding task, since participants (both the instructor and the students) should take several elements and factors into account. In our opinion, the monitoring and evaluation of the collaborative learning process should be done by structuring it through the use of well-defined collaboration strategies. These strategies can be proposed and described by either the instructor or the learning group itself and they aim at clearly specifying the tasks that the group has to carry out following specific steps and actions. The result of this approach is that participants know at any moment in which point of their process they are, what kind of actions they have taken, are taking and need to take further in order to accomplish their tasks, so it becomes easier for any participant to control and intervene accordingly when it is necessary.

Collaboration strategies are used to improve students collaborative work, overcome their limitations and problems due to false perceptions and lack of experience in such settings, combat their fears and negative attitudes, help them acquire specific skills/ knowledge to collaborate effectively, guide them to best use and exploit the different online tools that support their work, and finally orientate them to adapt themselves to the reality and the true conditions of their situation in the best possible way.

To this end, it is necessary to allow the instructor to provide the students a set of representative context-free collaboration strategies and ask them to make the best use of these so that they build a full, flexible and effective collaborative context within their group which will lead them to a successful realization of their tasks. A detailed description of such strategies has been described by [9]. For the sake of example, some of these strategies, and the learning objectives they achieve, are the following:

- *Brainstorming*. It focuses on the generation of a large number of ideas for the solution of a problem.
- *Student Teams Achievement Divisions (STAD)*. It motivates students to encourage and help each other, while at the same time accelerates their achievements.
- *Jigsaw*. It emphasizes interpersonal inter-dependence while allows groups to get to know a topic in depth, by making individuals become experts on a sub-topic and teach each other until the whole topic becomes familiar to any member of the group.
- *Group Investigation Method*. It promotes the use of learning activities that can be explored and approached through different ways by students.
- *Co-op Co-op*. It enhances collaboration by means of discussion, open-ended problems and activities, problem decomposition into suitable individual tasks, and composition of the group solution through discussion.
- *Guided Reciprocal Peer Questioning*. It encourages discussion and critical thinking through open-ended questions.
- *Three Steps Interview*. It enhances team building and in-depth understanding of the topic that students deal with through their engagement into an interview and role-playing.
- *Paired Annotations*. It promotes cooperative learning through accountability and positive interdependence (students discuss key issues, exchange ideas and questions, look for differences, comment and prepare a common attitude and treatment of the subject matter.
- *Double entry journal*. It gives students the ability to unfold their thoughts regarding a topic which help them concentrate on important terms and develop critical thinking and knowledge.

Each group of students studies and analyzes the given collaborative strategies so that to understand their goals, functioning and use as clearly as possible. Students may also search for more information in literature, if necessary. The analysis of each collaborative strategy takes into account the students' ideas, preferences, goals, attitudes and perceptions, as well as their particular styles, skills and knowledge. Students should be fully aware of the benefits and limitations of applying a strategy in real collaborative settings. At the end of this process, students are able to choose a collaboration strategy that best fits the dynamics and idiosyncrasy of their group.

Each group should then use the selected strategy to structure its interaction by specifying in detail the steps and actions which the group will follow during the whole process of collaborative work. More specifically, each step of the strategy will have to specify explicitly the goals it sets: which is each member's role; what each group member will do, that is, the tasks that a member will undertake to fulfill; how he/she will carry them out (e.g., through which tools, methods, etc); how he/she will collaborate with the rest of group members; and, which is the role that the various discussions (in forums and chats) play when they are performed within the group.

All this information can be captured and represented in the form of a script. In the field of computer-supported collaborative learning (CSCL), scripts are designed to support collaboration among distant learners or co-present learners whose interactions are (at least partially) mediated by a computer. The rationale of scripts is to structure collaborative learning processes in order to trigger group interactions that may not occur in free collaboration [3]. Scripting the details of a collaboration strategy, as described above, offers an effective way to structure group interaction, while allowing flexibility since it lets students make choices among the various options they have in each strategy step in order to accomplish a task/goal in the best possible way.

5 Conclusions and Future Work

This paper addresses an important issue: the importance of on-line education and the adoption of a student-centered approach pointing to the significance of monitoring online students' and groups' activities, and proposing the use of collaborative strategies as a framework for improving computer-supported collaborative learning. This approach has been applied to a real online classroom using a distance learning platform and other auxiliary tools (such as the Cmaptool, a Wiki tool) to achieve these goals. Though the initial experience showed promising results (the students' satisfaction and performance were clearly higher than before), several questions need to be still addressed in the near future: application of the approach to relatively large numbers of students, with varying knowledge and motivations, and pressures on teachers' time; adequate preparation of students, a more complete integration of software supports and activities into the curriculum; and a participative follow-up of the outcomes of the activities. Further work is in progress which is expected to provide a more complete solution to this issue and the afore-mentioned questions.

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Knowledge Construction with Social Web Tools

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Abstract. This paper examines knowledge construction in a distributed learning environment supported by social web tools. Research data was gathered from online asynchronous discussions in a first-year Masters Degree course in Multimedia in Education. Our analysis was modeled on Gunawardena, Lowe and Anderson's (1997) study and results indicate that, despite a significant percentage in the phase of sharing and comparing information, interaction at the highest levels of knowledge construction is relevant and suggests that knowledge was constructed.

Keywords: Social Web, Knowledge Construction, Interaction Analysis.

1 Introduction

The use of social Web tools for learning has become quite common since systems like wikis, forums, blogs and other social networking sites became easily available, widespread and user friendly. Adding to this, modern learning theories have emphasized the significance of social interactions fostered by these tools for the quality of learning. Furthermore, interactions sustained by such tools provide a reliable database which can be processed to analyze, among other processes, knowledge construction.

According to several researchers, one of the most powerful research methods to analyze knowledge construction is content analysis of communication transcripts, and many have attempted to develop coding schemes to account for the different aspects of asynchronous online interactions [1][2][3][4][5]. However, and despite the existence of different coding schemes and the several studies that have explored the process of knowledge construction through asynchronous discussions [2][3][6][7][8][9][10][11] evidence that it occurs at high levels of thought is usually poor and flaws to studies are often pointed out. Moreover, studies on deploying social Web tools for knowledge construction are scarce and questions on whether knowledge construction in open and flexible contexts can be analyzed using the methods used so far should be considered.

This work attempts to analyze the process of knowledge construction supported by open social Web tools in an open, distributed and learner-managed learning environment. It is by no means comprehensive due to its limited duration and scope, but it provides data on how the use of these tools impacted knowledge construction and on how future studies could be designed.

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2 Theoretical Framework

The theoretical framework of our study builds on social-cultural theories that view learning as a process of participating and interacting in a community of practice [12][13]. Under this broad framework, social interaction is the key mediator for the construction of shared perspectives and shared knowledge, for it enables learning to become a process of 'coming to know' based on sharing, negotiation and (re)adjustment(s).

Although our study clearly draws on socio-constructivist theories, it also places relative emphasis on the notions of distributed cognition and connectivism which, building on socio-constructivist principles, highlight how objects, tools and environments can influence the process of knowledge construction.

When we talk about a distributed learning environment supported by different social Web tools, we find that such notions may help us understand the effect technology has on how we learn and illustrate the type of connections that happen in online interactions. In this sense, connectivism, which Siemens describes as the "new theory for learning based on network structures, complex changing environments and distributed cognition" [14], emphasizes the importance of learners' active participation in learning. For connectivism, individuals chose their learning paths and control their connections and learning happens when they connect, when they are able to build, organize, expand and recognize patterns that allow them to interpret and understand the knowledge and cognitions found along the way or left by others.

The notion of distributed cognition within connectivism is specifically relevant for our work for it opposes the notion of cognitions being "possessed and residing in the heads of individuals" [15]. Thus, tools, artefacts and social interactions residing outside people's heads are not mere "sources of stimulation and guidance, but are actually vehicles of thought, for (…) it is not just the 'person-solo' who learns, but the 'person-plus', the whole system of interrelated factors" [16].

Under such assumptions, context becomes highly relevant, for it "brings as much to a space of knowledge connection and exchange as do the parties involved in the exchange" [14]. Thus, we believe the context of our study played a significant role for it placed students at the centre of the learning activity, enabling them to control and monitor their own learning, manage activities, course goals, develop specific skills and establishing desired connections. Also, when designing the course, emphasis was placed on community building and knowledge sharing which resulted in the implementation of pedagogical activities that included the participation in (a)synchronous discussions for shared knowledge construction and project-based learning for real world application.

In the next section we will briefly describe the context of our work, followed by the analysis of the data.

3 Research Context

The present study was conducted in the context of a first year b-learning course subject – Multimedia and Cognitive Architectures (MCA) – which was part of the Masters Degree on Multimedia in Education (MMEdu) at the University of Aveiro.

The course combined two face-to-face (f2f) sessions – one at the beginning and another one at the end – and distance work for the span of four weeks. The tools adopted to distribute the MCA learning environment, their specific purposes and the course objectives can be found in previous work [17].

In MCA, the 56 students were not required a minimum or maximum number of contributions in the discussions launched in the two blogs used in the course, but participation represented 15% of the course assessment. Topics discussed in one of the blogs were launched by the course's teachers and followed no previous schedule, i.e., blog posts and discussion emerged from the interaction that resulted from the first message. The topics explored in the other blog were launched by students, who were free to choose what they wanted to share and discuss as long as it related to the issues being dealt with in the course, the projects being developed or to their professional activity.

The research question that guided the present work focused on whether the use of open social Web tools as a means to distribute a learning environment had had an impact on the process of knowledge construction, i.e., to what extent were students constructing knowledge?

4 Data Analysis

The discussion transcripts of 28 posts were selected for this study, which resulted in 758 messages, from which 712 were analyzed.

In order to analyze the level of knowledge construction through social negotiation, we used the interaction analysis model developed by Gunawardena et al. (1997). This model is based on the principles of socio-constructivism and examines the social construction of knowledge in five different levels of activity: (1) sharing and comparing information, (2) identifying areas of disagreement, (3) negotiating meaning and co-construction of knowledge, (4) evaluation and modification of new schemas that result from co-construction, and (5) reaching and stating agreement and application of co-constructed knowledge.

Although we explored and considered the application of other models [2][6][7], we opted for the Gunawardena et al. one because: i) it is one of the most cited models in scholarly databases; ii) it has been applied in a considerable number of recent empirical studies [8][9][10][11][18][19][20]; iii) we feel some degree of confidence as far as replicability and validity are concerned, bearing in mind the number of times the instrument has been applied and used as a basis for the development of other instruments [6][cf.18]. Furthermore, the model is recognized to place a strong focus on interaction as the vehicle for shared construction of knowledge and as being appropriate in social constructivist and collaborative learning contexts.

When we started the coding process, we determined the whole message as our unit of analysis, in line with Rourke et al. [21], who established it as objectively identifiable and whose parameters are determined by the author of the message. However, due to the length and depth of messages posted, we felt it inappropriate to code some of the messages in only one of the phases, since we were able to identify more than one phase in some of them. As a result we adopted the coding steps suggested by different authors [22][8], applying the highest phase evidenced in each message as a coding result.

Teachers' messages were coded and treated as any other message, as their role in the course was that of co-learners, sometimes monitoring the discussion but almost never modeling the actions that could stimulate knowledge construction. Instead, they shared, asked and collaborated in a way that their presence became diluted in the course of events.

Three independent coders codified the messages. Two were familiar with the model and had already used it in the course of their work whereas the other had never used it. An initial meeting took place for this coder to work with examples of the different levels of knowledge construction and to discuss details regarding the model and its application. The transcripts were then coded by each of the coders. In order to verify reliability of results, a sample was randomly selected and recoded. After discussion and consensus negotiation, the three coders reached a final codification.

5 Results and Discussion

The total number of messages presented in the following table refers to messages from both blogs. Although we find the highest number of occurrences in phase I, suggesting that there was a high focus on sharing and comparing knowledge, we also find the number of occurrences in the other phases as very balanced, which may indicate that students were building on each other's ideas. In fact, bearing in mind that phases II to V correspond to phases indicating knowledge construction, we may conclude the percentage of messages within the knowledge construction process result in 59% of the total number of messages coded.

Table 1. Occurrences based on coding categories (Gunawardena et al., 1997)

Phases		Total
I	Sharing and comparing information	290
II	Identifying areas of disagreement	111
III	Negotiation of meaning and co-construction of knowledge	107
IV	Evaluation and modification of new schemas that result from co-construction	99
V	Stating agreement and application of co-constructed knowledge	105
Total		712

The proportion of the coded phases is presented and highlighted in the following pie chart (Fig. 1).

The most common activity was exchanging ideas, opinions and experiences (41%). As most students were teachers and shared a common professional background, it seems natural that they shared and exchanged their experiences, known resources or

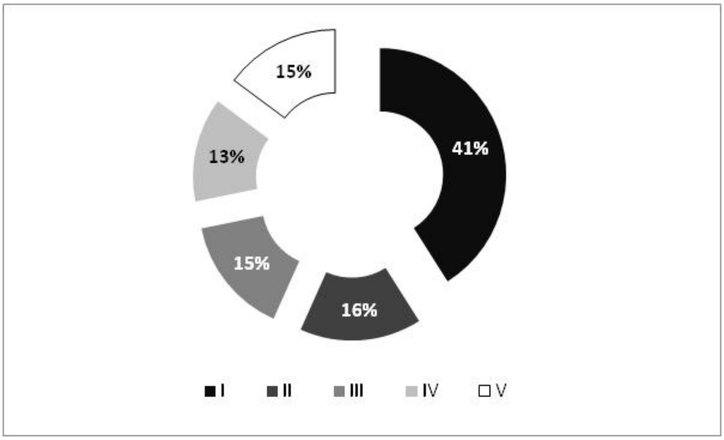

Fig. 1. Distribution of knowledge construction activities among the five phases

information, which they found useful for their activity. By resorting to these activities, students supported and provided feedback on each other's ideas and experiences, but did not necessarily act upon them to construct knowledge, since exchanging information, sharing resources or agreeing with what had already been said does not cause disagreement or cognitive conflict. Therefore, such interactions remain in phase I.

When students experienced conflict and inconsistency in ideas, they had to negotiate meaning, making it possible for higher levels of knowledge construction to happen. 16% of the activity coded in phase II involved some form of meaning negotiation. Students counter-argumented and sometimes criticized or provoked reactions. Some restated arguments by using different sources of information or posed pertinent questions. By doing so, they raised the opportunity for further discussions and exchange of ideas, which challenged many of the initial opinions.

The percentage obtained in phase III seems, to a certain extent, to illustrate the advancement of arguments obtained in phase II. 15% of the messages reveal that students pursued the discussion by proposing alternative views and compromising with them. This result may lead us to think that these activities opened the opportunity for students to discuss different points of view and reach a common understanding, as results obtained in the highest phases of knowledge construction are similar to this, suggesting a balanced pattern of knowledge construction involving participant students as a whole. 15% was the percentage obtained in phase V, which refers to messages that evidence accommodation of new knowledge (or its synthesis) on the part of the students. A lower percentage, although almost in line with the one obtained in phases II, III and V, was gathered in phase IV. The evaluation and modification of new schemas that result from co-construction correspond to 13% of the total of coded messages. This happened mostly due to the confrontation of new meanings proposed and students' personal experiences.

Although results show that the highest percentage of interactions occurred in phase I, which is in line with most studies [3][9][11][18][19], results differ from these in the highest levels of knowledge construction. We find similar percentages in phases II to V, which may suggest increments in knowledge construction. Besides, triangulation with other data [17] suggests that students perceived the ‘hands-on’ experience developed in MCA as one that allowed them to develop their skills, develop new ways of learning and build new knowledge, not only socially as a community by means of sharing and collaborating, but also internally by means of personal meaning negotiation and adjustments of new ideas. Furthermore, they emphasized the role played by social Web tools in the openness of the learning environment and in their motivation to learn, share, create, connect and interact.

Such results made us question the use and viability of the coding scheme in our educational context. Although its application has been widely used in different studies, we find it lacks the capability to demonstrate the social and interaction dynamics that go beyond the categorization proposed for the knowledge construction stages. Furthermore, it does not provide an accurate picture of the progress and development of students’ knowledge.

6 Conclusion

In the past few years, the evolution of Internet applications, now called social web, has placed strong emphasis on sharing, participating and collaborating. Such evolution has posed new opportunities for learning and set renewed challenges for the analysis of knowledge construction.

In this paper we sought to analyze the process of knowledge construction in an open and distributed learning environment supported by the use of social web tools and results seem to suggest that students built on each other’s ideas and constructed knowledge.

Further insights concerning the present study, including the validity of the model used in the analysis of the transcripts and visualization of the interaction dynamics will be the object of future work.

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Information Security Threats Analysis for E-Learning

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Abstract. The purpose of this paper is to investigate and define the information security threats in e-learning environment. A threat analysis has been conducted for each application in Managed Learning Environment (MLE) system used in e-learning. The threats analysis was conducted according to the approach adapted from Microsoft. This study produce a list of information security threats per application used in e-learning and a matrix of threats' risk for e-learning. This study focused on vulnerabilities in application system and do not cover the vulnerabilities in host and network in e-learning. Thus, this study has revealed the information security threats specifically for applications in e-learning environment. The results of the threats analysis can be used as guidance to e-learning provider in implementing e-learning security strategy. The results can also be a guide for the e-learning users to increase their awareness on the potential threats in e-learning environment.

Keywords: Threats analysis, E-learning, Application system, Information security threats, Matrix of threats' risk.

1 Introduction

E-learning is a term used to define the use of communication technologies and team learning systems to enhance the teaching and learning process. Gunasekaran et al., [8] has defined e-learning as an education or training that takes place via computer and is also known as Internet-enabled learning. The acceptance of e-learning usage has increased year by year. Patterson et al., [14] in the UK E-learning Market 2009, reported that: "The financial modeling and third party research all correlated in a robustly positive trend of continued and significant growth for the UK e-learning industry. The market size estimates varying between £300 million to £450 million, and growth rates forecast of between 6.7% and 8%." This is mainly because of the potential benefits offered to users.

An apparent advantage of e-learning is that users can be anywhere and anytime to access the learning materials. However, given that the Internet is always exposed to the information security threats, the chances of users facing the threats are likely high. In late 2002, the Knowledgeville University in Southeastern US experienced an attack resulted in the server hosting the e-learning system application shutting down in the middle of semester [16]. This situation has putting halt to students and faculty member to perform the teaching and learning process. Having a denial of service or an interruption during online examination and online class would be a disaster to

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students. Furthermore the students would expect the availability and integrity of information provided by the e-learning provider. Students will be worried if the information could be tampered or fabricated by unauthorized party. The issue of information security threats also impact the e-learning provider. They might suffer reduction in of students' enrolment and difficulties to ensure the business continuity.

This paper presents the information security threats in e-learning environment, particularly in the area of applications in Managed Learning Environment (MLE) system. A threats analysis was executed using a threats analysis model based on the approach adapted from Microsoft. The main aim of this threats analysis is to look at what are the threats and how the threats can occur.

2 Literature Review

Many studies have been carried out to ensure the successful implementation of e-learning. The studies include not only the technical aspect such as the infrastructures and technological devices but also the aspect on ensuring successful learning process. Conole et al., [5] has suggested that research in e-learning are categorised into four main areas; pedagogical, organisational, technical and socio-cultural. Security issues are the consequence of the interaction between organisation, technical and socio-cultural areas.

Among the early discussion on security in learning environment is by Littman[12] in 1996. She mentioned that "Internet access to online information can enhance a classroom instruction. However, network connectivity generates security risks for the learning environment". The growth of e-learning has cultivated research in security in e-learning. Norman and Da Costa [13] has suggested that to protect and maximise the return on investment in learning technology content and services the systems used in e-learning must be interoperable, usable, manageable and durable. Ensuring these elements, information security consideration is essential. Previous studies have shown that there is a barrier to more wide-spread adoption of online education [1]. The reason behind this barrier is not the high cost or more tasks to be done but the information security aspect which is something that is really intangible in the cyber world.

Studies in security are mainly focused on three main areas: policy [20], [6], [3], identity which refers to access management [6], [4], [18], [15], [11], [21], [9], and intellectual property [7], [10], [17]. Most of authors stated that the way to avoid all attacks to the e-learning environment is by controlling the access. One of the ways is the authentication and authorisation process. Graf [7] suggested an approach to protect intellectual property by extending the control of copyright holder to the entire lifetime of digital data. He suggested a method called CIPRESS which controls the access to the material. Yong [21] discussed another technical aspect on how to secure e-learning by digital identity design and privacy preservation. Jalal [9] recommended an authentication process to identify a legal user process. All of the studies above have proposed solutions and countermeasures to overcome the threats and attacks in the e-learning. Siponen [19] proposed on having a standard that specifically for certain organisations. A standard can be a model or framework that consists of the process and procedures to manage the information security. However to produce such standard, the organisations should initially identify the vulnerabilities and threats to their organisation.

3 Threat Analysis

Threats analysis is a process of detection, identification and evaluation of vulnerabilities of an operation or system. Threats are analysed with respect to their likelihood of occurrence, their possible impact on individual users and system and the global risk they represent. This study conducted a threats analysis for each application used in e-learning. It is executed by adapting the threat modelling for web application by Microsoft, followed by a validation process. The threats analysis process conducted has been simplified according the e-learning environment suitability. Threats analysis model for e-learning for this study consists of 5 steps.

Step 1- Identify security objectives
The threats analysis starts with identifying the objectives of security in e-learning application. The main elements of security are confidentiality, integrity and availability.

Table 1. Threats per application in e-learning

			Applications in e-learning																				
			VLE																				
			Online Course admin			Course Management		Communication Tools															
No	Vulnerabilities Category	Threats	Course Listing	Grading Centre	Performance Monitoring	Deliver Learning Content	Deliver Assignment & Collect Assignment	Online Session	Discussion Board	Email	Personal Portfolio	File Storage	File Exchange	Project Collaboration & Sharing	Assessment Tool	Survey Tool	Other	Registration	Finance	Students Administration	Certification	Mobile Learning	Virtual Library
1	Input & Data Validation	Buffer Overflow	√	√		√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√
2	Authentication	Network Eavesdropping	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√
		Password Guessing	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√
		Cookie Replay	√	√	√	√	√	√	√			√						√					
		Credential Theft	√	√	√	√	√	√	√			√						√					
3	Authorisation	Elevation of Privilege	√	√	√	√	√																
		Unauthorised Access						√	√	√	√	√			√	√	√	√	√	√	√	√	√
4	Configuration Management	Unauthorised access to administration interfaces and configuration stores	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Exception Management	Trap Door	√	√	√	√	√				√	√	√	√				√					
		Spamming	√		√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6	Sensitive Data	Tunnelling	√	√	√		√																
		Software Malfunction	√	√	√		√																
		Network Eavesdropping									√	√	√	√						√	√	√	√
7	Session Management	Session Replay						√	√	√			√	√	√	√	√		√				√
		Man in the Middle						√	√				√	√	√								
8	Cryptography	User Error						√	√	√			√	√	√	√	√		√				√
9	Parameter Manipulation	Http Manipulation						√	√	√	√				√	√	√		√	√	√	√	√
		Cookie Manipulation					√	√	√	√	√				√	√	√		√	√	√	√	√
10	Auditing & Logging	User Masquerade						√	√	√	√	√			√	√	√	√	√	√	√	√	√
		Malicious Code	√	√	√	√	√																

Step 2-Application overview

In this step, applications in the e-learning environment were identified. Applications listed are: Virtual Learning Environment (VLE), registration, finance, student administration, certification, mobile learning and virtual learning. VLE consist of online course administration, course management and communication tools. The actors and roles in each application are also listed in this step. The actors are divided into two groups that are registered and unregistered users. The registered users are: Delivery Coordinator, (System) Administrator, Online Course Coordinator, Course Manager (Instructors or Facilitators), Discussion Facilitator or Moderator, Students, Stake Holder or Top Management. The unregistered users are the guest or visitors and the sponsors.

Step 3 –Identify Application Vulnerabilities

The security vulnerabilities for each application in e-learning were identified. This step uses the classes of common application vulnerabilities categories.

Step 4 -Identify Threats

The details of threats were characterized in this step. The possible attacks is defined whether it is intentional threats or unintentional threats. These attacks were also reflected whether they will give effect of fabrication, modification, interruption or interception to the information. The result of step 3 and 4 are summarised in Table 1.

Table 2. E-Learning Threats' Risk Matrix

Legend: CR Critical; MA Major; MI Minor; Not Relevant

			Applications in e-learning																				
			VLE																				
			Online Course admin			*Course Management*		*Communication Tools*										Registration	Finance	Students Administration	Certification	Mobile Learning	Virtual Library
No.	Vulnerabilities Category	Threats	Course Listing	Grading Centre	Performance Monitoring	Deliver Learning Content	Deliver Assignment & Collect Assignment	Online Session	Discussion Board	Email	Personal Portfolio	File Storage	File Exchange	Project Collaboration & Sharing	Assessment Tool	Survey Tool	Other						
1	Input & Data Validation	Buffer Overflow	MI	MA		MA	MA	MI	MI	MA	MI	MA		MA	CR	MA	MA	CR	MA	MA	MA	MA	MI
2	Authentication	Network Eavesdropping	MI	CR	MI	MI	MA	MI	MI	MA	MA	MA			CR	MI	MA	CR	MA	MI	CR	MA	MI
		Password Guessing	MI	MA	MI	MA	MA	MI	MA	MA	MA	MA			CR	MI	MA	MA	MA	MI	CR	MA	MI
		Cookie Replay	MI	MA	MI	MI	MA	MI	MI			MI						MA					
		Credential Theft	MI	MI	MI	MA	MA	MI	MI			MA						CR					
3	Authorisation	Elevation of Privilege	MA	CR	MA	MA	CR																
		Unauthorised Access						MA	MA	MA	MA	CR			CR	MI	MA	CR	CR	MA	CR	MA	MI
4	Configuration Management	Unauthorised access to administration interfaces and configuration stores	MI	CR		MA	MA	MA	MA	MA	MA	MA	MA	MA	CR	MI	MA	CR	CR	MA	CR	MA	MI
5	Exception Management	Trap Door	MI	MA	MI	MI	MA				CR	MA	MI	MI				MA					
		Spamming	MI		MI	MI	CR		MI	MA	MI	MA	MI	MI	CR	MI	MI	CR	MA	MI	MA	MA	MA
6	Sensitive Data	Tunnelling	MA	CR	MA		MA																
		Software Malfunction	MA	CR	MA		MI																
		Network Eavesdropping									MA	MA	MA	MI						MA	CR	MA	MA
7	Session Management	Session Replay						MI	MI	MI			MI	MI	CR	MI	MI		CR				CR
		Man in the Middle						MI	MI				MI	MI	CR								
8	Cryptography	User Error						MI	MI	MI			MI	MA	CR	MI	MI		CR				MA
9	Parameter Manipulation	Http Manipulation						MI	MI	MI	MI				CR	MI	MI		CR	MI	MA	MA	MI
		Cookie Manipulation					CR	MI	MI	MI	MI				CR	MI	MI		CR	MI	MA	MA	MI
10	Auditing & Logging	User Masquerade						MA	MI	MI	MA	MI			CR	MI	MA	CR	CR	MI	CR	MI	MI
		Malicious Code	MI	MI	MA	MA	MA																

Step 5 –Analysis of Threats
After completing the four steps, risk of each threat is measured by assigning the likelihood of occurrence and impact to individual or system. The risk evaluation is using the risk evaluation grid proposed by Barbeau [2]. Risks derived from the threat analysis were classified in three main groups namely minor, major and critical. The summary of the threats analysis result has been converted to the e-learning threats' risk matrix as shown in Table 2.

4 Discussions

Many people think e-learning environment need not to be secured compared to e-banking and e-commerce, due to the intangible financial value involved. Furthermore, education is always seen as something that is in safe and positive surrounding, and no intimidations pertain. However, dependency on the Internet can lead to exposure to threats. An appropriate level of security is needed in view of the fact that e-learning material is a valuable asset (Weippl, 2005). The threats analysis conducted had investigated the potential threats to the e-learning environment. The result of the threats analysis revealed the potential threats according to the applications in e-learning. The common threats for most applications are spamming, unauthorized access to administration interfaces and configuration stores, buffer overflow, network eavesdropping, and password guessing. The most critical application is the assessment tool as it is expose to 12 listed threats.

The main contribution of this threats analysis is an e-learning threats' risk matrix which is specifically developed for an e-learning environment. The threats analysis conducted has assigned the level of likelihood of the occurrence of threat and the impact it could bring to the system and individual. The matrix which showed the vulnerabilities or threat versus the application can be seen in three meaningful risk groups that are minor, major and critical. Vulnerabilities and threats that are categorised as critical need to be addressed immediately because the impact to the user and system is severe and can lead to the business discontinuity. The major group also needs to be addressed even though it is not considered as high profile as the critical group. Some threats fall in the minor group which reflect that the likelihood for it to occur is low and the impact is also low. However, it still needs to be addressed adequately because there is still a potential of that minor threat will lead and become critical threats.

The results of this study can be used by e-learning provider and user in structuring a safe and secure e-learning environment. The categories of risk have a different perspective of use for both communities, but towards the same objective- securing the information and data in e-learning environment. The e-learning provider can depend on this threats analysis to plan for necessary countermeasures. It help in prioritizing which threats that need to be addressed the most based on the category of threats risk. Using the matrix of threats risk, users of e-learning will be alert on what to expect when accessing the e-learning applications and materials.

The threats analysis conducted can be guidance in preparing the security strategies and countermeasures. Knowing the list of threats is not enough to avoid the attack, therefore prevention procedures and countermeasure need to be proposed. The implementation of threats countermeasures for e-learning should not merely employ the technical solution but also need to consider the security management. The security management in e-learning should include the process and procedures to implement the technical solution plus the education and awareness among users.

5 Conclusions

The growth of e-learning and its dependency to the Internet have made significant the e-learning security issues. This study has conducted a threats analysis to investigate the threats in e-learning institutions, concentrating on each application in a Managed Learning Environment (MLE) system used in e-learning. The threats analysis was conducted according to the approach adapted from Microsoft and focused on vulnerabilities in application system only. The result of the threats analysis conducted has revealed the potential threats according to the applications used in e-learning. The threats analysis conducted has assigned the level of likelihood of the occurrence of threat and the impact it could bring to the system and individual. Apart from that, a matrix of threat risk for e-learning has been derived. The matrix showed the three meaningful risk groups that are minor, major and critical. The different type of risk associated with each threat will help the e-learning provider in prioritising which threat needs more attention. The users can use it as guidance to protect themselves from the threats. This study has focused on the threats in e-learning. The future work will be designing the countermeasure for the listed threats and designing a framework for security in e-learning. The design will include the information security management because it could be a huge element that will facilitate the successful implementation of information security countermeasure and reduce the potential attacks in an e-learning environment.

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Employability: Challenges for Education and Training Systems

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Abstract. The recent crisis has taken its toll in terms of unemployment, especially among young people. This has revived the debate on the contribution of Education and Training (E&T) systems to the employability of young graduates. At European policy level, there is a growing interest in creating incentives for reforming E&T systems so as to make them more responsive to future labour market needs and short term adverse labour market conditions. One of the main challenges is finding valid measures for evaluating the contribution of E&T systems to employability, taking into account their diversity within the European Union. This paper presents an operational framework of analysis for employability and discusses some of the most important challenges related to the multidimensional nature of the employability concept, the lack of data for cross-country comparison and the difficulty of disentangling the role of education and training systems from other factors in evaluating labour market outcomes.

Keywords: Employability, European Education and Training Systems, young graduates, school-to-work transition.

1 Introduction

Employability is the target of several European policies e.g., the Mobility and Lifelong Learning initiatives[1] as well as the Copenhagen Process (on Vocational Education and Training, VET). They include for instance initiatives for mutual recognition of qualifications, diplomas and study abroad periods. Within the Bologna Process, enhancing employability has been one of the main goals to be achieved with the creation of the European Higher Education Area as stated in the Bologna Process 2007 London

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[1] Examples are EFKC, EQF, Europass, ECTS, NARIC, ECVET, EQARF, Erasmus, Leonardo da Vinci, Gruntvig.

M.D. Lytras et al. (Eds.): TECH-EDUCATION 2010, CCIS 73, pp. 292–300, 2010.

Communiqué. A special Bologna Follow-up Working Group on Employability was set up in 2007. The importance of employment was strengthened in the re-launch of the Lisbon agenda, highlighting the contribution of education. Policies related to Flexicurity (European Commission, 2007) and the Social inclusion process, have also paid special attention to employability. Within the framework of the 2008 New Skills for New Jobs strategy, the Council Conclusions emphasize the role of education and training for promoting employability and underline the importance of matching identified skills needs[2].

Moroever, in 2009 the Council Conclusions on a Strategic Framework for European cooperation in Education and Training (E&T) for the next decade ("ET 2020") put employability for the first time as one of the main goals of E&T systems. It, furthermore, requested the European Commission to submit to the Council a proposal for a possible European benchmark monitoring the ability of E&T systems to enhance employability in order to meet current and future challenges. Four out of the ET 2020 five benchmarks adopted by the Council to support the ET 2020 objectives are also directly related to employability (lifelong learning participation, low achievers in basic skills, tertiary level attainment and early leavers from education).

The objective of this paper is three-fold. It aims first at discussing some of the challenges that make employability especially relevant as an aspect of increasing importance in measuring the quality of E&T systems in Europe. Second, it aims at presenting an operational framework of analysis for employability. Third and last, it aims at discussing some of the most important challenges related to the multidimensional nature of the employability concept, the lack of data for cross-country comparison and the difficulty of disentangling the role of education and training systems from other factors in evaluating labour market outcomes.

2 Current and Future Challenges

As underlined by the EU 2020 Strategy, the change in the demographic situation of the EU, resulting in lower proportion of young people in the overall population, is expected to result in a substantially reduced potential growth by 2020. A 2010 report of the Expert Group on New Skills for New Jobs points out that the only growth of the labour force is expected to be amongst those aged over 50 (Cedefop, 2010a).

These changes in the structure of the population are significant, particularly given the short period considered. They have two important implications. On the one hand, it becomes essential to ensure that young people successfully and timely integrate into the labour market. E&T systems are an important factor in making this transition successful. On the other hand, E&T systems should ensure continuous re-training and learning opportunities for those already in the labour market to enhance their adaptability to the changing economic circumstances and maintain their employability.

Moreover, the ever increasing importance of innovation and technological advancement puts a strong pressure on the skills supplied by E&T systems. Studies on

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[2] The work of Cedefop on skills supply and on skills demands is directly related to this initiative.

skill-biased technological change underline that increasing complexity of work leads to accelerating obsolescence of existing skills (Van der Velden et al, 2008).

Furthermore, unemployment rates have risen sharply across EU countries due to the crisis. According to Eurostat, youth unemployment has increased at even faster pace (by 3.7 percentage points between the first quarter of 2008 and the first quarter of 2009) leading to a rate of 18.3 % in the first quarter of 2009 and up to 21.4% in November 2009.

A recent Eurostat Statistics in Focus report on "The impact of the crisis on employment" (Eurostat, 2009) underlines that employees have been affected differently depending on their level of education. A fall in employment rate was observed among persons with low and medium levels of education, while employment among highly educated persons continued to increase against the prevailing trend.[3]

3 An Employability Concept and Framework

Employability is a complex and multi-faceted concept. The difficulty in applying a straight-forward definition has been recognized by various studies (see among others Gazier, 1999; Harvey, 1999; Hillage and Pollard, 1998; McQuaid and Lindsay, 2005). McQuaid and Lindsay (2005) highlight the existence of two alternative perspectives in the employability debate: one focuses only on the individual's characteristics and skills, referring to the individual potential to obtain a job, while the other perspective takes into account also external factors (e.g. labour market institutions, socio-economic status) that influence a person getting into a job, moving in between jobs or improving their job. De Grip at al (2004) call these factors 'effectuation conditions', i.e. the conditions under which workers can effectuate their employability. There are a number of additional aspects considered in the literature such as the time lag between leaving education and employment, the degree of skills match between one's educational background and his/her occupation as well as the type of contractual arrangement (full-time vs. part-time; permanent vs. temporary).

Any definition based only upon individual characteristics and skills would disregard the potential influence of the institutional settings[4] that support personally or collectively the transition from school to work, the employed workers to stay in their job and the non-employed workers to find a job. As our interest is in identifying ways in which policies impact and can further enhance employability, we adopt for our analysis the definition given by Cedefop (2008): "Employability is the combination of factors which enable individuals to progress towards or get into employment, to stay in employment and to progress during their career."

According to this definition, a successful realization of individuals in each stage of their working life (as shown in Figure 1) would require the presence of the right combination of employability factors. From the education and training perspective, such factors include learning outcomes (knowledge, skills and attitudes) and their relevance to the labour market, as well as learning incentives and learning opportunities. Jointly

[3] Potentially implying that crowding out/bumping down takes place.
[4] Few examples are public and private employment and education services, subsidized programmes.

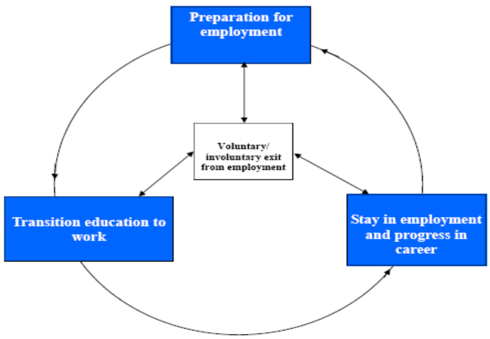

Fig. 1. Key stages in employment

with these educational determinants, many other personal, economic and institutional features influence labour market outcomes throughout the working life of an individual (as shown in Figure 2).

It is important to note that the transition through the different stages of employment is not necessarily linear. Going back to education and preparing for employment can occur at different stages of one's life and transition from education to work can mark both the first transition as well as subsequent ones. Thus, a more appropriate dynamic view on employment would include possible ways back and forth from the different stages, taking into account the possibility of unemployment/inactivity (Figure 1).

Figure 2 zooms into the factors that influence the individual transition to a job, taking into account both the micro and macro level perspectives. It highlights the fact that E&T systems are relevant in the creation of human capital, measured through learning outcomes in terms of formal qualification as well as actual skills acquisition.

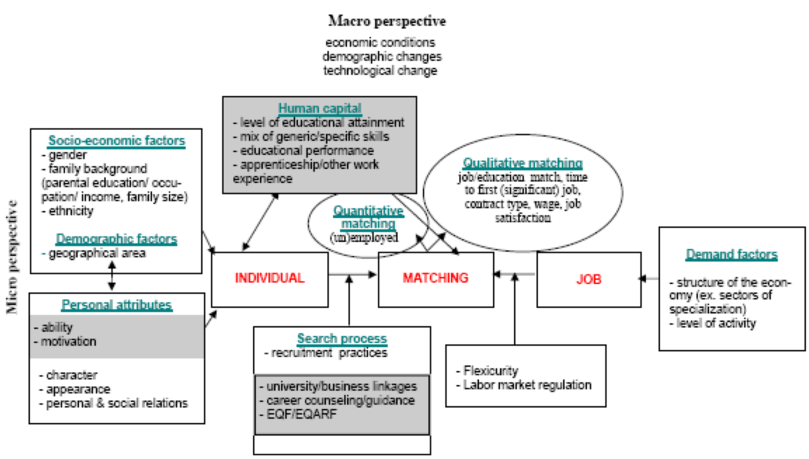

Fig. 2. Factors influencing labor market outcomes (*adapted from Van der Velden et al (2008))*

E&T systems also facilitate the job search process by providing concrete guidance and counselling and making qualification systems more understandable to employers across Europe.

4 Analysis

Recognizing that the primary contribution of E&T is of a different nature at each stage, we use the frameworks presented in the preceding section to identify a) the most influential educational factors, b) the specific challenge(s) to be addressed or policy goal(s) and c) the availability of relevant data.

4.1 Preparation for Employment

Typically, individuals acquire the essential knowledge and competences required for a given occupation while at formal E&T[5]. At this stage, educational systems are seen as the main responsible for the skill attainment of the workforce[6]. They contribute through a) *input* factors (e.g investments), b) *processes*: quality, equity, mobility and responsiveness to changing demands, c) *outputs*: graduation or attainment levels and d) *learning outcomes*: knowledge, skills and attitudes valued in the labor market.

Which skills should the E&T systems provide to foster employability? and *how* best to provide those skills? Much research and policy attention has been devoted to the quantity, the quality and the mix of skills. Cedefop has forecasted[7] an increase in the demand for skills, as more new jobs will be open for professionals and technicians (Cedefop 2010b). In addition, E&T shall provide a combination of *specific* knowledge and skills and *transversal* or generic skills[8] (learning to learn, digital competence, initiative and entrepreneurship, communication skills, mathematical and science competences, etc).

In order to achieve high levels of competences among the population, current policy strategies focus in improving the effectiveness and the efficiency of E&T. Most discussions revolve around the orientation of programs (relative importance of vocational training), the recognition of qualifications and the revision of curricula and delivery methods. Performance is commonly measured in terms of secondary (including VET) as well as tertiary education attainment levels, share of early leavers and share of low-achievers in reading, mathematics and science.

Educational attainment is the most used proxy for qualification levels. Although readily available, such indicator gives an over-generalized idea of skills supply. From the policy perspective, a depiction of the skills mix at broad level (low, medium, high

[5] However, participation to E&T can occur at any time in the lifespan of an individual. In addition, many achieve that learning outcomes through informal education.

[6] Research has also shown that the socio-economic status and economic systems (e.g. family background) greatly affect learning outcomes.

[7] The share of jobs requiring high-level qualifications will rise to 35% (from 29% in 2010) while the share of jobs for which low qualifications are required will fall to 15% (from 20%).

[8] The 2007 Flash Eurobarometer on Young Europeans show that the most important quality they retain for finding a job is communication and teamwork skills. Entrepreneurial skills and good appearance are also mentioned.

qualification) is of limited operational significance and would need to be complemented with detailed information (enterprise surveys). On the other hand, depicting skill supply and demand in more specific terms would make international comparisons difficult (as countries have very different labour demands and supply characteristics). The indicators on literacy in reading, mathematics and science from the OECD Programme for International Student Assessment (PISA) survey are commonly used as proxies for competences. In reality, these indicators gauge only basic employability skills. In addition, learning outcomes that are highly contextualized (sector or work specific skills) are not well measured. There is an increasing need to conduct surveys to assess vocational and/or professional skills and competences.

4.2 Transition from Education to Work

We shall define education-to-work transition as the transition from the education system to the employment system through the attainment of permanent employment (as the most accurate proxy for significant job). Frequent problems at this stage are high unemployment and excessive job turnover. The impact of the economic crisis on young people illustrates this vulnerability of youth in the transition period.

Research has shown that a transition from education to first job associated with a long period of unemployment could have significant implications for future labour market outcomes. In addition, entry to unskilled occupations as a first job (over-education or over-skilling) is likely to reduce lifetime earnings and increase the risk of experiencing periodic spells of unemployment (e.g. Arulampalam et al., 2000). Possible reasons suggested by the ‘scarring’ theory of unemployment are depreciation of human capital though atrophy (i.e. not using skills leads to losing them), or the fact that employers use an individual’s previous labour market experience as a screening mechanism.

The 2000 OECD Thematic Review on the Transition from Initial Education to Working Life underlines three key ingredients for successful transition which are related to E&T - well organized pathways that connect initial education with work and further activity, widespread opportunities to combine workplace experience with education, and good information and guidance.

Indicators of labor market outcomes (such as proportion of young people unemployed) can be used as proxies for the efficiency of the transition process. Data for these indicators is readily available but it is highly sensitive to the age cohorts. In addition, performance can not be exclusively attributed to either the efficiency of E&T systems or to the functioning of the labour market. Employability is also related to the quality of employment and the time interval for finding a proper job. In this context we can distinguish between quantitative and qualitative indicators of labour market outcomes (proportion of young people having an unmatched job; time interval between education and first significant (permanent) job, etc). Data that allows international comparisons on these qualitative aspects of the transition process is scarce or available on at ad-hoc basis. Some European countries (e.g. Sweden, United Kingdom) regularly undertake tracer studies among higher education graduates.

Much recent policy attention has been devoted to youth disengaged from both the labor market and E&T, arguably at a high risk of labor market and social exclusion.

However, international data on youth neither in employment nor in education and training (NEET) is not produced regularly.

Factors such as the level of collaboration between E&T systems (universities, schools, etc.) and businesses, career counselling and guidance offered to graduates could facilitate the process of transiting from education to work. However, data on these aspects is not readily available.

4.3 Stay in Employment and Progress in Career

Staying in employment and progressing in career constitute the two main employability challenges of experienced workers. As a result of long term factors (technological change) or short term shocks skills may become obsolete (Van Loo et al., 2001), leading to a decline in productivity. In addition, multiple transitions become a very common situation as the incidence of temporality increases (in particular, among low-skill occupations).

Easy access to adequate forms of education can facilitate a smooth transition from one position to another, avoiding long unemployment spells. Ensuring flexible learning pathways (so that people can transit from employment to education and vice versa smoothly) is essential to respond to the competitive challenges of the future.

In 2008 almost 10% of 25-64 year-olds participated in lifelong learning in the EU-27. The rates are higher among the youngest (25-34 years olds), the most educated and the employed (European Commission, 2009)[9]. Adults in the age group 50-74 have much lower lifelong participation rate (4,3% in 2007)[10]. This age group is expected to increase in the future (see Section 2) and remains the object of policy concern.

The data on continuing education remain scarce, with only three surveys providing this kind of information: the Labor Force Survey (on a yearly basis), the Adult Education Survey (AES, in the pilot phase, to be undertaken every five years covering 26 EU countries) and the Continuing Vocational Training Survey on enterprises (CVTS, also every five years, covering 27 Member States).

The LFS informs on the participation of adults in lifelong learning with breakdowns by employment status. The Adult Education Survey offers data on participation in formal and non-formal learning, as well as the reasons, costs, and obstacles for doing so. Finally, the CVTS reports participation to training courses offered by the enterprises as well as type and costs of those learning activities. It is expected that the new round of the CVTS planned for 2011 will explore the skills that the enterprises seek to develop through the training they offer.

Similarly, the OECD Programme for the International Assessment of Adult Competences (PIAAC), currently under preparation, intends to measure key cognitive and generic skills and their actual use in the workplace. The PIAAC survey is expected to take place in 2011, with results being released in early 2013 and should cover 18 EU countries.

Unfortunately, the lack of comprehensive and periodic data at European level on the quality or relevance of continuing education is still a challenge for evaluating the

[9] The participation rate according to CVTS data is 36%. Divergences among these two surveys are due to differences in the reference period (4 last weeks for the LFS, and last 12 months in the CVTS).

[10] Participation of 55-64 years olds amounts to 21,7% in 2007 according to the CVTS.

effectiveness of lifelong learning activities in terms of enhanced employability. Improving the validation of non-formal learning or enhancing the recognition of skills and qualifications by employers are additional important policy objectives relevant to this phase. However, there is no data available concerning these two issues.

5 Conclusions

The importance of employability as a policy objective has been rising in the last years together with the focus on the match between skills demand and supply and its essential role for productivity and competitiveness. E&T systems have a significant role in imparting individuals with the right mix of skills which can allow them to have better chances on the labor market. Considering employability as one potential criteria for the evaluation of the efficiency and effectiveness of E&T systems is a considerable change of perspective on education policy making. The challenges related to the measurement of employability, a complex, multidimensional concept, present some difficulties for international, cross-country comparisons and the establishment of more broadly accepted employability indicators, as illustrated by this paper. However, opening the debate on the topic of the role of E&T for enhancing employability and the need for closer link between skills suppliers (E&T systems) and skills demand (enterprises) is a necessary input in revisiting the quality and responsiveness of E&T to current and future challenges.

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System and User Characteristics in the Adoption and Use of e-Learning Management Systems: A Cross-Age Study

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Abstract. This study analyses the most relevant factors which affect users' intention to use e-learning management systems, with special focus in the difference of age. The fundamental hypothesis is that there can be established a influence of behavioural intention, attitude toward behaviour, perceived usefulness, perceived ease of use, subjective norms and social influence in the intention to use of e-learning management systems, with user and system factors as antecedents.

In order to design the theoretical model, the most relevant technology acceptance models have been reviewed from literature, with special focus in learning management systems (LMS) adoption. The result of this review is a unified model which has been validated with data collected from 94 people through a web questionnaire. The results from this data have been analysed using the partial least squares (PLS) method. The analysis has demonstrated the predictive relevance and the validation of the model for users between 26 to 35 years old and 36 to 45 years old.

Keywords: LMS, technology acceptance models, e-learning, TAM, partial least squares.

1 Introduction

In the recent years the use and implementation of LMS is rapidly growing both in the industrial and academic environment. The use of TEL (Technology Enhanced Learning) is a fundamental concept for the current learning processes because technology allows expanding the learning scope. In the last 40 years, the technologies supporting these learning processes have received different names, although the more used term is e-learning, which can be defined as "the use of the new multimedia technology and Internet, to improve the learning quality, supporting the access to resources and services, as well as the interchange and the remote collaboration" [1].

This study covers the factors which have a greater influence in the users' intention to use LMS systems, from a review of technology adoption models, with focus on LMS systems, and an analysis of LMS implementation case studies, and proposing a study framework based on a unified model.

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2 Theoretical Background

In order to examine the intention to use LMS, there is a wide range of theoretical models for characterizing technological acceptance, being the most relevant TAM (Technology Acceptance Model) [2], UTAUT (Unified Theory of Acceptance and Use of Technology) [3], TRA (Theory of Reasoned Action) [4], TAM2 [5], TPB (Theory of Planned Behaviour) [6], MM (Motivational Model) [7], PC MPCU (Model of PC Utilization) [8], IDT (Innovation Diffusion Theory) [9], and SCT (Social Cognitive Theory) [10].

Even though their approaches vary from one theory to another, they share some elements in common. Based upon the common constructs presented in these theories, and extracting other factors identified on LMS adoption focused studies [11], [12], [8], four types of constructs have been identified:

1. Actual use of technology
2. Intention to use/attitude towards use, as a predisposition against or towards a stimulus object [4]; in this particular case, the use of a LMS
3. Attitude antecedents, being the most relevant those related to TAM (perceived ease of use, perceived usefulness) and TPB (normative and social factors, such as normative beliefs and subjective norm)
4. A group of different factors which affect the attitude antecedents. These factors include self-efficacy, anxiety, system functionality, performance expectations, and quality of contents, and can be classified into two separate groups: those user related (i.e., self-efficacy, anxiety, performance expectations) and those system related (i.e., functionality, contents)

2.1 Research Model and Hypotheses

In order to define the research model, the aforementioned technological acceptance models, as well as use cases related to e-learning system acceptance, have been reviewed and compared in order to extract the latent constructs. According to these theoretical and practical approaches, the research model was formulated. Figure 1 illustrates the research model, hypotheses and relations between constructs.

The following hypotheses were formulated:

- H1, H2: Behavioural intention is positively influenced by attitude towards behaviour and the perceived usefulness.
- H3, H4, H5, H6: Attitude towards behaviour is positively affected by perceived usefulness, perceived ease of use, subjective norms and social influence.
- H7: Perceived usefulness is positively influenced by perceived ease of use.
- H8, H9, H10, H11: User related factors have a positive influence on perceived usefulness, perceived ease of use, subjective norms and social influence.
- H12, H13 H14, H15: System related factors have a positive influence on perceived usefulness, perceived ease of use, subjective norms and social influence.

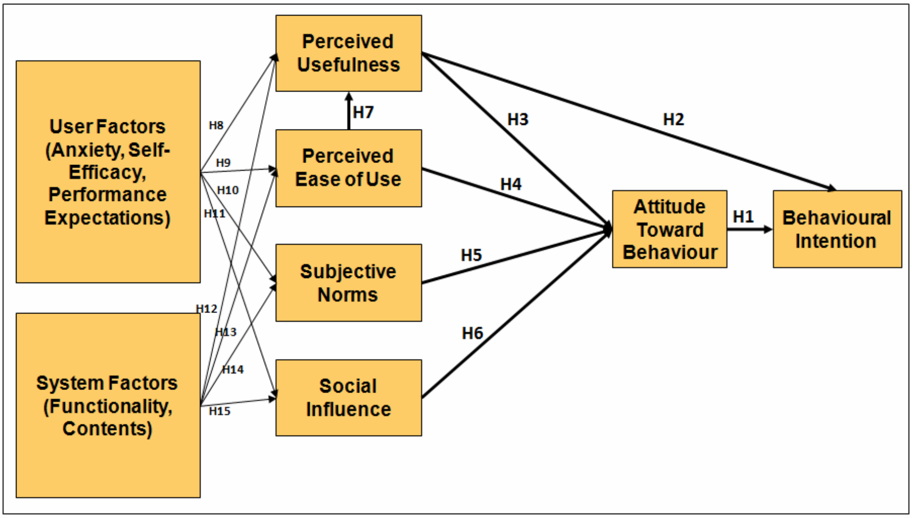

Fig. 1. Research Model

3 Research Design and Methodology

A survey from the research model was taken to 200 students, grouped by age (from 18 to 25 years, from 26 to 35 years, and from 36 to 45 years), who had previous experience with e-learning systems, from both the academic and industrial environment in Spain. The survey included 41 items measured using a seven-point Likert-type scale and ranging from "Strongly disagree" to "Strongly agree".

The survey data was gathered with the help of the web tool LimeWire Survey. This survey was anonymous and was sent to respondents by email with the link reference. In order to analyse the results, SEM (Structured Equations Models) was used with a Partial Least Squares (PLS) method approach, used for prediction and confirmatory analysis. According to Fornell and Bookstein [14], PLS presents relevant advantages, such as: minimal sample size requirements, with different measurement scales and kind of variables. PLS-GRAPH software was used for extraction and analysis of results.

4 Data Analysis

A total of 94 complete surveys were received (47% answering rate). Data from this survey were exported from the web tool to Microsoft Excel, and then converted to PLS-Graph readable files. The sample size was adequate for analysis according to the criteria from [14] except for the group of students ranging from 18 to 25 years, with a sample size of 20.

Next, measurement model and structural model validity were performed.

For measurement model validity, factorial analysis, convergent validity and discriminant validity were tested. Table 1 displays the results from the factorial analysis and convergent validity.

The factorial loadings for each construct and item are significantly greater than the acceptable limit of 0.5, and most of them are greater than the optimal limit of 0.707. Composite reliability values are significantly greater than the optimal limit of 0.7; with most of them higher than 0.9. On the other hand, the AVE (Average Variance Extracted) values are equal or greater than the minimal limit of 0.5. AVE values for the construct "User Factors" fell slightly below the limit of 0.5.

Furthermore, another discriminant validity analysis was done, taking into account the correlations between item weights and constructs.

Finally, structural model validity was studied. This analysis includes the construct variance explained (R^2), the predictive relevance (Q^2), and the values of the significant structural paths. Table 2 illustrates R^2 and Q^2 analysis.

As shown in Table 2, the construct variance explained (R^2), for the ranges between 26 to 35 years old and 36 to 45 years old indicate a good explanation of the model (more than 50% of the variance explained in the former case and more than 75% in the latter). For the range between 18 to 25 years old, values were lower than 50% – mainly for behavioural intention–.

Table 1. Measurement Model Validity (Factorial Analysis and Convergent Validity)

		18 to 25 years old			26 to 35 years old			36 to 45 years old		
Construct	Item	Factorial Loading	Composite Reliability	AVE	Factorial Loading	Composite Reliability	AVE	Factorial Loading	Composite Reliability	AVE
User Factors	CU3	0,725	0,848	0,488	0,421	0,831	0,474	0,816	0,923	0,669
	CU4	0,729			0,444			0,870		
	CU5	0,511			0,480			0,729		
	CU6	0,881			0,869			0,820		
	CU7	0,666			0,862			0,885		
	CU8	0,625			0,861			0,777		
System Factors	CS1	0,283	0,869	0,593	0,790	0,939	0,754	0,871	0,951	0,795
	CS2	0,831			0,848			0,891		
	CS3	0,881			0,883			0,932		
	CS4	0,862			0,909			0,882		
	CS5	0,821			0,906			0,882		
Perceived Usefulness	UP1	0,879	0,868	0,622	0,836	0,934	0,779	0,904	0,960	0,857
	UP2	0,732			0,855			0,892		
	UP3	0,764			0,887			0,964		
	UP4	0,774			0,949			0,941		
Perceived Ease of Use	FU1	0,859	0,922	0,749	0,887	0,941	0,801	0,940	0,939	0,794
	FU2	0,792			0,911			0,835		
	FU3	0,956			0,907			0,898		
	FU4	0,847			0,874			0,890		
Subjective Norms	NS1	0,901	0,913	0,840	0,918	0,926	0,863	0,982	0,980	0,961
	NS2	0,932			0,940			0,979		
Social Influence	IS2	0,870	0,908	0,832	0,898	0,885	0,794	0,971	0,958	0,919
	IS3	0,953			0,884			0,946		
Attitude Toward Behaviour	AU1	0,799	0,874	0,635	0,849	0,907	0,711	0,901	0,941	0,799
	AU2	0,855			0,909			0,889		
	AU3	0,813			0,765			0,914		
	AU4	0,712			0,844			0,871		
Behavioural Intention	IU1	0,874	0,915	0,782	0,953	0,958	0,883	0,946	0,964	0,898
	IU2	0,867			0,924			0,934		
	IU3	0,912			0,941			0,964		

Table 2. Construct Variance Explained (R^2) and Predictive Relevance (Q^2)

	18 to 25 years old		26 to 35 years old		36 to 45 years old	
Construct	R^2	Q^2	R^2	Q^2	R^2	Q^2
Behavioural Intention	0,124	-0,424	0,510	0,377	0,759	0,617
Attitude Toward Behaviour	0,560	0,164	0,769	0,484	0,833	0,594
Perceived Usefulness	0,531	0,126	0,621	0,431	0,434	0,255
Perceived Ease of Use	0,423	0,136	0,664	0,491	0,784	0,581
Subjective Norms	0,256	-0,142	0,394	0,210	0,545	0,424
Social Influence	0,405	0,119	0,566	0,391	0,437	0,265

Observing model's predictive relevance analysis, the construct of the ranges between 26 to 35 years old and 36 to 45 years old indicate predictive relevance (values greater than 0). On the other hand, values for the group of students between 18 and 25 years showed no predictive relevance with a very low value of variance explained for the total model of 12,4%.

Then, structural paths were analyzed (results are shown in figure 2).

Although predictive relevance may be question for the group of students between 18 to 25 years old, behavioural intention would be influenced by attitude towards behaviour, which is influenced by perceived usefulness (strongly) and social influence. User factors would have a more notable influence on perceived usefulness than perceived ease of use. , the social influence is influenced by the user (0.406) and system factors (0.285).

The range between 26 to 35 years old indicates that the behavioural intention is influenced by the attitude toward behaviour (0.824). Consequently, the attitude toward behaviour is influenced by the perceived usefulness (0.468) and the perceived ease of use (0.335). Finally, the perceived usefulness and the perceived ease of use are influenced by the user (0.350 and 0.402) and system factors (0.532 and 0.499).

The range between 36 to 45 years old indicates that the behavioural intention is influenced by the attitude toward behaviour (0.551) and the perceived usefulness (0.375). Consequently, the attitude toward behaviour is influenced by the perceived usefulness (0.638) and the perceived ease of use (0.340). Finally, the perceived usefulness is influenced by the user factors (0.824), and the perceived ease of use is influenced by the user and system factors (0.455 and 0.510).

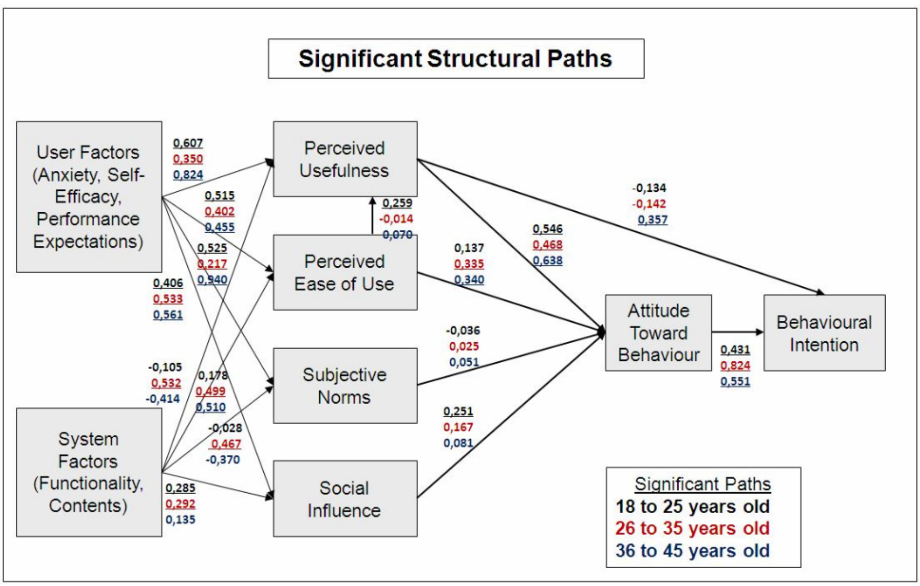

Fig. 2. Structural Paths (significant paths are underlined)

5 Conclusions

The analysis has demonstrated the predictive relevance and the validation of the model for users between 26 to 35 years old and 36 to 45 years old, whereas no significant relations were extracted from the analysis of users between 18 and 25 years old, most probably due to the small data sample. However, social influence outstands as a significant factor on attitude towards behaviour, whilst this relation is not confirmed on the other two groups. The main reasons behind this finding may be both the obligation to take courses under LMS environments, and/or the peer pressure when there has been a successful experience in the use of LMS.

The importance of perceived usefulness stands out as the most relevant factor impacting attitude towards behaviour; this result recommends the use of LMS only where the benefits related to LMS use exceed those of traditional learning.

Also, the authors think that a more detailed study should be made about the construct "user factors", as it could be interesting to decompose it into three subconstructs: anxiety, self-efficacy and performance expectations, so that influence of each one could be observed.

Surprisingly, both subjective norms and social influence seemed to have weak or no influence on attitude towards behaviour. The explanation to this result may lay on the non coercive nature of courses taken by the students, perceived more as an individual opportunity than a group obligation.

Another point of interest rises from the results on the relevance of system factors, which only seem to be relevant for the group between 26 to 35 years. In the authors' opinion, this result should be contrasted with another experiment; if this difference is maintained, reasons behind this finding should be imperative to study in order to be able to make a better design of LMS systems taking into account the age profile of students.

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A Comparative Study on the Influence between Interaction and Performance in Postgraduate In-Class and Distance Learning Courses Based on the Analysis of LMS Logs

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Abstract. Learning Management Systems' use has been rapidly increasing during the last ten years, mainly in online distance learning courses but also in in-class courses. In parallel, technological advances have made it possible to track and store all the activity taking place in the LMS, and therefore to register the participation and interaction of students. This paper addresses two key questions: a) Is student interaction in the LMS an indicator of the final academic performance in a course?; and b) Is this interaction carried out in a different way in distance and in-class education, with different final results?. In order to answer this question, different types of interaction have been classified and extracted from Moodle LMS activity record logs during two years in one master program with online distance learning and in-class learning modalities at the Universidad Politécnica de Madrid. The results show partial or no evidence of influence between interaction indicators and academic performance. The last section of this study covers a discussion of results and implications.

Keywords: e-learning, interaction, student performance, LMS, activity logs.

1 Introduction

In the last years, there has been an increasing interest on introducing Internet and Communication Technologies (ICT) in education, which has led to the development and expansion of educational platforms known as Learning Management Systems (LMS). One of the most popular LMS is the license free open-source Moodle (Modular Object-Oriented Dynamic Learning Environment), a common learning space for students designed after a social constructionist pedagogy.

This educational approach requires a high level of commitment and interaction from both students and teachers, and also a high degree of flexibility and monitoring capabilities from the system itself. This learning style is in tune with the application of the changes required in Spanish universities in order to adapt to the EHEA (European Higher Education Area) according to the European Directives, aiming at a

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student-centered teaching with a greater level of activity and cooperation. Flexibility for students can also be achieved with these systems in terms of temporal and spatial ubiquity, synchronous and asynchronous learning resources, and abundance of learning resources.

Traditionally, the level of interaction of students has been measured from a subjective point of view (be it the teacher's or the one perceived by the students), and its correspondence with academic performance, though vastly studied, seldom has been quantifiable in terms of number of interactions. Again, the application of ICT to education offer the means to make quantitative analysis based on the record of each and every action registered in the LMS.

Though this approach to make a characterization of the student interaction is relatively new, a part of the academic research has turned its attention towards the tracking information available at LMS and, what is more important, its relation –if there is any– with the final student's academic performance; and furthermore, these research works do not cover yet the different levels of learning possible, ranging from primary school to enterprise continuous learning.

In recent studies the focus of this characterization has been set on distance learning, in which the absence of a face-to-face interaction makes it harder for teachers to discern the student's progress or unveil learning issues (knowledge shortcomings). But as LMS may also be used as a supplementary resource and shared learning space among students and teachers in presence learning environments [1], a question arises about the influence of the interaction of students with the system with their academic progress and achievement, which –if found– may help both teachers to contrast their perceptions with numerical data, and LMS designers to better adapt the system functionalities to the course and audience requirements.

2 Theoretical Background

2.1 Interaction and LMS

The recent changes and efforts made in European higher education institutions in order to adapt to the EHEA tend to center the learning process in the student [2], seeking for a more robust and self-experience based knowledge. ICT learning systems have been improving in parallel from information repositories to multifunctional learning environments where all the course interaction –from the student with other students, teachers, content and the system itself– with capabilities to actively track in real time the participation of students in the courses [3].

The relation between this participation and the academic performance has always stood out as one of the main concerns for teachers and course designers, since it has been proven that it exists a direct correlation between the student's participation and his final performance [4][5], with better performance achieved when the levels of interaction were more intensive. Participation and interaction in LMS have traditionally been measured based on the amount of e-mails interchanged between student and teacher, forum activity or time logged onto the system, and the findings suggest that there is a relation between academic performance and forum postings, system use time [6], number of system accesses [7] [8].

Recent research studies have found a suitable tool to analyze more in depth this interaction in the LMS activity records log [9][10][11][12][13][14][15][16], as indicators of academic performance. Moodle, for instance, features a built-in tool tracking tool that registers the activity of every user in the system, writing it to a database that can be used to generate global or filtered reports. Some authors suggest using this data in conjunction with individual feedback from the teachers [17] or automatic system feedback in response to the amount of interaction of the student [16].

Nevertheless, at least two problems have been found regarding these measurement tools: first, the known as "learning witness" phenomenon, in which the best performing students rarely interact with the teachers and their fellow students, just spend their time reading others' contributions [18][19]; second, the previous experience with LMS, which can dramatically reduce the number of interactions required to do a task [20]. The first issue may be slightly overcome by making a difference between active and passive interactions; thus, any interaction that involves interaction with the system solely with no contribution to any other LMS user could be classified as "passive" –for example, reading forum posts– while contributions available to other users would be considered "active". The second issue may arise on heterogeneous groups, and must be taken into account and addressed carefully by the teachers.

2.2 In-Class and Distance Learning Supported by LMS

As mentioned in the introduction, LMS may be used in distance learning courses, as well as in-class courses –and the various types of blended learning courses that go from one modality to the other–. A main concern, when the same course is being taught, is whether the same contents may be delivered effectively in both teaching styles and, when supported by LMS, if the use of the learning environment may differ between both versions, so that data from interactions might have different meanings. And, what is more important, if similar academic performances may be achieved without having to design different plan courses, facilitating course reusability.

There does not seem to exist a general consensus in the reviewed literature on whether the final performance differs between both; [21], for example, states that better results are achieved in online courses, while [22][23][24] and [20] found no significant differences.

3 Methodology

3.1 Course Description

For this study, two postgraduate master's degree programs (Master in Domotics and Digital Home of the Universidad Politécnica de Madrid, in-class and online distance learning modalities), comprised of eight courses each, were analyzed and monitored during two consecutive years, 2008 and 2009. The duration of the courses varied from 2 week courses to 9 week courses.

It must be pointed out that the course contents are delivered to the students via Moodle LMS in distance learning modality, while in-class students are given a printed version of the contents as well as a digital version available at the LMS. In every and each of the courses, tasks –which include tests, short essays, and individual and group tasks that require the upload of one or more files– must be submitted on the LMS. The courses were planned according to a fixed task calendar, with deadlines for each submission. Once graded, the teachers have sent every student personal feedback about their assignment.

Before starting each master program, students were instructed on how to use the platform and a non graded test course was available during the first two weeks of the program in order to get used to the functionalities offered by the LMS and to be able to solve any technical difficulties the students might have.

Communication tools included forums and chat rooms, which have only been used in the online master courses. Chat rooms purpose was to weekly communicate with the teacher or teachers to resolve doubts and to discuss the group tasks submitted by each team.

Overall, data from 48 students have been gathered. The students were technical graduates and postgraduates with a long experience in the use of information systems and with no previous experience with LMS. A monitoring task has been performed by the LMS administrators and the courses coordinators in order to prevent prolonged absences or abnormal behaviour.

3.2 Research Methodology

A multiple backwards regression has been performed with the variable academic performance as independent variable for each course, then aggregated for each modality and year, and finally the total aggregated data for each modality, in order to detect similarities, differences and inconsistencies in data. This method allows establishing, in a predictive way, the relative influence –if any– of each independent variable over the dependent variable as a linear combination of factors, at certain significance level, as well as the variance explained of the dependent level [25]. The software used to perform the analysis was SPSS v. 16.0.

The interactions have been measured according to five types: total interactions (number of records –web page hits– for each student), chats (passive –read actions–

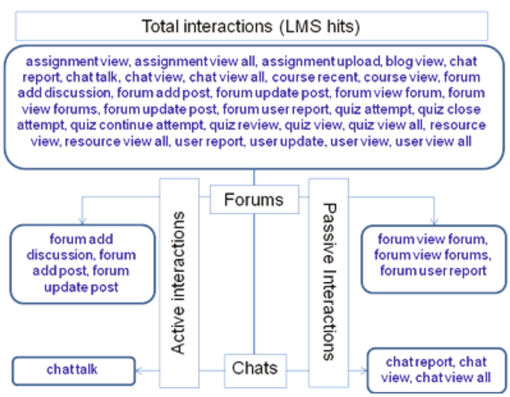

Fig. 1. Moodle LMS interactions classification

and active –write actions–) and forums (again, separating passive and active actions). Academic performance was calculated upon the final course grade. In the case of in-class courses, the only type of interaction analyzed was total interactions. Figure 1 shows the different actions registered.

4 Data Analysis and Results

First of all, Pearson's coefficients were extracted and observed, and multicollinearity problems were discarded for every course, although a slight correlation was detected between forum post readings and total interaction in online courses. Then, main statisticals –mean of variables of the complete master programs is shown in Table 1– were calculated, with a great difference of results for online courses between the first and second year, since the students of the first year program seem to have had more activity in chat rooms whereas the students of the second year's program have had a more intensive use of forum boards.

Table 1. Mean of study variables (in parenthesis, standard deviation)

Master program	Total interactions	Posts (active)	Posts (passive)	Chats (active)	Chats (passive)	Final Grade	N
Online 1st year	**2422.50** (573.98)	15.88 (9.35)	264.13 (142.65)	**481.38** (241.78)	**102.00** (39.20)	7.926 (0.24)	8
Online 2nd year	1901.70 (524.16)	**34.90** (16.90)	**341.10** (150.18)	115.60 (70.31)	35.70 (16.63)	7.964 (0.48)	10
In-class 1st year	1052.00 (638.16)	-	-	-	-	7.846 (0.38)	13
In-class 2nd year	856.65 (278.35)	-	-	-	-	**8.041** (0.46)	17
Total online	2133.17 (593.32)	26.44 (16.79)	306.89 (147.88)	278.17 (248.32)	65.17 (43.91)	7.947 (0.39)	18
Total in-class	941.30 (458.86)	-	-	-	-	7.957 (0.43)	30

The most noticeable finding at this stage was the absence of significant difference between the academic performances for each of the programs.

The ANOVA analysis showed different results for the courses: in general, no significant relation between variables was found within the courses –except for the longest course of the first year online program–; but when studied aggregated, the ANOVA offered quite different results: in online first year program, there was a significant influence –at a 0.1 level– of total interactions, forum postings (both reading and writing) and academic performance –accounting to 48.9% of the variance explained, corresponding to the value of the corrected R^2–, and the second in-class program featured a positive influence of LMS interaction on performance, though less relevant. Different than expected, the influence of the factors in the first year's online program was not positive except for the forum passive indicator. The standardized beta coefficients were as follows:

Table 2. Standardized beta coefficients for first year program (online) (final model)

Variable	Beta standardized coefficient
Total interactions	-1.018
Forum (active)	-0.617
Forum (passive)	1.055

Global values for online and in-class programs also showed no significant relations between the study variables.

5 Conclusions and Discussion of Results

This study has presented an analysis based upon objective and non-intrusive Moodle LMS activity record logs. Although, according to the theory, there should be a relation between the student's activity in the platform and his final academic performance, the results have not shown clear and final evidence of this fact, be it in-class LMS supported courses or "pure" online distance learning.

One of the reasons underlying this results may have its root in the small sample size, so a broader study could help to shed a light on this topic. Also, the duration of the courses must be taken into account, since shorter courses show less relation between variables than longer courses. However, there are some findings worth noting.

First, by inspecting the type of activity in each group of students there seems to be a biased behaviour accepted for all; that is, when the use of forum boards is more intensive, every student tend to communicate more with his fellow students and with teachers via forum than by using the chat rooms, and vice versa. Apart from this, no other significant difference was found between students taking the courses in different years.

Second, the use of LMS as a primary tool in online environments or the auxiliary use given in in-class courses does not affect the academic performance of the students. This finding suggests that there may be other variables more relevant, such as the quality of contents and resources accessible at the LMS, or the quality of the feedback given by the teachers. It could also be of interest to study separately the influence of interactions directly related to assignments –essays, tasks…– and those related to content taking place in each learning modality.

Third, this study proposes a method to evaluate the students' interaction in a LMS which is able to detect known issues as the "learning witnesses" –who have not been found in this study–. Nonetheless, this interaction does not take into consideration other measures such as global time dedication or, maybe even better, a time dedication vs. total dedication ratio. Some Moodle plug-ins, such as course dedication [25], may help perform this tasks and will be included in future studies.

Fourth, there are some psychosocial and system factors which were not included in this study because of their subjective nature and, if present, could help to reach a better understanding of this key question in learning processes, such as perceived enjoyment, perceived satisfaction or perceived ease of use. All these factors should be integrated with objective indicators in a common framework able to predict final academic performance. Student motivation should also be addressed, but in this study, and due to the nature of the programs –medium-high priced postgraduate courses linking higher studies with enterprise jobs or start-ups– and personal interviews taken prior to the start of the course, the profile was considered too homogeneous to be a representative factor. In the same way, other factors such as previous experience using LMS have not been considered because the groups of students all had similar experience.

Finally, it must be stressed that the results from this study may have somehow been distorted because of the tracking mechanisms employed, with course coordinators encouraging participation when activity drops from any particular student were detected.

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Education for Sustainable Development through the Use of the Second Life: The Case of a Virtual Museum for Sharks

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Abstract. The present work investigates the virtual world “Second Life” as an educational tool. The work commences with the very first steps of using the software and it ends up at the construction of a virtual building for the study of a subject in the context of Education for Sustainable Development. The subject is the pedagogical treatment of sharks due to the danger of extinction. The use of the term “Virtual Museum” is the proper term to describe the entire effort. Further than the constructional process, the paper focuses on the investigation of how easy it is for any educator to use this software and how likely it is to be used in a modern classroom in an effective way. In order to achieve that, a few internet sites were developed, a number of on line questionnaires were published and a series of virtual meetings were held. The entire effort was attempted through Internet exclusively.

Keywords: Education for sustainable development, Second Life, virtual museum.

1 Introduction

Virtual Reality (VR) is characterized by the development and use of man-made worlds that are organized and governed by a set of rules and regulation. These worlds allow all users to navigate and interact with them. For a user to navigate, there are specific input and output devices that give him/her the experience of a realistic feeling. These are joysticks, special glasses, gloves etc. The field of VR covers the areas of education and entertainment.

According to Bell and Fogler [2] VR is a new type of technology based on Web 2.0 components that leads to a dramatic increase of realism in simulations, getting its users deep into interactive environments that are created with the support of a number of computers. This augmented reality has the potential to increase the impact and effectiveness of educational simulation. Learning in a VR environment is a dynamic process determined by the user who sets the aims and changes them at will and the outcomes of the training process differ from individual to individual [7].

In fact, virtual reality is a three dimensional environment of simulation running on a computer whose display happens in real time and depends on every user’s activity in it. A virtual environment is consisted by an index (objects and actors), geometry

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and physics, that include the perception of objects in depth and through this all senses can be stimulated by an ego-centered context [8]. Moreover, VR is a deep and multi-sense experience where its illusive nature provides users more than just a simple observation but the ability to participate in an environment and interact with objects [6].

It is important that the strengths and weaknesses of VR are determined, before a VR application is implemented. Hence, there is a need to examine in which scientific fields VR seems to find a better use. For these issues to be investigated according to Bell and Fogler [2] there is a number of educational research that is set up, aiming at three basic goals:

Educational software has to be produced with as much practical use as possible to the largest possible number of students. This educational software must have the ability to run to all personal computers and to be able to spread out among the educational community with the least possible cost to the final user. Moreover, there must be an investigation for which educational cases and subjects, VR is more suitable. A great variety of educational subjects are tested to determine in which VR works efficiently. Specifically, VR is used widely in mathematics and physics science, architecture, medicine, aviation and in general fields which involve the study of natural phenomena and abstract concepts. An advantage of virtual reality is that of making what is abstract and intangible to become concrete and manipulable [10]. Nevertheless, the application of VR in arts and humanities studies should not be ignored. For example the ability of VR to develop places of educational interest such as historical sites and museums that are not easily accessible in the everyday life to students across the world, could be beneficial to social studies, culture and foreign languages [4]. Finally, techniques must be developed for the display of, and interaction with, scientific and technological information and concepts in a virtual world.

In the present work, the term of “Virtual Museum” was adopted. Sotirova [9] comments that the purpose of computers is often to entertain or to create a game or a competition and this is one of the characteristics that a museum has to fulfill. Museums though give also emphasis to educational issues, preservation and, or scientific work.

“Second Life” is the software that had been chosen to provide the means to develop a virtual museum. In 2007, when the project started, Second Life was the most famous and widely spread virtual world in Internet. Its key features, particularly networking, user interaction and the ability to cooperate for a common task (e.g. to create an object by using their own knowledge), cooperation with a variety of external components and 3D environment, played a crucial role on its selection against other types of virtual reality. Nowadays, Second Life seems to be more “mature” both technically and socially. Due to this fact, many educational institutions keep their own spaces in this virtual world and offer knowledge in an original way. However, there are powerful pedagogical utilities of Virtual Worlds that are not yet fully evolved or utilized and are thus worthy of consideration [5].

This particular museum is dedicated to an important issue of sustainability: the loss of biodiversity. The subject of this work was the shark, as an endangered fish. Since the late ’80s the shark had a notorious fame as a serial killer. Nowadays, evidence proves that there is yet little knowledge about the life of sharks. So, the task of preserving its existence on our planet seems to be tougher than ever before. Some species of sharks are thought to be more endangered than others. For example the great white shark is the species that gained the negative image, and a massive worldwide extinction campaign started against it. Shark finning (the removal and retention of shark fins) is also a major reason that sharks are facing extinction.

Consequently, it is expected that the educational community already have a controversial attitude about sharks. Though providing educators with new and subversive information and pedagogical activities about sharks, it was our belief that teachers and students would develop a new interest about shark's life. Given the sharks nature, it is very difficult to sustain a pedagogically useful approach to a considerable level using traditional techniques. Second Life's key features provide the ability to know about and study sharks very close.

Accordingly, the main purpose of this project was to provide teachers, who deal with education for sustainable development, with information about the new possibilities that cutting edge technology could offer to the quality of teaching. Moreover, there was an effort to examine if the study and presentation of an environmental issue, such as species extinction, through this technology would make it more interesting and beneficial.

2 The Virtual Museum

The virtual museum was developed on our own prim[1] that was located on an island divided into smaller areas, and one of them was our own rented prim (Fig.1).

The location was selected specifically to be by the sea so that the water element is projected at the maximum, the topic being the life of sharks. Our prim consisted of two major sections:

a) The 3-floor building.
b) Outside space.

Both were considered as one entity, while the whole space rented was able to provide visitors with a variety of information and services. It is important to mention that the area was set as open to all SL users even if they weren't invited to participate in the project.

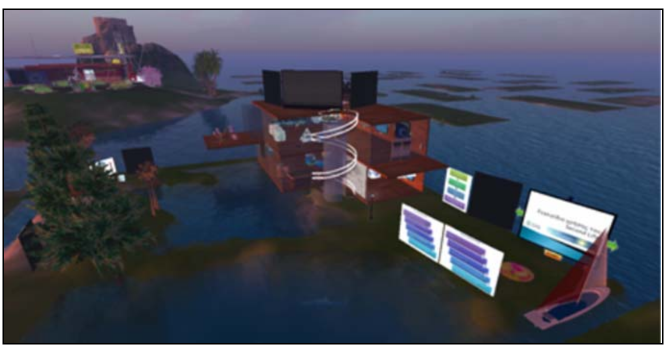

Fig. 1. A view from above

[1] Abbreviation of the term 'primitive'. A prim is a single part object. Multipart objects will have multiple primitive parts ('prims'). Virtual physical objects such as cars and even less obvious things such as hair are made out of one or more prims [1].

The building was separated into three floors, i.e. the ground floor, first and second floor, where every floor had its own purpose and theme:

A. the ground floor (Fig.2) was open to all visitors (although focused to serve primarily school age children), and there users were able to discover, read and learn about sharks in various ways:

a) A poster that was situated at the entrance of the building, showing the size of sharks compared to the size of a diver.
b) A specialized webpage dedicated to school age children, constructed by the researchers in Greek, providing students with simplified information and educational activities about sharks.
c) A series of PowerPoint presentations that displayed information for the main shark species separately.
d) Virtual objects that were programmed to work as links to other web pages, specialized on sharks and “flash” activities that in-world could not be provided.

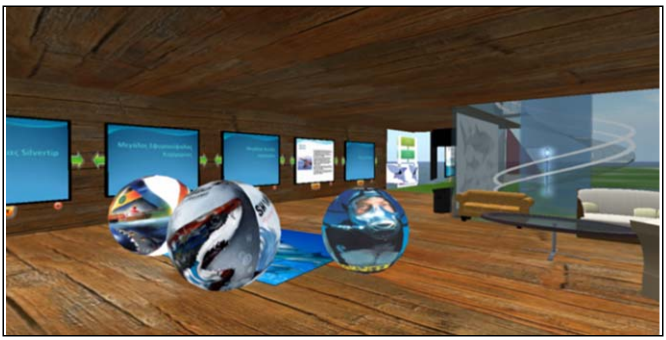

Fig. 2. Inside view of the ground floor

All of the features mentioned were constructed by using programming on Second Life’s own scripting language. The whole area was supervised by a “beam” programmed to keep for the researcher all information needed about the visitors and the number of their visits.

B. The first floor was dedicated exclusively to educators. This floor provided educators with more specialized information about sharks, again, through PowerPoint’s and links to other web-pages. It must be noted here, that the links were categorized accordingly to their use and content by geometric shapes as follows:

a) Scientific information about sharks → pyramids
b) Useful educational tools and search engines for a potential new user-educator to use in-world or to construct his/her own virtual space → cubes
c) Links to environmental education sites → spheres

The first floor area had the ability to lock when pupils were in the area, as there was no purpose for them to be there. That was achieved by the use of some programming.

C. The second floor was actually an open space and an amphitheatre for lectures. There was room for 25 persons - avatars[2] to actually sit and take part in a lecture. This amphitheatre had also 3 large video-wall displays that they were used for projecting PowerPoint presentations, web pages and videos. Moreover, the capability for connection to "Moodle" was installed but was not actually used as it was a far too extended feature to use in the framework of this project at that point.

More video wall displays were scattered around the whole area, so that users participating in this educational project would be able to participate more actively even if they weren't physically in the area of the amphitheater.

Despite the capabilities of Second Life the designs were kept to a conventional standard to encourage the users and to give them the feeling of real life

The outdoor section is described by four main features:

a) The entrance area, where all information needed by a user was provided, for example a welcome note, PowerPoint presentations etc.
b) The outside scenery that was constructed to serve the whole theme of the project i.e. there were spaces filled with 3D and 2D models of shark species.
c) The evaluation corner, where the two in-world questionnaires were located.
d) The video walls scattered throughout the outdoor space, so that users had the ability to watch any material used in the amphitheater, but not having to be there constantly while a lecture takes place.

3 Evaluation

Due to the special nature of this software, the project was evaluated by using a variety of methods, to achieve our main goal; to assess the pedagogical value of this application. The educators who participated in the project were to evaluate it.

Following the test of the software for several months and before the involvement of the users with the software, a questionnaire was developed to:

(a) Identify the profile of each individual user, and
(b) Tabulate the opinion of the potential users about this new technology

This questionnaire was addressed by e-mail, to two major groups of users. To a group in the social network "Facebook" and to the mailing list of the wiki that was set up especially for this purpose, a total of 300 teachers in Greece and Cyprus. Out of them, 101 teachers, all with good Information and Communication Technology (ICT) knowledge, answered the results of the questionnaire.

In detail, 54.46% stated that they have a good relationship and 30.69% stated that they are experts on using ICT. Moreover 62% of the sample is using the web for educational purposes. A part of 86.14% answered that they use the Internet more than 5 hours/week. Furthermore, participants consider computer to be a tool (11.17%), entertainment medium (13.51%), communication medium (19.74%), knowledge medium (18.70%) and professional medium (18.70%). With regard to the Second Life a remarkable share of participants (38.6%) stated that they ignore the existence of this particular world. This is probably due to the very little promotion Second Life has in Greece and

[2] Avatar is a representative of a real person in the virtual world.

Cyprus. Finally, all of them answered positively that the Internet could be an educational medium and 81.2% answered that a virtual space could be an educational tool.

Further, all of the potential users were provided with all the basic information necessary to access the virtual location of the project. They were asked to download two major word files; one contained installation guidelines and the other a user's manual so that everyone would have a source of instructions on their whereabouts in Second Life.

A time period was given for the new users to become familiar with the new software, irrespectively of the level of ICT skills. This period was nearly 30 days, where a number of group meetings inside the virtual world were held, so that all problems were solved before the actual educational project occurred. A group of around 30 people managed to enter the virtual world but statistics showed that their action was very limited, except that of their participation on the scheduled meetings. All of them had joined most of the training days. Those meetings, not only helped the new users, to sort out their way around the virtual world, but also helped the administrator of this project to have a deeper understanding of the software and all possible technical problems that could arouse at any point of the project.

Later on, the evaluation process occurred in two phases:

a) During their stay in the museum (in-world). This phase included both synchronous and asynchronous methods and it was related to the learning content of the museum. Users had plenty of time to read the information provided in the virtual museum about sharks and at the end of their virtual stay, they would have the chance to test their newly acquired knowledge on a questionnaire dedicated to shark's life, at the "Evaluation Corner" that was set up especially for this reason. In this questionnaire, the knowledge offered about sharks to students was tested. The so called "Shark Quiz", available during the entire period of the project, provided us useful information. This quiz was answered by just 26 users out of the 101 that formerly answered the first questionnaire, and had an 82% of success.

b) After completing their visit to the museum. Participants were provided with a new questionnaire, which examined the first impression of users about the museum. The questions referred to the quality of the virtual world. The answers of the questionnaire were of "Yes" / "No" type and was programmed to be directed automatically to the researcher's email address. Positive answers, regarding the quality of services provided, were in excess of 90%.

There were further oral or written references by the users of the whole period that the project was on, about technical aspects of the software that helped us to make improvements were it needed and possible.

In addition, the fact that just 26 of the potential users, finally reached the final stage, needs to be examined, by mentioning two major factors. First, the installation process of the software could be considered as a major obstacle to work using the software. Second, a phenomenal denial was observed in the participation aspect by the potential users that firstly responded positively to the idea of using technology and virtual reality as an educational tool. 101 people that had relation with education, mostly primary school teachers, responded positively at the first questionnaire. But despite motivation issues and all the help that was provided, a very small percentage of that group finally participated. It is our belief that the fear of the new was a major reason of the distance kept by the potential users.

4 Conclusions

The results of this project helped us to reach some interesting conclusions on the use of such a high edge technology as an educational tool.

It should be mentioned that all problems that arose during this effort actually concern the technological dimension, and they are to be solved in the near future as technology progresses and is more widely spread throughout the world. This technology is deriving from a very technologically progressed country (the USA) and the difficulty that the Greeks and Cypriot users faced is statistically understandable and expected. This is due to the fact that culture for ICT is less widespread and deep in the above countries, together with lees infrastructure (networks and Internet connections) The technological difficulties could not be taken into consideration before using this software, due to the fact that most problems came up when the administrator passed from the simple user status to a premium user status i.e. when the administrator started to create and build virtual objects.

Nevertheless, this is not discouraging us in continuing this effort. As technology advances in general, we are convinced that it will provide us the chance to reach all the pedagogical goals set. The prospect for reaching the maximum potential of this virtual world for educational purposes is yet to come.

The prospect of using 3D environments as an educational tool and the possibility of widening the variety of means for this purpose are very important for the cont emporary school, which has to deal with complex and multidimensional topics, such as the environmental issues. The educational aspect of Second Life proves to be able to assist us with new aspects about how a subject can be taught more efficiently. In fact, cooperative construction of knowledge and user interaction, are fields that traditional education has a lot to progress. Therefore, we consider that technological advancement will allow researchers and educators to use the multiple opportunities for interaction among participants that Second Life provides in a more efficient way. In addition, the 3D aspect of Second Life in combination with its networking ability is a key instrument for any teacher that wants to approach a subject with animation and realism that in other way would probably be impossible. Education for Sustainable Development deals with various such subjects i.e. endangered species, less known ecosystems etc. Second Life is free to acquire it and very cheap to use it for educational purposes too.

Such advantages should encourage researchers, from the fields of Education for Sustainable Development and ICT, to investigate and plan new educational applications.

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Quality of Project Management Education and Training Programmes

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Abstract. The paper refers to the factors which influence the quality of training and education on project management. A survey was made and the main results are presented. 81 % of the responses came from China. The rest were professionals of different EU nationalities. The percentage of Project Managers who answered the questions is rather low – 8%. In the “Others” category, we have software developers, financial managers and professors, who are involved in both training on project management, but also as team members or team managers in projects, thus ensuring a balanced overview of both theory and practical issues.

Keywords: Quality, Project management, training and education, competences.

1 Introduction

Project management has become widely known, as the main form of organization in knowledge economy [1]. Project management isn't about quick fixes: the key to success here, as everywhere else, lies in preparation. A good project manager knows the project management principles, methods and techniques and applies them, always looking for the best outcome of a situation. Some project managers don’t need too much training to do that, but others, on the other hand, need tons of training and they never really quite figure out what’s the best solution to be applied.

Whatever the scope of the work, training and education is a key element to survive in knowledge society, as it facilitates the competences development in professional activities [2], [3], [4], [5]. Nevertheless, practice has its place in sharpening the work skills, especially in project management [6]. Project managers make decisions which affect not only a project, but a carefully built network of contacts and a carefully promoted image [7]. Consequently, the following questions arise: “Where does the quality of project management education and training lie?”, “How can we define project management training and education quality?”, “Where should we establish boundaries so as to achieve effective and efficient and fit-for-purpose project management training?”, “What should we teach, in order to get a ready-to-go project manager?”, “Should the project management education be addressed as input based – provider, trainer, curriculum, or also output based – trainee, beneficiary?”. The authors of current paper aimed at finding out the answers to these questions, using a questionnaire-based survey.

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2 Training the Project Manager: The Roles of Training Providers and Trainers

In project management, a training session could aim at developing or improving one of the project manager competences [1]. By developing, we mean that the competence is at its basics or is not there at all. By improving, we mean that, from the documentation received from a candidate, we can assume that some competences exist and we can build on those. A training session could refer to one topic or more, thus having an impact on duration of the training [8], [9]. Although it may seem that we are only approaching technical competences, a balanced percentage of theoretical and practical training, backed up by modern teaching methods [10], could lead to the improvement of behavioral competences, as well.

Having established what training means in project management, the paper will further focus on finding out what makes a project management training to be qualitative.

3 The Quality of Education and Training on Project Management: Research Methodology

The instrument used in current research was a **questionnaire**. The methodology for the development of the questionnaire was based on the following aims:

1. Development of a questionnaire for assessing the general and specific traits of quality in training on project management;
2. Focusing on the practical aspects of organization and logistics, as part of the training organization;
3. Stressing on candidate accession / enrolment in a training course / programme;
4.Finding out the needs for the inputs and resources ensured by the training providers;
5. Finding out what the trainers' profiles should be;
6. Discovering the minimum requirements of curriculum;
7. Highlighting what the expectations for the training result are;

The main research question is related to what determines the quality of project management training/ programme. The authors argue on determining a good combination of traditional and modern teaching for the project managers-to-be, who do not have the physical time to attend project management traditional courses / programmes. This combination should be practical enough to offer them a ready-to-go information and also will provide them with a certification or a diploma, which is accepted and valuable by their co-workers and clients.

The questionnaire is structured into two main parts, split into questions about general aspects of education and training and particular questions related to project management education and training.

The respondents' distribution was analyzed from two points of view (see Fig. 1):

- ***by nationality -*** 81 % of the responses came from China; the rest were received from Romania, from a number of professionals of different EU nationalities;
- ***by profession:*** the percentage of Project Managers who answered the questions is rather low – 8%; the most of the respondents are professors, who are involved in

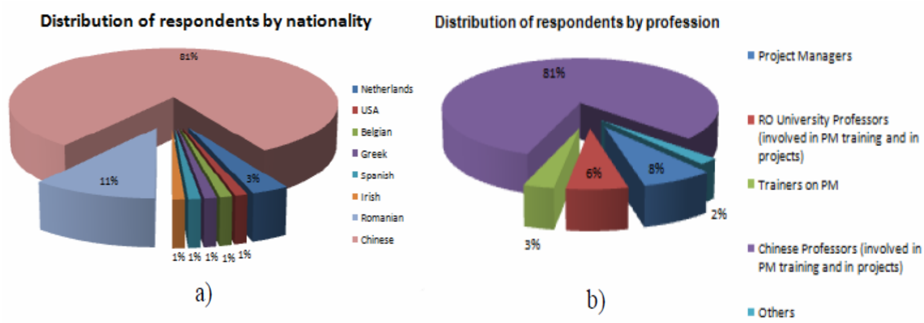

Fig. 1. The respondents' distribution

both training on project management, but also as team members or team managers in projects, thus ensuring a balanced overview of both theory and practical issues;

4 Research Results and Analysis

The survey revealed important aspects to the quality of project management education. As shown in Fig. 2, the selected location for training is considered important by most respondents – 41 out of the 96. Only 11 say that location is very important, same goes for two who cannot decide. 13 people stated location is not very important, while 27 consider location is neither important, nor un-important. 55 respondents opt for the higher percentage of face-to-face, traditional training. At the extreme, only 14 people consider that open and distance learning (ODL) is more useful than traditional methods (see Fig. 3). 24 think an equal split of modern and traditional is useful. Most respondents opt for the network video (52%) and e-platform – 28%. 7% recommend case studies, while only 1% opts for e-tutoring, during and after course delivery (see Fig. 4).

The majority of respondents opt for the outmost importance of accreditation of training providers (national or international). At the other end, 6 respondents do not care at all about this issue.

National accreditation is seen as very important by 43 respondents, when compared to international – only 41 (Fig. 5a). The same trend as above is kept when talking about trainers' accreditation (Fig. 5b). The analysis of the questionnaire shows that the importance of accreditation is mostly stressed for the institution, not for the person, but those who opted for 1 in the above questions, also opted for 1 or 2, in the trainers' answers, as well.

With regard to the characteristics of trainers (see Fig. 6), 1 person stated language skills, as being important, while 3 others stated pedagogical skills. 81 interviewees state that it is important for trainers to speak from experience, while 70 consider that the technical expertise is also required. 73 say that it would be important that the trainer is certified as Project Manager. PhD is considered important by 28 people.

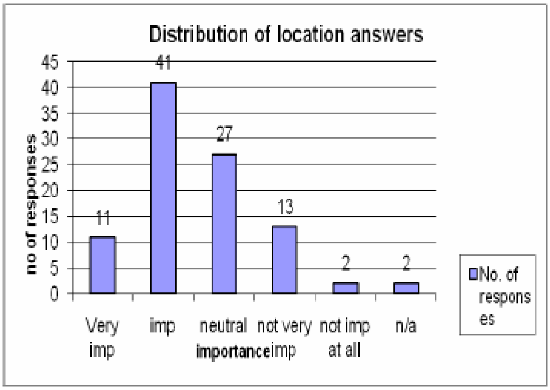

Fig. 2. The distribution of answers regarding training location

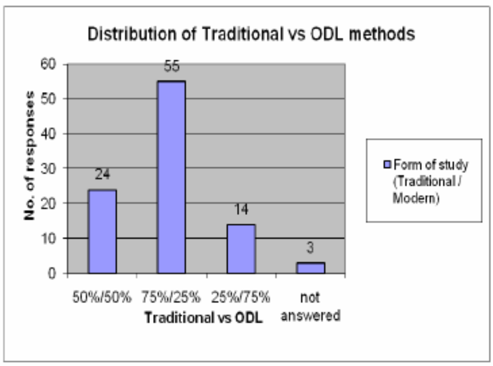

Fig. 3. Distribution of answers regarding utility of the ODL methods vs. traditional methods

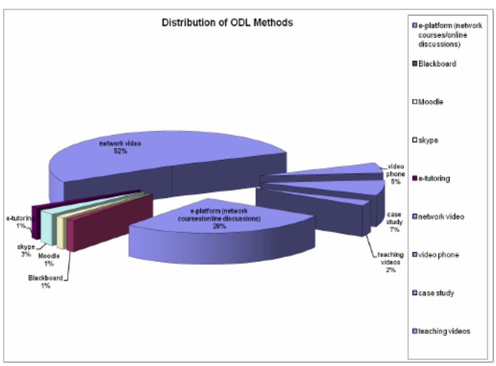

Fig. 4. Distribution of answers regarding ODL methods

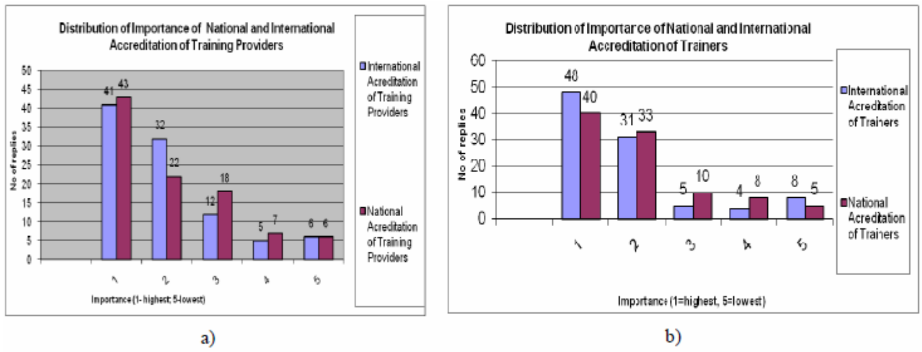

Fig. 5. a) Distribution of answers regarding the provider accreditation; b) Distribution of answers regarding the trainer accreditation

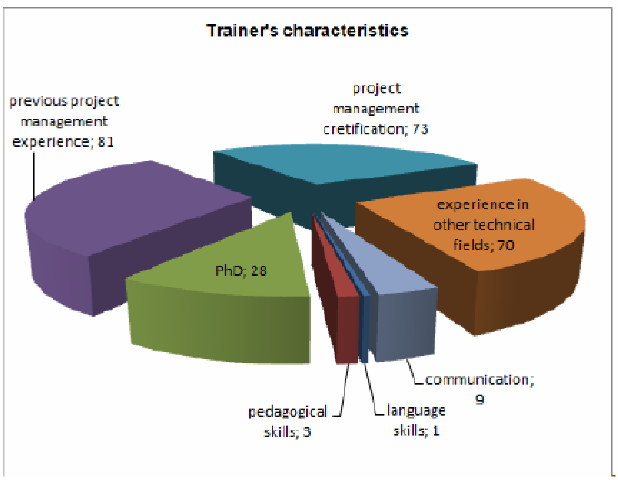

Fig. 6. Distribution of answers regarding the trainer characteristics

Candidate selection is very important for 18 people, and important for 45. This leads to a majority of 63 respondents who think that selection of candidates is an aspect of quality assurance. 25 are neutral about this aspect, while 5 feel that candidate selection is not important for training quality. Most of the respondents declare themselves in favor of candidate selection. Most important documents required in the candidate file are: CV (very important for 66 respondents), Diplomas, and Employer's references (very important for 39 of them, but completely unimportant for 48), as well as an Application Form.

After our respondents' opinion, the form of addressing the needs of the ones involved in the training activities is the most important factor which determines the quality of the training (see Fig. 7). According to the R square value (0.87), the endogenous variables are explained in 87% proportion by the exogenous ones, so the quality indicator is positively influenced by people needs, organization accomplishments, trainees' motivation and trainers' skills. The Wald statistic test came to strengthen the idea that all considered variables have an impact on quality. The statistics from Fig. 7 was made with EViews tool and Ordinary Least Squares method was applied.

Dependent Variable: QUALITY
Method: Least Squares
Date: 02/03/10 Time: 13:08
Sample: 1 96
Included observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NEEDS	0.400070	0.037417	10.69215	0.0000
ORGANIZATION	0.135136	0.029024	4.655957	0.0000
TRAINEE_S_MOTIVATION	0.420516	0.072164	5.827203	0.0000
TRAINER_S_SKILLS	0.273471	0.045321	6.034139	0.0000
C	-21.49685	4.632236	-4.640707	0.0000

R-squared	0.870996	Mean dependent var	81.05208
Adjusted R-squared	0.865326	S.D. dependent var	6.990776
S.E. of regression	2.565474	Akaike info criterion	4.772842
Sum squared resid	598.9307	Schwarz criterion	4.906401
Log likelihood	-224.0964	F-statistic	153.6015
Durbin-Watson stat	1.989826	Prob(F-statistic)	0.000000

Fig. 7. Regression output for the multiple regression model regarding the factors which influence quality of project management trainings

5 Conclusions

According to our survey, we conclude that quality in project management education and training depends on: organization and logistics – a good organization and combination of teaching methods adds value to training (assessed through Session Feedback Forms), the training need addressed – practical solutions, exercises, case studies (assessed through Session Feedback Forms), trainer's skills – pedagogy, languages, knowledge of the field, experience in the field, trainee's commitment and motivation.

Training providers should promote a coaching service for a limited period after the training sessions. Alumni's databases and forums are desirable solutions. Training providers are not responsible for the performance of the graduate at the work place. Training impact should be assessed through feedback forms, after a reasonable period from session graduation. This study can be an important tool in improving quality of project management education, as it identifies the factors which influence it.

Acknowledgments

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ICT in the Education of Students with SEN: Perceptions of Stakeholders

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Abstract. Portugal is experiencing a technological reform in education. Technological refurbishing of schools and training of students and teachers is a reality on the rise, enhanced by the implementation of the Education Technological Plan, which also aims at computer skills certification, by 2010, of 90% of teachers. In a School that must be adjusted to all pupils, Special Educational Needs cannot be neglected and the nature and constitution of its computer resources should obviate the support of these students. ICT training is essential to benefit all students from its use. In the case of SEN, this need for training is of paramount importance to establish itself as a facilitator for these students. ICT Coordinators are the visible face of ICT implementation in schools; their functions include the management of the schools computer facilities and to zeal for the ICT training of fellow teachers.

Keywords: ICT, SEN, ETP, Teacher Training.

1 Introduction

The technological dimension of the world which cannot be ignored, is immeasurable, with ramifications in almost every aspect of daily life and consequently of education. However, this is not always taken into account by the school to integrate it into learning, despite ample warnings from researchers. The lack of proper training in the use of ICT in pre- and in-service teacher education programs is one of most often cited barriers to the use of technology in the classroom [1][2][3][4][5].

On the national scene new school and teachers' roles are currently being discussed along with the concerns and implications underlying the level of teaching strategies and teacher training in the educational use of ICT. The Education Technological Plan (ETP) seeks to "*put Portugal among the five European countries with the most advanced level of technological modernization in teaching*"[1].

With the implementation of the ETP, where one visible aspect is the distribution of computers at no (or low) cost to elementary up to secondary students and teachers, much is debated about the pros and cons of technology in schools. When over 1.198.930 computers have been distributed and Portugal ranks 3rd in the use of mobile

[1] The mission and objectives of the Portuguese Education Technological Plan (ETP) are available in: http://www.pte.gov.pt/pte/PT/OPTE/index.htm

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broadband, the specific case of the use of technology with SEN students raises issues relevant for discussion: when will the implementation of specific technologies to support students with SEN take place; what is the priority given to training in ICT to meet special teaching needs of staff with responsibility in putting ETP into practice; are professionals with operational responsibility in ICT, knowledgeable of their educational potential and aware and informed of the opportunities these tools can provide to students who struggle with learning problems; are they making efforts to provide Special Education colleagues with the necessary skills to use ICT in the education of students with SEN?

The Inclusive School requires a school for all and a school for each one. This raises the issue of teachers that not being obliged to have specific knowledge in SEN must comprehend the nature of their situation and be prepared to receive and educate all students that come into their classroom.

1.1 ICT and the Education of Students with Special Educational Needs

It is unquestionable that the use of computers and technologies presents itself as an added value to the process of teaching and learning. ICT is used internationally at different levels to increase access, efficiency and quality in the teaching-learning process. The advantages of using ICT in the education of SEN students are also substantiated by several studies [6][7][8][9], reinforcing the benefits obtained by these students that tend to be exponentially higher when compared with pupils without SEN. Ribeiro, Moreira and Almeida [10] synthesize several studies that explore the inclusive potential of ICT. The studies and testimonies from teachers and from students with SEN corroborate a wide range of applications of ICT, either as Assistive Technologies (AT) or as educational tools, overcoming various difficulties these students encounter, that range from the most visible physical disabilities, to emotional and behavioral problems [10]. Teachers, by their proximity to the educational process, are clearly defenders of the use of ICT in inclusive education. Several studies, particularly the surveys conducted by Benigno, Bocconi and Ott [11] with Italian teachers, and Brodin and Lindstrand [4] with Swedish teachers, show recognition of the potential of ICT in fostering inclusion by 75% of the first set of respondents and of 79% by the second set.

It is impossible to deny that ICT have numerous advantages for students with SEN, promoting equal opportunities and active participation in their learning process. As an AT it can assist the overthrow of barriers in the access to education; as a pedagogical tool it can foster new opportunities and educational strategies that are more successful than the simple use of traditional teaching methods. However, the mere introduction of the computer in the classroom does not lead to automatic effects beneficial to the process of teaching and learning [2][3]. It requires the implementation of teaching methodologies that leverage the great potential that ICT carries.

At present with the ETP there is an urge to equip Portuguese schools with computers and associated technologies and to certify teachers in ICT. We can observe the emersion of directives, policies and projects that attempt to tackle the digital divide and lack of computer literacy, as well as to potentiate the use of ICT as a pedagogical tool. However, not all means are available and/or adapted to the real needs of students with or without SEN: not only to understand these resources as hardware and software, but also integrating the professionals who know how to extract benefits from ICT. Ramos et al. [12] mention that the presence of computers in schools will not foster their use because of lack of information and training in ICT. In the specific case of support to pupils with SEN, the study by Ribeiro, Moreira and Almeida [13] shows an obvious need for general training in ICT in particular, and especially in ICT SEN oriented training. This study also found that only 1 of 19 respondents was confident of his/her technological capabilities to use ICT to support pupils with SEN. The lack of adequate education and training has an impact that is particularly preponderant in students with handicaps and disabilities. ICT is often a crucial component of planning/implementation of educational programs for these students [5]. Accordingly, the training of those who work with SEN students should be seen as a priority in order to promote access and educational success of these students.

1.2 The ICT/ETP Coordinator

The ICT Coordinator "emerged" by means of a 2005 government bill during the first technological equipping of schools, aiming to promote the use of differentiated technologies in education. Their need was identified in two main areas: to ensure the maintenance of networks and computer equipment to facilitate their effective use in teaching and learning; to assist the investment in training and to support teachers in ICT, enabling ICT use for teaching, non-teaching and administrative activities. These tasks should be carried out based on the development of an ICT Plan.

A bill from 2009 introduced the ETP Coordinator and Team, responsible for carrying out the functions formerly performed by a single element. This mandatory team has the task of putting into practice the ETP directives. The ETP coordinator keeps all the functions attributed to the ICT coordinator, to enforce ETP directives: provision and maintenance of equipment, networks and Internet; survey and meet the training needs of teachers in the school. These functions emphasize the crucial role the figure of the ICT/ETP coordinator plays in providing resources and promoting ICT use in the education of all students.

1.3 Research Background

This study is part of a nationwide survey that has raised from the conviction that ICT as teaching tools or assistive technologies are an asset to the education of SEN pupils. It consists on a pilot survey, part of the main data collection instrument validation.

The ongoing research seeks to determine working conditions and training needs for the use of ICT with students with learning issues and aims to design a teacher training program for 1st to 9th grade teachers, adapted to real training needs and appropriate to SEN contexts. Considering ICT as a unifying factor, we argue that those involved in this area are primarily Special Education and Support Teachers, whose mission is to support these students, and the ICT/ETP Coordinators for their central role in the deployment of ICT in schools and the promotion of training of fellow teachers. Since ICT is often the only means by which SEN pupils have access to learning, the role of ICT/ETP Coordinators is of paramount importance, as they can make a positive or negative difference on the use of ICT by these students because of their responsibility in the management of the technological inventory of schools and in the ICT training of teachers who support these pupils.

As the questionnaire used here is very similar to the final one, we concur with the perspective of authors such as Lanphear [14] for whom the publication of results of pilot studies may contribute towards improvements in educational programs. We believe that the data published here may stimulate discussion on the initial/continuous training of those who, in the course of their work, have to support pupils with SEN and provide them with tools that facilitate access and participation in their learning and promote success rates, along with experience of citizenship.

2 Study

The digital questionnaire consisted of multiple-choice questions about professional behavior and training needs on the use of ICT in the education of SEN students. The respondents were 13 ICT Coordinators in office in July 2009 with experience of 5 to 36 months. 6 of them were responsible for a group of schools and 7 for single schools. The questionnaire was self-administered, with respondents filling it out in a situation similar to that of the response to the final instrument, with only an added short interview to identify any final corrections and/or additions to the questionnaire.

2.1 Results

As regards work experience as ICT coordinators 6 respondents were in office from 25 to 36 months, 4 between 13 to 24 months and 3 between 0 and 1 year, with a minimum experience of 5 months. As for teaching qualifications 3 respondents had a degree in 2nd cycle education, 6 in 3rd cycle and secondary education. When asked if their basic training had addressed the use of ICT with SEN or Assistive Technology, it was found that, in the first case, 5 of 13 coordinators had lessons on the use of ICT in SEN in their graduate course and 2 addressed the use of AT.

The analysis of the academic history of the respondents showed that 4 had a post-graduation/specialization in a computing area, 3 of them a master's degree, and 1 of the computing graduates cluster a master's and a post-graduation/specialization in the area. However, when asked whether their specific training in the area had included content related to the use of ICT for SEN and AT, out of the 4 respondents with degrees in computing only 1 had classes on the use of AT and of the 3 respondents with master's, only 1 had some training in AT.

Concerning specific training in SEN we observed that only 1 of 13 respondents had some training in the form of a seminar titled “ICT and SEN" as part of their degree in Information Science and this was attended less than 1 year ago.

Regarding the interest about the use of ICT in the education of students with SEN, all respondents answered affirmatively (7 very interested; 6 interested). As to the scope of the ICT Plan under their responsibility, only 4 (30,8%) respondents said that this includes the use of ICT by SEN pupils. As it relates to the equipping the school groups/schools with technologies for SEN 6 respondents stated that schools do not have sufficient resources, 5 emit no opinion, 1 does not agree nor disagree, and 1 disagrees.

Analyzing knowing the technologies especially designed to educate students with SEN, all respondents reveal they are outdated, or that they have no or reduced knowledge about them. Regarding the need for training in SEN, 11 respondents stated they need more training and 12 more training in ICT for SEN. In this item, 7 concretize referring motivation for training in this area. As regards surveying training needs in ICT for SEN, only 1 respondent stated s/he had already taken steps in this direction, but that there were no arrangements made for training in the schools under their scope.

Nationally there are 25 ICT Resource Centers for Special Education (ICTRCE) for advice and support in the use of ICT in education of SEN students. The majority of coordinators (10 of 13) are not aware of the existence of these centres, 2 know about them but never consulted with them, and only one stated that s/he consults the centre a few times a year. As for their perceptions on the use of ICT, ICT coordinators in national schools believe that technologies are a tool for inclusion (11 - 84.6%) and therefore offer significant educational benefits for pupils with SEN (12 - 92, 3%).

2.2 Discussion of Results

Having these respondents an appetence for ICT it is not surprising to find that their beliefs on the potential of ICT to support pupils with Special Educational Needs is evident. In the cases surveyed there is a lack of technological equipment for pupils with SEN in schools. It seems that, despite the few technologies available, very small steps to strengthen the supply of schools in this area have been taken. However, the lack of equipment is only part of the problem as this also applies to insufficient qualified professionals to support pupils with SEN. It was also possible to determine that these qualified professionals in the use of ICT in education in general show clear needs at the level of expertise to support pupils with SEN in the use of ICT. However, they demonstrate motivation to overcome these problems, revealing that they need training in SEN and in the specific use of ICT with these students. ICT/ETP Coordinators are not the only human resources required to support students with SEN. This role is mainly intended for Special Education and Support Teachers with specialized training for the job. Nevertheless, the ICT Coordinator plays an important role in the qualification and certification of ICT teachers and, in that respect, only in 1 case did we find a professional who was careful enough to survey the teachers from his/her schools about their need for training in ICT applied to SEN. Despite this survey, no respondent reported to have taught or organized training in the area.

The responses analyzed, in our view, make us believe that the main problem lies in the awareness of the problematic involved in SEN and the training of teaching staff that support these students. The respondents, although aware of the enormous potential of ICT, seem to adopt a position of contemplation, believing that teachers who specifically support SEN students already have the necessary training, an erroneous assumption already reported in several studies and recently in the study by Ribeiro, Moreira and Almeida [13]. Costa et al. [15] consider that a general insufficiency in the training of teachers in the education of pupils with SEN negatively conditions the functioning of schools and activities in the classroom. We therefore agree with Carvalho and Peixoto [16] that *"What is at issue is the doing, constantly seeking improvement, not to slacken their efforts on behalf of the force of inertia (...)"*.

3 Final Considerations

The present study was conducted with a very small number of respondents so we can only infer their training needs and draw some lessons that can underlie a training program without the pretension of major generalizations. In a school that aims at inclusion, with the increasing presence of SEN pupils in mainstream classrooms, coupled with the certification of computer skills, the specter of knowledge of any teacher should be extended to understanding the paradigm of inclusion underlying the comprehension of the particular needs of SEN pupils.

Concerning technological support for pupils with SEN, there are at present the efforts of educational authorities to centralize technology resources in specialized centers and extension of laptops distribution initiatives for pupils with SEN. Nonetheless, ICT adapted to special needs should be available in any school so that any student can attend the school nearer his/her home as if s/he wouldn't have any special need. However, it appears that the necessary arrangements are not always made to ensure the use of ICT by pupils with SEN, either by insufficient acquisition of technology or by insufficient surveying and available training in the area. There is still a path to trail until this reality is met. Respondents seem to reveal gaps essentially at the level of awareness of the problem, with reduced pro-activity.

The ICT/ETP coordinator appears as a central element in promoting the use of ICT by SEN pupils. S/he must retire from the role frequently imposed by their fellow teachers as *"(...) computer engineer that tightens screws."*[12]. S/he should rather take a proactive stance, also in signaling pupils with SEN, endeavouring to propose the purchase of computer equipment to facilitate the use of ICT by these students, consulting specialized agencies, surveying, requiring and promoting training specifically targeted for teachers that accompany these students.

In this perspective, associated with conceptual and practical training, we believe that training for ICT Coordinators should first address an attitudinal component of information and awareness, and then technological knowledge and learning. When much is invested in training in the educational use of ICT, data collected in this study seems to indicate an inadequate approach to the potential of its use with students with SEN in initial and specialized training for professionals in ICT in education.

In conclusion, aware of the fact that these measures are not just at the operational level of responsibility of the ICT Coordinator, they should be molded at an organizational level responsible for policies to equip schools and teacher training. We agree with the 1999 British Code of Practice of the Disability Act Discrimination (DDA), that failure to anticipate the need for an adjustment may make it too late to comply with the duty to make the adjustment. We therefore also agree with Trucano [17] who, referring to the use of ICT in teaching says that training is the key to technological innovation and teaching. Teacher education and the progressive development of relevant professionals are essential for the benefits of ICT investments to be maximized.

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A Haptic-Based Framework for Chemistry Education: Experiencing Molecular Interactions with Touch

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Abstract. The science of haptics has received a great attention in the last decade for data visualization and training. In particular haptics can be introduced as a novel technology for educational purposes. The usage of haptic technologies can greatly help to make the students feel sensations not directly experienceable and typically only reported as notions, sometimes also counter-intuitively, in textbooks. In this work, we present a haptically-enhanced system for the tactile exploration of molecules. After a brief description of the architecture of the developed system, the paper describes how it has been introduced in the usual didactic activity by providing a support for the comprehension of concepts typically explained only theoretically. Users feedbacks and impressions are reported as results of this innovation in teaching.

Keywords: Haptic technology, Chemical education and teaching, Molecular interaction.

1 Introduction

The science of haptics has received a great attention in the last decade. One of the major application trends of haptic technology is data visualization and training. In connection with such field, haptic can be introduced as a novel technology for educational purposes. In particular, the usage of haptic technologies can greatly help to make the students feel sensations not directly experienceable and typically only reported as notions, sometimes also counter-intuitively, in textbooks. In this work, we present a haptically-enhanced system for the tactile exploration of molecules. A deep understanding of *inter-molecular* forces that govern the binding processes is nowadays fundamental in many applications, like for example in drug design, and for this reason they have acquired a great importance in the formation of chemists and future scientists. Interactions among molecules are usually described in research as huge sequences of data, which describe the attraction/repulsion forces and the positions of binding sites on molecular surfaces. These data are awkward to interpret *as-is*, even by experts of the field. Students, on the other side, can only rely on their thought and imagination to understand how interactions take place, once they have studied them from their books.

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Haptic interaction could greatly help here, because the sense of involved forces could be used to better *feel* the intensity of interactions. At this aim we developed a virtual environment endowed with a haptic device. While an analyzed molecule is shown to the user, a *haptic probe* with an associated electric charge is used to *explore* the electronic surface of the molecule. Auxiliary information associated with the haptic interaction help student in the navigation and comprehension of the related concepts.

2 Description of the Framework

Figure 1 sketches the architecture of the developed system. The framework consists of a computer with a connected haptic device, in this case the Sensable PHANToM [10]. The user explores a virtual 3D environment showing the geometrical structure of a molecule, and a cursor, that represents the current position of the haptic probe. The cursor of the probe is associated to an electric charge, which magnitude can be arbitrarily set by the user, either for positively and negative values. The user can move the haptic probe and navigate the 3D space around the molecule, getting the feeling of the forces of the electrostatic interaction between the charge and the molecule.

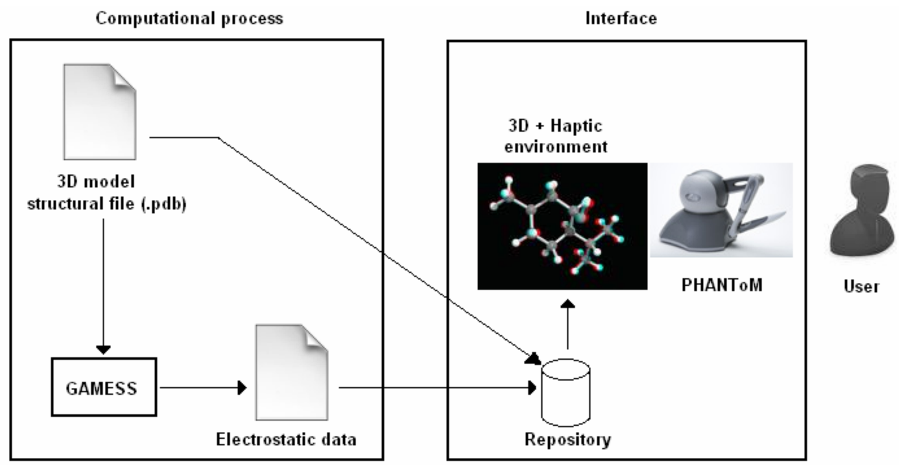
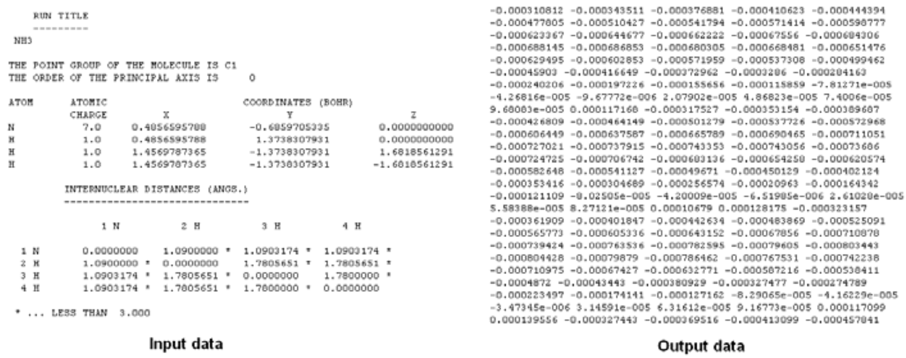


Fig. 1. The architecture of the designed haptic system

To model the interaction, the system takes in input some information, stored in a data repository. For the geometrical representation of the molecule structural formats widely adopted in experimental chemistry (.PDB file format) are used. For a reference on the used file format, see [11]. Such data are then elaborated by a computational tool [9], which provides in output the electric field data needed to model the force interaction. The electrostatic field is modeled as a quantized grid of values surrounding the molecule till a certain distance. Given a proxy position at any instant in time, it falls in a *voxel* of the grid which allows to determine the force felt by the user. The intensity of returned forces are naturally very weak (nanoscale). A human operator cannot feel them *as is*. After some usage tests, an amplification has been determined to scale the force appropriately without losing the proportions among real forces.



```
    RUN TITLE
    ---------
 NH3

THE POINT GROUP OF THE MOLECULE IS C1
THE ORDER OF THE PRINCIPAL AXIS IS     0

ATOM      ATOMIC                      COORDINATES (BOHR)
          CHARGE         X                  Y                  Z
N           7.0     0.4856595788      -0.6859705335       0.0000000000
H           1.0     0.4856595788       1.3738307931       0.0000000000
H           1.0     1.4569787365      -1.3738307931       1.6818561291
H           1.0     1.4569787365      -1.3738307931      -1.6818561291

         INTERNUCLEAR DISTANCES (ANGS.)
         ------------------------------

              1 N           2 H           3 H           4 H

   1 N       0.0000000     1.0900000 *   1.0903174 *   1.0903174 *
   2 H       1.0900000 *   0.0000000     1.7805651 *   1.7805651 *
   3 H       1.0903174 *   1.7805651 *   0.0000000     1.7800000 *
   4 H       1.0903174 *   1.7805651 *   1.7800000 *   0.0000000

  * ... LESS THAN  3.000
```

Input data

```
-0.000310812 -0.000343511 -0.000376881 -0.000410623 -0.000444394
-0.000477805 -0.000510427 -0.000541794 -0.000571414 -0.000598777
-0.000623367 -0.000644677 -0.000662222 -0.00067556 -0.000684306
-0.000688145 -0.000686853 -0.000680305 -0.000668481 -0.000651476
-0.000629495 -0.000602853 -0.000571959 -0.000537308 -0.000499462
-0.00045903 -0.000416649 -0.000372962 -0.0003286 -0.000284163
-0.000240206 -0.000197226 -0.000155656 -0.000115859 -7.81271e-005
-4.26816e-005 -9.67772e-006 2.07902e-005 4.86823e-005 7.4006e-005
9.68083e-005 0.000117168 -0.000317527 -0.000353154 -0.000389687
-0.000426809 -0.000464149 -0.000501279 -0.000537726 -0.000572968
-0.000606449 -0.000637587 -0.000665789 -0.000690465 -0.000711051
-0.000727021 -0.000737915 -0.000743353 -0.000743056 -0.00073686
-0.000724725 -0.000706742 -0.000683136 -0.000654258 -0.000620574
-0.000582648 -0.000541127 -0.00049671 -0.000450129 -0.000402124
-0.000353416 -0.000304689 -0.000256574 -0.00020963 -0.000164342
-0.000121109 -8.02505e-005 -4.20009e-005 -6.51985e-006 2.61028e-005
5.58388e-005 8.27121e-005 0.00010679 0.000128175 -0.000323157
-0.000361909 -0.000401847 -0.000442634 -0.000483869 -0.000525091
-0.000565773 -0.000605336 -0.000643152 -0.00067856 -0.000710878
-0.000739424 -0.000763536 -0.000782595 -0.00079605 -0.000803443
-0.000804428 -0.00079879 -0.000786462 -0.000767531 -0.000742238
-0.000710975 -0.00067427 -0.000632771 -0.000587216 -0.000538411
-0.0004872 -0.00043443 -0.000380929 -0.000327477 -0.000274789
-0.000223497 -0.000174141 -0.000127162 -8.29065e-005 -4.16229e-005
-3.47345e-006 3.14591e-005 6.31612e-005 9.16773e-005 0.000117099
0.000139556 -0.000327443 -0.000369516 -0.000413099 -0.000457841
```

Output data

Fig. 2. Abstracts from sample input and output data files in case of ammonia (NH3) molecule

Both input and output data are huge in size and it is therefore difficult to catch atoms position and electronic fields' interactions directly from such data. Figure 2 shows some examples of fragments of input and output data. Just to give an idea of the amount of information to deal with, the original files shown in Figure 2, referred to the ammonia molecule, are composed of 1508 and 22933 lines of numbers, respectively.

Figure 3 shows a snapshot of the tool in action. The 3D molecule representation and the proxy pointer are clearly visible. The plot of the electrostatic field is shown in the bottom-right corner.

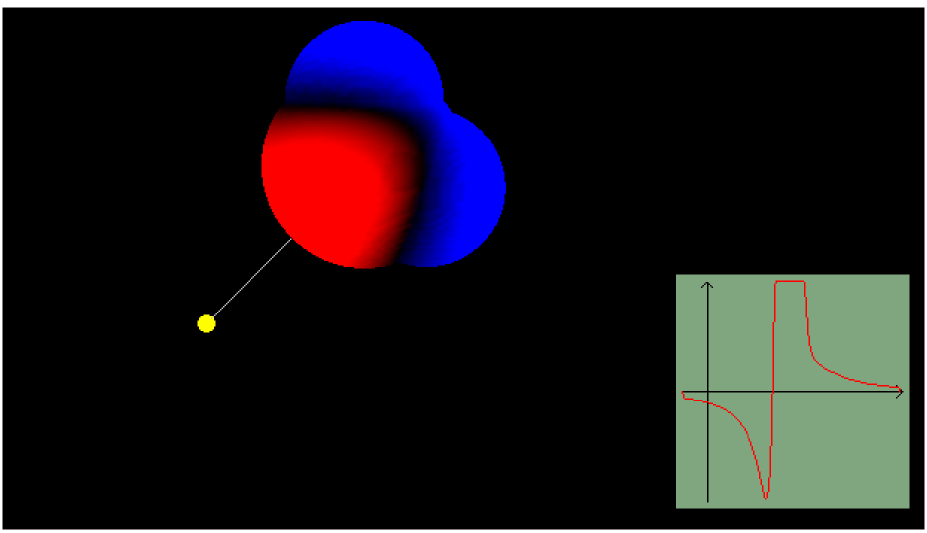


Fig. 3. A screenshot of the tool in case of water molecule. The proxy position (yellow circle) and the plot of the electrostatic field are visible. The plot is computed using the value of the field along the thin white line connecting the proxy with the center of the molecule.

Auxiliary key information is also shown, such as the plot of the electrostatic field along the direction connecting the proxy position and the center of the molecule, and the force field on the molecule surface (represented by means of different colors). This information can help in the determination of the direction and magnitude of the interaction, and can be exploited to understand the binding mechanism. For example, such representation could help in determining at what distance a binding would take place, which would be indicated be the minima points of the plot. In this way the student could get the double sensation of binding, graphical and in force, where the probe would reach a stable position at the binding point.

3 Usage in Didactic Activities

The developed tool has been realized with the purpose of being used in research and didactic activities. The tool can help students to understand the way in which molecules interact, not just studying it on a book, but experiencing it really.

With our tool, students can explore the electrostatic surface of one of the molecules of the repository, and feel where this electric field has their typical values (minima, maxima) or where holes can be found in this electronic surface. Holes are the specific sites where molecular bindings take place during inter-molecular interactions. With our tool, students can get the information on where such holes are placed in the molecular electric surface, and so which part of a molecule really takes part in a binding (e.g., how the binding happens, how the molecule is oriented when it happens and how it must be placed to make the binding happen, etc.).

Moreover, the system is also able to render the peculiar characteristics of bindings by providing attractions to molecular binding sites till the real binding distance that would occur during the interactions with other molecules. In those points, at the correct binding distance, minima of the electronic surface around the molecule are placed and a stable point for haptic probe movement can be found. In that position the probe of the haptic device will really stop at the binding distance, giving the user exactly the sensation that a binding has occurred.

3.1 The Realism of the Simulation

The developed framework is based on data retrieved with the help of a computational chemistry tool very used in chemical research field. This implies that our work is based on data that simulates the behaviour of interactions in a very realistic way and, at the maximum possible degree, similar to what scientific research has identified as molecular behaviours, thus providing significant sensations of the way in which nature interacts, with high fidelity to such mechanisms. This is not just another implementation of the interaction between a charge and a molecule modeled from a theoretical point of view, as can be found in many applets all around the Web or in other similar applications.

3.2 Laboratory Activities

The tool has been inserted in a laboratory activity in parallel with a normal chemistry course as integration of the topics usually explained to the classes. This laboratory can be attended by students who want to improve their knowledge on the chemical subjects discussed during the normal teaching hours, by experiencing the explained topics in a more immersive way. The laboratory sessions consisted in a step-by-step highly guided experience to test the inter-molecular behaviours explained in theory with the help of the developed frameworks.

Figure 4 shows a picture taken live during the usage of the tool by our students.

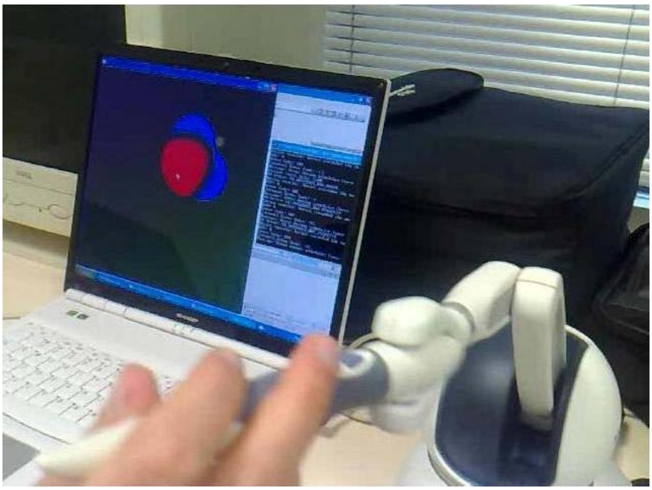


Fig. 4. The tool at work in our laboratory

3.3 Users' Feedbacks

The tool has been tested by different kinds of users on different molecules (e.g., water, ammonia, methane). The students of a chemistry course tried the *experience* of the interaction as a didactic tool; chemical technicians appreciated the improved awareness of the phenomena they are used to work with, which are otherwise not so intuitive; researchers tried to test how the tool is able to render well-known interactions. In general, the most important benefit is represented by the possibility of combining the visualization of data with the rendering of the *feeling* of nanoscale / atomic interactions that can improve the understanding of real phenomena. Students greatly appreciated it and they were literally enthusiastic when facing the novelty of such a tool in the current teaching activities. They reported us the easiness by which they understood the explained concepts, thus leading to an increasing interest in the subject.

4 Related Works

[8] provides a survey on haptic rendering techniques: most of the haptic algorithms and applications focus on the rendering of surface tactile feedback, rather than force fields that are distributed in the whole space. In the field of chemical visualization and haptics, from the research point of view our tool is on the boundary of old computational chemistry (which privileges awkward numerical outputs, disregarding user-friendliness) and the brand-new bioinformatics (which introduces better and more graceful user interfaces to show results). Most of the developed tools, whenever presenting haptic interaction, exhibit it as a side feature, usually because it has been added later. In our tool it is the *core* interaction. Examples of similar tools include VMD, PyMol, and others (see [2] for a survey), which offer a wide range of representations, but interpretation of data is not so straightforward for non-technician of the field. [3] presents a similar tool, but it is strongly designed on theoretical models and, compared to our systems, it does not allow to use or explore empirical data directly obtained in laboratories.

From the educational point of view, some works involving haptic and molecules for didactic purposes exist in literature. In [1] they analyze the introduction of a Tangible User Interface for chemistry education in the Augmented Chemistry system developed by them. They use a specific device developed on their own, while our system employs an on-the-shelf device (PHANToM), nowadays even more accessible for costs to final users. [7] proposes a work similar to our system. Anyway it suffer of lack of generality being applied only to a couple of water molecules. In [5] a visual and haptic-based biomolecular docking system that could be used for biomolecular docking to study helix-helix interactions in e-learning is proposed.

Multi-modal interfaces have also been proposed. [4] proposes a learning object development to support understanding of molecular structures, using multi-modal virtual reality technology. In [6] a multi-modal human-scale virtual reality platform for simulation and experimentation that provides haptic interaction using a string-based interface, olfactory and auditory feedbacks is described. Anyway such multi-modal solutions are quite complex to be replicated in educational environments. Instead our work is scalable and can be reproduced to make it easily available to schools' laboratories.

5 Conclusions and Future Work

This paper presented a framework for the haptic sensations of molecular interactions. The system is formed by a computer and haptic device which allows to improve the user experience and to make students to feel what they are used to study only on textbooks. The system strongly relies on data retrieved with a computational tool widely used for chemistry research, which makes the simulated behaviour of molecular interactions not based on theoretical models, as usually done, but on information that represents at the maximum extent which are the features of the actual phenomena, as nowadays considered by research.

Further improvements include the implementation of other kinds of interactions, such as the simulation of molecule-molecule interactions, to extend the charge-molecule one already realized with this work.

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The Academic Advising System in a Virtual University

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Abstract. The scarcity of studies on academic advising in virtual environments hinders the development of alternative models that can be compared in search for greater efficiency. As a contribution to fill this gap, this paper describes the online academic advising system in a virtual university. We describe the background of this system and its main elements: the advisor's functions, the types of advisors (incorporation, beginning and continuation), the available tools for advisors, and the organisation of the advisorial activity both from the internal and the student's point of view.

Keywords: academic advising, online education, virtual university.

1 Introduction

The continued growth of online education has been followed by an extensive literature focused on the teaching-learning process in virtual environments. Thus, there are numerous studies on teaching methodologies, evaluation systems, teacher-student and student-student relationships in the virtual classroom, and so on. However, there is much less research on the support systems that surround the online learning activity itself (some exceptions are LaPadula, 2003 [1]; Ludwig-Hardman and Dunlap, 2003 [2]; McCracken, 2004 [3]; Tait, 2003 [4]; Thorpe, 2002 [5]). In particular, research on the activity of academic advising in virtual environments is particularly scarce (see, for exceptions: Dahl, 2004 [6]; Luna and Medina, 2005 [7]; Morris and Miller, 2007 [8]; Patterson Lorenzetti, 2004 [9]; Pevoto, 2000 [10]), although this activity has been suggested to improve the retention of online students [11][12].

This paper contributes to fill this gap, by describing the online academic advising system in a virtual university. It is intended that, through the study of this particular case, other institutions will be able to derive useful insights for their implementation or refinement of their online academic advisign system.

The remainder of the paper is organized as follows. Section 2 presents the UOC and the main traits of its students. Section 3 describes the functions of the academic advisors at the UOC. Sections 4 and 5 present the organization of this activity. Section 6 summarizes the tools available to online advisors. Finally, Section 7 offers some concluding remarks.

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2 The UOC and Its Students

The Open University of Catalonia (Universitat Oberta de Catalunya, UOC) was created in 1995 by the Catalan Government (Spain), and it had 41.763 enroled students in the 2009-10 course.

The UOC´s educational model is the university's main feature that distinguishes it since its introduction. The student is the protagonist of the whole academic process. He/she manages his/her own time, plans the study rhythm and builds his/her own academic itinerary. The most common characteristic of UOC students is the fact that they combine working with studying (93% of all UOC students are in employment). Otherwise, the profile of the UOC student is quite heterogeneous. Student ages range from 18 to 70, even though more than two thirds of all students are between 25 and 40 years old. Time dedicated to study varies according to subjects taken each semester (from full time dedication to as little as one subject per semester).

The life of the university community takes place in the Virtual Campus. It encompasses the support and learning areas, where the student accesses resources and can interact with the other members of the community. Students find three main elements in the Virtual Campus to foster their learning:

- The resources: They include the content, spaces and tools necessary to carry out the learning activities and their assessment.
- Collaboration: This is understood as the set of communicative and participative dynamics that favour the shared building of knowledge among classmates and teachers, problem solving through teamwork, project development, etc.
- Support: This group of actions is carried out by specialized teaching staff who guide, give advice and support, and dynamise the whole educational process. Following a model similar to that suggested by Nübel and Kerres [13], this staff splits personal support to students between two roles: The subject tutors ensure progress in each subject, and the academic advisors guide the students through their learning process in a personalised way.

3 Functions of the Academic Advisor at the UOC

The advisorial role at the UOC is played by a group of professionals who collaborate with the university in a part-time, virtual mode. They are mostly teachers in other institutions, although there are also professionals in an area related to their programme and, with increasing frequency, they are alumni of the same programme.

Their task is to accompany each student throughout their academic life in the university, from the moment s/he shows some interest in enroling in a programme until s/he receives her/his diploma. This function basically pursues the following goals:

1. *Advising on itinerary selection.* To ensure that students select an itinerary that is consistent with their needs and learning objectives, a core activity of the advisor is to know, firstly, which are their advisees' capabilities, and, secondly, which are the characteristics of the programme and educational offer, as a whole. It is essential to correctly decide each student's rate of progression in his/her own learning itinerary. This pace is marked by his/her actual availability of time for studying and the dedication required by each of the subjects of the selected itinerary. This advisory role is

embodied in the enrolment process. In this process, after receiving guidance from the advisor, the student makes an enrolment proposal that the advisor must finally assess.

2. *Enhancing students' investments of time and money*. The profile of the UOC students implies that they are particularly interested in getting the most out of their limited time available for education. The advisor thus trains students to quickly integrate in the dynamics of a virtual university programme. Furthermore, the advisor provides advice on how to optimally plan and manage study time in general. This function and the next one contribute significantly to improve student performance, i.e.: the successful completion of the ditfferent subjects of the program.

3. *Motivation*. The advisor plays a key role in encouraging the student's accomplishment of the selected learning itinerary. This function acquires special prominence because the risk of drop out is potentially high, given the profile of students and the virtual setting. The advisor disposes of information about the academic behaviour of students, that can be useful to motivate them in moments of discouragement or unforeseen difficulties.

4. *Reference person*. The advisor is a reference for students in their relationship with the university, during all the time they are enroled in a programme. In this sense, the advisor is the person the student contacts with if he/she faces doubts, incidents or unexpected problems, special personal circumstances, and so on. The advisor must solve these problems directly if possible, or refer the student to the adequate service or person in the university. This helps to customize the service and to increase the loyalty of the student with the particular programme, and the university in general.

With the development of these four functions, the advisor obtains significant information directly from students. This information is transferred to the programme director, who may use it to detect problems and plan improvements.

4 Internal Organization of the Advisorial System

The academic advisors at the UOC have a double internal dependency, which creates a matrix structure. On the one hand, they organically depend on the Programme Director. The director selects them, appraises their performance and decides on their continuation. He/she provides training and advice and resolves questions on everything related to the academic aspects of the programme. In addition, throughout the semester, the director advises on all possible educational problems that may arise.

On the other hand, the advisors functionally depend on the Advisorial Function team, which is transversal to the entire university. This team is responsible for providing training and assistance necessary for advisors so that they can, in turn, train students to take full advantage of their effort. Subsequently, the Advisorial Function monitors such training given by advisors. Similarly, this team offers suggestions and monitors advisors' activity in relation to student motivation and university procedures.

The work of the advisors, in collaboration with and dependence on the Programme Director and the Advisorial Function person, is mostly carried out virtually. According to the matrix structure, advisors have two work spaces in the virtual campus. In the first one, the Programme Director communicates with all the advisors of the programme. In the other virtual room, the advisor communicates with the member of the Advisorial Function assigned to a group of programmes as well as with the other advisors of those related programmes. Obviously, every advisor has also a personal e-mail and can contact directly with the Programme Director and the assigned member of the Advisorial Team.

5 Organization of the Advisorial Activity from the Student Point of View

Each student is assigned to an advisor from the moment he/she expresses some interest in enroling in the university. The advisoring activity is developed in both a group (through a virtual classroom) and an individual (using e-mail) setting. The activity of the advisor is proactive (teaching on the various aspects outlined above, informing about the terms and conditions for different procedures and, above all, encouraging students) and also reactive when needed. In reactive communications, the advisor has a compromise to answer students' questions in up to 48 hours. These activities in the classroom can be monitored by the Programme Director and the Advisorial Function team.

Every semester, students can meet in person with their advisors and, if extraordinary circumstances suggest it, advisors can telephone their students.

In recent years, the UOC has grouped the advisors according to the stage of advancement of their students. Thus, the incorporation, the beginnings and the continuation advisor roles were introduced. In accordance with some research on student retention [14], it was noted that the first three semesters in a programme were critical to prevent student dropout. Before the student has enroled in the university, the incorporation advisors offers information related to general aspects of the programme and the university. After that, during the initial period, the beginnings advisor strives to introduce the student as soon as possible in the dynamics of a virtual programme. Later, the key activity of the continuation advisor is to facilitate and advise on the following courses of the programme.

6 Tools for Online Academic Advising

The tools available to advisors depend on the type of student (new to the university or already enroled in a programme) and the period of the semester (the initial weeks or the following weeks).

Students that are interested in registering for the first time in the UOC, are incorporated into a welcome classroom some weeks before the start of the course, to which an incorporation academic advisor is assigned. The main resources in the welcome period are the following: the Virtual Classroom with an advisor desk and a forum, a mailing list of students and a questionnaire completed by students.

All the students in a classroom have access to the advisor's desk, but only the advisor may post messages concerning academic procedures, general information about the university, deadlines and key dates, and so on. The forum is a more informal space where students and the advisor alike may exchange information, post messages, hints, ideas, suggestions, etc. It is also the place where each student introduces oneself, with the aim of creating a feeling of community right from the start.

The questionnaire provides information about each student, such as their available time, their work, aims, expectations… This information is used to asses the enrolment proposal made by each student, and to ensure that such enrolment is tailored to their needs and possibilities.

When students are effectively enroled in a programme, the tools used by the beginnings and continuation advisors vary along the semester.

Some days before the start of the courses, the academic advisors have access to all the subject classrooms in order to provide students with the necessary information in case they have any problem. The information about each subject work plan, learning resources and activities is available in the Virtual Campus.

During the initial period (first month of the semester), academic advisors can access many reports about their students, in order to detect critical situations which may affect the proper development of the course. For example, a list of students with and without access to the classrooms, students' frequency of connection to the Campus, a list of students who have never connected and who have connected only once, etc.

In the follow-up period (from the second month to the end of the semester), the university provides advisors with different information related to the assessment process. The most important reports along the semester are: the students who have not submitted any activity, the students who have only submitted one activity, and the students who have failed any activity. Reports provided at the end of the semester are: students who didn't pass the final exam, those who asked for a revision of their grades, and list of students who have not submitted the final exams.

It must be noted here that, although the university provides many reports to advisors, their goal is not to act as the police with students, but to offer their help and support.

In addition to the previous information, the academic advisor has access to a student profile along all his or her university career. This profile includes seven different virtual spaces which provide data on the state of the student's registration and the delivery of learning resources; technological requests made by the students; the calendar of continuous assessment activities and their grades; date and time of students' connections to the virtual campus; information about the final presential exams; and the courses and degrees that the student has obtained through his/her academic life at the UOC.

7 Concluding Remarks

Shurville and Browne [15] highlight that the development of distance education needs a model of flexibility that results in substantial changes at both the individual and the organisational levels, which must be adequately resourced and managed. In order to develop management models for online universities, we must first find and compare management alternatives that have proved viable. This paper tries to contribute to the building of such body of knowledge.

This paper has explained the main characteristics of the virtual advising system developed at the UOC. Despite being a particular case, the authors hope that it will be useful to other universities that are developing their first online activity, as well as for more experienced institutions that want to reflect on their existing advising system.

Specifically, the information provided on the role of the advisor at the UOC shows the possibility of splitting the student support functions described by Tait [16]. The UOC's advisors focus on the affective and systemic functions, sharing the latter with other areas of administrative support. Moreover, there are hardly any models available on how to organize the advisorial activity. As a consequence, the detailed description given in this paper can be useful for academic managers.

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Course Evaluation Study in Europe: The Current Picture

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Abstract. Course evaluation is one of the key processes in the educational context that is in charge of the assurance of quality of courses taught in an institution. Although it is an essential process realized in every institution, the procedure followed for course evaluation does not comply with any evaluation standard. The objectives of this document are: to define a course evaluation concept map to understand better the needs of this field; to analyze the course evaluation standard ISO/IEC 19796, the only standard for course evaluation; and finally, to carry out a study of European institutions evaluation processes to determine why anyone is using standards in this learning process.

Keywords: course evaluation, shared-teaching, ISO/IEC 19796.

1 Introduction

The main objectives of this article is to have a look at the current situation of course evaluation in European institutions; this big objective can be divided in three smaller ones: to present the development of the evaluation concept map in the domain of course evaluation; to summarize a study performed on a current quality management assurance metrics standards; and to provide a global picture of the current status of course evaluation practices in Europe.

Both theoretical models contained in this article have been developed through a series of reviewing sessions, undergoing continuous modifications in order to achieve a model capable of describing the essential elements and procedures involved in learning quality assurance.

The standard studied in this paper is ISO/IEC 19796, parts 1 [1] and 3 [2] which are the only sections released up to the date of the creation of this article. These parts provide a general approach and a reference for methods and metrics within the context of quality management in information technology for learning, education and training.

The current status of evaluation practices in Europe has been obtained by the evaluation of different scenarios through means such as personal interviews and surveys. These surveys have been filled out by some ICOPER partners in order to study the usage of course evaluation in real institutions.

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ICOPER [3] is an eContentPlus Best Practice Network that started its work in September 2008. As part of its objectives, ICOPER will provide a *Reference Model* and mechanisms to ensure European-wide user involvement, cooperation, and adoption of standards in the educational framework. To accomplish this goal, the project will systematically analyse the specifications and standards available and in use, to draw conclusions on their validity. In the context of the ICOPER project, an effort is under way to detect the course evaluation standards problems and to propose a set of best practices according to their usage in European institutions.

2 Course Evaluation Concepts and Standards

In this section the development of a concept map about course evaluation is presented. After that, and taking into account the main concepts in this field, an analysis of ISO/IEC 19796 is performed, because it is the only standard that could be used for course evaluation.

2.1 Concept Map

As part of the ICOPER Reference Model, a conceptual map modelling key concepts for course evaluation is being developed, by capturing key concepts and related specifications. It is important to define a set of concepts in the domain of course evaluation, on one hand to clarify the terminology used in the study presented in the next section and, on the other hand to establish the relationships between these concepts.

The main focus of the evaluation concept map in Fig. 1 is centred on Course Evaluation, which is understood as the process of identifying, obtaining and interpreting data to determine which course objectives are being achieved; this definition comes from the concepts of assessment and evaluation in [4]. The Course Evaluation is ruled by a Quality Assurance Approach, usually a learning quality assurance standard, specification or guide.

The data collected during the evaluation process provides a performance qualification of the unit of learning, the learning supporter and the learning assessment. The final output generated by the course evaluation is the Evaluation Result, which reports formally the quality status of the course.

The ICOPER Reference Model allocates the evaluation processes within the service layer. The key processes of the evaluation domain have been identified like:

- Creating survey
- Visualising survey
- Submitting evaluation
- Visualising global results

All of these processes belong to the evaluation stage of the process model. There has been an emphasis on the use of questionnaires to collect the evaluation data since it was observed that this was the most appropriate way to perform this task.

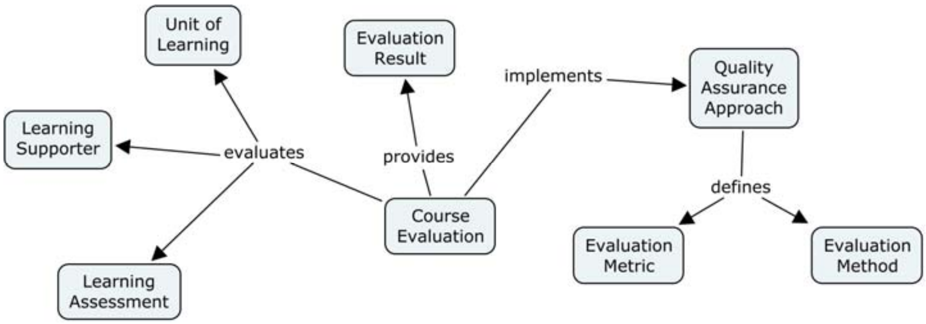

Fig. 1. Course evaluation concept map

2.2 ISO/IEC 19796-1

Part 1 of the ISO/IEC 19796 standard provides a general approach for quality management, assurance and metrics in learning, education and training scenarios.

The purpose of [1] is to provide a Reference Framework for the Description of Quality Approaches, which is defined as a framework to describe, compare and analyze quality management and quality assurance approaches.

In order to describe and elaborate this reference framework [1] includes its process model. This process model is a framework used for the description, comparison and analysis of process-oriented quality approaches and can be used in other scenarios such as the harmonization of quality approaches.

The process model is divided in seven parts where every part includes a set of sub-processes or sub-aspects.

It is stated in [1] that a quality description conforms to the standard if each included process corresponds to the appropriate specification and includes all sub-processes. A conforming description may contain additional processes and data elements.

Due to the relevance of this framework, the ICOPER Reference Model has adopted this process model for the classification of key processes.

2.3 ISO-IEC 19796-3

Part 3 of the ISO/IEC 19796 standard [2], *Reference methods and metrics*, provides a harmonized description of the methods and metrics that are needed in the implementation of systems of quality management and quality assurance for stakeholders involved in a learning process that makes use of information technology.

Previous to classifying the methods and metrics involved in a learning quality assurance process, it is important to define these terms. In a quality approach context, method is one of a set of instruments or tools used to assure or manage quality in processes, while metric is a material measure within some aspects of quality characteristics [2].

This part of the standard provides the reference models for quality methods and for quality metrics. Some previous studies [5] explain the importance of such models and show the evolution that they experienced in order to contain the critical aspects of any quality method and quality metric.

A relevant section of part 3 is the collection of methods and metrics, which consist of a classification of categories, category descriptions and subcategories of methods.

3 Course Evaluation Study in Europe

A series of interviews and reports have been used to collect the analysed data. The participating institutions are all inside ICOPER consortium. An in depth analysis is very appropriate in this study and ICOPER consortium provide us with this possibility. It is also suitable to determine and analyse the causes of the lack of standards utilization in some of the participating organisations.

The sample we have worked on has the following features that make it appropriate for the intended purpose of the article:

- Deals with formal and informal learning
- Deals with face-to-face, blended and pure e-learning examples
- It is geographically distributed all around Europe (geographical diversity)
- The sample distribution also cover multicultural and multilingual examples

As shown in Table 1, studied scenarios are much heterogeneous. The commonalities between them are that the students are the course evaluators; neither teacher nor quality assurance institutions perform any evaluation. In all cases the objectives are formative (mainly for course improvement). The access to the evaluation results is quite varied, but, in general, the lecturer/instructor is the entity that has this privilege. Sometimes also the students can access to this information.

The most common methodology instrument is the questionnaire/survey; some other methods like group discussion are applied but in just one case. The tools used in these institutions are mainly paper (almost all of them) with some online questionnaires, often integrated in LMS, and in other cases surveys/questionnaires are attached to specific tools.

Regarding standards usage, the trend is quite clear: none of the participating institutions use a specific standard for course evaluation. An internal (ad hoc) methodology, however, is followed and institution-dependant in some cases; in other cases, evaluation management is directly conducted by the lecturer of the course. Finally, there exists a scarce use of course evaluation content repositories and the evaluation process use to be anonymous.

The entities that are evaluated are the course and sometimes the instructors and tools. In the case of JSI [6], the evaluation of the course consisted on questions of several topics: educational content, assessment, communication, personalization, and directedness. The questions about tools also covered different aspects like multimedia or technical elements.

In the concrete case of UK, universities are their own awarding bodies and they continually assess their systems and their courses to ensure that they are fit for purpose. In addition, all universities use a network of external experts – called external examiners - to advise on whether the standards a university sets are appropriate [8].

Table 1. Course evaluation survey results

Institution	Evaluator	Evaluee	Process	Repos.	Artifact/Tool	Other info.
IMC AG	Student	Course Instructors	Ad hoc	Yes	Survey/CLIX	-
Jozef Stefan Institute	Student	Course Tools	Ad hoc	No	Survey/Paper	-
Humance AG	Student	Course Tools	Ad hoc	No	Survey/Paper	-
Open University Nederland	Student	Course	Ad hoc	No	Survey /Web tool	-
Tallin University	Student	Course Instructors	Ad hoc	No	Survey/Paper & Information system	Anonymous
University Leicester	Student	Course	Ad hoc	No	Survey/Paper	-
Umea University	Student	Course	Ad hoc	No	Survey/phpESP, VTSurvey, LimeSurvey	-
Vienna University Economics and Business	Student	Course	Ad hoc	No	Survey/Paper & learn@wu	Survey templates
AGH University	Student	Course	Ad hoc	No	Survey/Moodle	-
University of Vienna	Student	Course Instructors	Ad hoc	Yes	Survey/Paper & EvaSyS, GmbH	Anonymous

3.1 Shared-Teaching Course Evaluation

The following section is a study of a concrete scenario of course evaluation: shared-teaching. It is based on a set of surveys different from the previous study.

In order to capture the current state of shared-teaching evaluation in Europe, an evaluation pilot experience was performed with a group of ICOPER partners. This pilot experience was defined as the analysis and comparison of shared-teaching evaluation processes.

The pilot procedure consisted of participants responding to a survey, whose topics included the evaluation of the shared-teaching scenario (evaluators, evaluees and reviewers of the evaluation results), the use of standards and the evaluation process as a whole.

The survey responses showed the lack of use of standards for quality assurance and the use of customised quality assurance procedures to evaluate shared-teaching courses. Among the common practices mentioned by the pilot participants it could be found that the data collection is often computer based, usually through a web application. The answers provided by the evaluators are usually anonymous and the learner comments are provided to the instructors as feedback.

4 Conclusions

The study detailed in this article, concretely the interviews performed to the ICOPER partners, has shown that currently there is not such thing as a course evaluation standard, since each institution manages and assures the quality of its TEL approaches using established procedures that are customised to their needs. The shared-teaching evaluation pilot experience was intended to analyse the different approaches taken to assure quality, focusing in a specific scenario. Finally, the study and summary of Parts 1 and 3 of the standard ISO/IEC 19796 are intended to serve as a guide for future competence-driven quality assurance reference models.

In the course evaluation domain, a trend has been identified: none of the analysed institutions is using any standards or specifications. There appear to be some sets of guidelines used within individual institutions that are followed without any direct relation to evaluation standards. In this way, explicit quality assurance is not performed. These guidelines do not follow a common pattern easily identified, constituting a very heterogeneous set. It is fair to say that, in order to motivate organizations to go through this quality processes, references to external standards need to be emphasised, possibly by professional accrediting bodies.

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Enhanced Learning Methodologies and the Implementation of an Identification Course

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Abstract. This paper proposes some considerations on the role played by information and communication technologies in the evolution of educational systems and describes the design philosophy and the realization of a basic course on dynamic system identification that relies on constructivist methodologies and on the use of e–learning environments. It reports also some of the opinions formulated by the students on the effectiveness of the available tools and on their role in acquiring proficiency in the application of identification techniques in modeling real processes.

Keywords: Enhanced Learning, E–Learning, System Identification, Constructivism, Virtual Laboratories.

1 Introduction

The role played by technologies in the evolution of educational systems has always been of paramount relevance. All present systems are based on the extraordinary innovation introduced five hundred years ago by Johannes Gutenberg, the movable type printing process, that has made books available to an increasingly larger number of persons. It must however be noted that the evolution of educational systems triggered by the new printing technologies was slow and can be described as an evolution more than as a revolution. In fact more than a century elapsed before the acceptance and diffusion of the new educational model whose spatial and temporal structure was based on classes formed by students with an homogeneous background of knowledges and inserted in temporally well defined learning paths.

The new learning system inherited from the old one some specific tools, suitably adapted to the new environment: teacher's lectures thus evolved from their initial role of exclusive channel for the transmission of knowledge to a softer role of critical analysis of the reference knowledge stored in the books. Their role remains, however, central since teachers must now master and manage the variety of information and knowledge spread by the new technology. The new system remains focused mainly on the teaching process and on the role of teachers, not on the learning process and on the role(s) of learners.

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1.1 The Fallout of Digital Technologies

The digital revolution, i.e. the large scale diffusion of digital coding, can be considered, by far, as the most important revolution of the last century. Among the consequences of this revolution, the role played by computers in the distribution, elaboration and storage of information cannot be overemphasized and today it is possible to access, in a selective way, the enormous amount of information distributed by telematic networks. Moreover the continuously increasing computing power and reduction of hardware costs allow sophisticated operations on the available sets of information that can be analyzed, modified, aggregated and searched for otherwise unnoticeable correlations.

This set of potentialities influences in a decisive way the definition of possible learning paths. A whole new range of abilities is made available by computers: the ability of performing complex computations, of pronouncing correctly a phrase in an unknown language, of interpreting and executing a musical score, of tracing accurately the profile of a mechanical device and so on. The possibilities are so numerous that it is almost impossible to define a reasonably complete list. It is also important to observe that the acquisition of these new abilities requires only learning modest amounts of knowledge, essentially limited to the user interface of specific applications. As an example, the pilots of modern liners spend most of their time in programming and supervising the autopilot activities, not in a direct control of their aircraft. The amplification of the cognitive and operational capabilities of learners due to this context and the wider range of existing backgrounds require a suitable revision in the design of learning paths that leads, inevitably, to an associate revision of the education systems to be adopted in this century.

1.2 New Technologies and the Evolution of Educational Environments

Our point of view is that information and communication technologies (ICT) do not lead, necessarily, to better learning environments. The introduction of advanced information and communication systems has seen a parallel emphasis on "new" educational methodologies like constructivism, cooperative learning and learner-centered pedagogy; at present, however, no conclusive evidence shows an undiscussed superiority of any of these environments. Their implementation shows, however, that the availability of ICT leads to a significant departure from traditional learning contexts and, in fact, allows the substitution of the actual system with a new more open and flexible learner centered environment not rigidly based on predefined paths but open to individual interests and requests. The synergy between advanced information tools and new pedagogic approaches creates thus new and significant perspectives. Their potentialities pose, in any case, the problem of a critical reevaluation of the goals of educational systems. After reaching the targets of productivism in the area of economy, the challenge is now focused on the dynamical management of consumers and many observers see market-driven consumerism as the emerging paradigm also in the world culture context; see, for instance, the keen analysis of McClintock, in his Educators Manifesto (McClintock, 1999).

2 From Theory to Practice: An Application at Bologna University

If we agree with Ludwig Boltzmann that nothing is more practical than a *good* theory, all previous premises should lead, when properly implemented, to evaluable benefits. This section describes the design of a Dynamic System Identification course based on constructivism at Bologna University and the results obtained in its delivery.

Constructivism is often considered the new paradigm in e–learning and its present popularity is, in part, due to this association and to the diffusion of e–learning approaches in several contexts. However there is nothing of particularly new in constructivism, whose basic principles are due, among others, to John Dewey (Dewey, 1964), Jean Piaget (Piaget, 1977) and Lev Vygotsky (Vygotsky, 1986). What has changed is the new wide acceptance of this set of ideas and a remarkable amount of new research in the area of cognitive psychology to support it.

Constructivism refers, essentially, to the idea that knowledge is achieved individually by learners by constructing meanings. In this context, the process of construction of meanings is identified with the learning process; learning is thus no longer a path toward understanding the true nature of reality or, as in Plato, an imperfect perception of perfect ideas. It assumes, instead, the form of a personal and/or social extraction of possible interpretations from a complex universe of sensations.

2.1 The System Identification Course

The course *(Dynamic System Identification)* is associated with 6 credits and treats traditional equation–error identification techniques, the algorithmic and (some) numerical aspects of their implementation and their application. An official textbook is available (Guidorzi, 2003) and the learners are invited to follow a sequence of traditional lectures that are organized in weekly modules (Guidorzi et al., 2000), (Guidorzi et al., 2003), (Guidorzi et al., 2006). A relevant number of activities is based on an instance of the e–learning platform of Bologna University, *AlmaChannel* (www.almachannel.unibo.it) that can be accessed only by the students registered for this course. The platform allows, on the student side, the following operations:

- Access to general information on the course (program, goals, length, activities, evaluation criteria, official textbooks etc.).
- Access to the course calendar.
- Access to updated information on current activities.
- Access to detailed descriptions of the contents and of the planned activities of every module.

• Access to a set of educational materials (lecture notes, exam exercises, slides, multimedia documents).
• Access to Frequently Asked Questions (FAQs).
• Access to a selection of links related to the course.
• Self–evaluation by means of tests analyzed by an inference engine (1.099.511. 630.000 possible evaluations).
• Access to a personal repository of documents (not accessible by tutors and other students).
• Access to the repository of personal uploaded documents (accessible to tutors).
• Access to the area of shared documents (produced and made available by students).
• Access to the personal evaluation area containing evaluations of the performed activities and suggestions concerning the improvement of knowledge on course topics.
• Access to moderated Fora concerning specific discussion topics (one for every module).
• Access to a data base containing the description of real processes and sequences of observations collected on these processes.
• Access to virtual laboratories to perform batch and on–line identification experiments on the real process data stored in the data base.

Tutors and teachers with administrator status, besides all previous possibilities, can also:

• Insert or delete students and modify their profile and access privileges.
• Upload a wide variety of documents (text files, images, pdf files, audio and video files, animations, multimedia etc.).
• Manage the process data base and virtual laboratories.
• Insert the evaluations of the tasks performed by learners.
• Activate and moderate Fora and Chats.

A description of the constructivist aspects considered in the design of this course can be found in (Guidorzi et al., 2006).

2.2 Virtual Laboratories

The virtual laboratories that have been implemented allow to perform the identification of equation–error models by means of the algorithms described in the course. Some algorithms are available in both batch and on–line versions and, in some cases, different algorithms can be selected to identify the same model or other user choices can be inserted in the identification process.

The processes that can be identified are those contained in the data base. The real processes actually available concern the quotation of shares at NYSE, Italian macroeconomic data, offshore natural gas reservoirs, natural gas storages, power plants, ethane–ethylene distillation columns, butane distillation columns, fiberglass furnaces, yearly sunspot count, eutrophication phenomena in the Adriatic sea, eutrophication phenomena in lake Erie, river Hirnant, maximal daily temperature in Bologna and mean monthly temperature at mount Cimone. Every set of data is completed by a short description of the process, useful also for its orientation. The available user interface in every laboratory allows to select the sequence or subsequence to be used in the identification experiment, to orient the process and to introduce all other information, if any, necessary to carry out the identification or order evaluation experiments. The estimated parameters, their standard deviation, the model poles, a χ^2 evaluation of the innovation whiteness and all other relevant information is then presented to the user by means of the same interface. Graphical tools are also available to visualize the data, the innovations and the covariance matrix of the parameter estimates.

The e–learning platform, AlmaChannel, where the course has been implemented as well as the virtual laboratories are based on the Java technology and are completely platform–independent. AlmaChannel is the e–learning platform developed at Bologna University and is currently used by many courses. The virtual laboratories used by this course, on the contrary, have been developed only for this application and are not based on commercial or open software. Their access requires only a standard browser and an Internet connection.

It is important to observe that the Java technology used to develop the laboratories has led to client–based packages that do not introduce limits, differently from server–based applications, in the number of simultaneous users. On the other hand, the necessity to rely on the client resources imposes very efficient implementations of the identification algorithms because on–line identification can require the computation of several hundred or even thousand models; this aspect has been taken into proper account and the waiting time does not usually exceed few seconds.

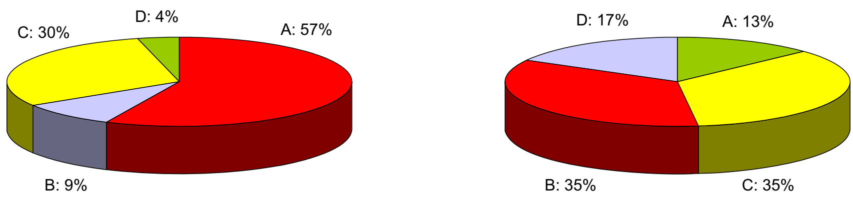
2.3 Students' Opinions

The traceability allowed by AlmaChannel extends, if desired, to single user actions; some access statistics omitted here for lack of space can be found in (Guidorzi et al., 2006). Users' opinion has been collected by means of anonymous questionnaires distributed after the final examinations. Some of the proposed questions are the following.

• *How do you evaluate the user interface of the AlmaChannel platform?* A: Easy and intuitive. B: Not particularly intuitive. C: Rationally structured into homogeneous sections. D: Poorly structured from the navigation point of view. The pie chart in Fig. 1 shows that 87% of the students have given a very positive evaluation of AlmaChannel's user interface.

• *How do you evaluate the availability of tutoring in the course learning path?* A: Without real advantages. B: Effective. C: Very effective. D: Effective in reducing or eliminating the uncertainties associated with the final evaluation.

Fig. 2 shows that 70% of the students evaluate as effective or very effective tutoring services. Only 13% of them do not see substantial advantages associated with this service.



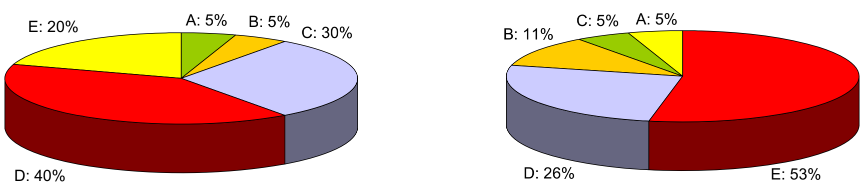
Figs. 1. and 2. Questions 1 and 2: AlmaChannel user interface and Tutoring

• *What's your evaluation of the significance of the processes inserted in the data base?* A: Poor. B: Sufficient. C: Good. D: Very good. E: Outstanding.

The results reported in Fig. 3 show that 90% of the students give an high or very high evaluation of the significance of the available data. Only 5% of the students evaluate as poor their relevance.

• *What's your evaluation of the ease of use of the virtual laboratories of the course?* A: Poor. B: Sufficient. C: Good. D: Very good. E: Outstanding.

As shown in the pie chart of Fig. 4, 79% of the students evaluate the ease of use of the available tools as high or very high. 16% of them give a sufficient or good evaluation and only 5% of the students have encountered problems in using the laboratories.



Figs. 3. and 4. Questions 3 and 4: Process data base and Identification laboratories

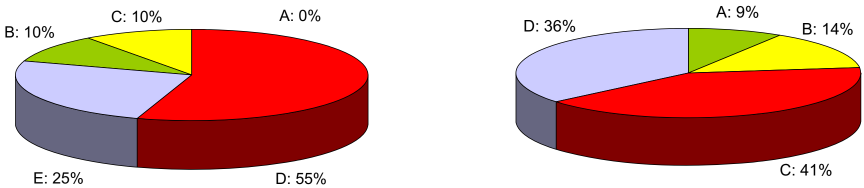
• *How do you evaluate the increment in your professionalism deriving from the possibility of performing identification experiments on real processes?* A: Marginal. B: Limited. C: Significant. D: Very significant. E: Fundamental.

Fig. 5 shows that nobody evaluates as useless the possibility of performing the identification of real processes. 80% of the students evaluate as very significant or fundamental these experiences. 10% of them evaluate this possibility as useful while the remaining 10% of the students select a more modest score.

• *What are the main difficulties encountered in identifying the models described in the final thesis requested by the course?* A: Selection of a suitable model class for the process to be identified. B: Estimation of a suitable model order. C: Estimation of model parameters. D: Validation of the obtained models.

It is very surprising to see (Fig. 6) that an high number of students (41%) has encountered problems in estimating the model parameters and that less students

(36%) evaluate as difficult the validation of the identified models. 14% of the students have encountered problems in selecting a proper model order and 9% of them in selecting a suitable class of models to describe the considered process.



Figs. 5. and 6. Questions 5 and 6: Professionalism increment and Difficulties in identification

3 Concluding Remarks

This paper has formulated some considerations on the role played by technology in the evolution of educational systems and has described the design philosophy and implementation of a system identification course that relies, on a constructivist approach.

This goal has been obtained by developing a set of platform–independent client–based virtual laboratories and a data base of real processes that have allowed learners to acquire a personal experience in model identification in the context of an e–learning environment independent from space and time constraints associated with traditional laboratory activities.

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The Reforming of Vocational Teacher Training Colleges in Turkey

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Abstract. In Turkey, for many decades college level technical education has been in the form of two main tracks: namely the "Faculty of Engineering" and the "Faculty of Technical Education". The Faculties of Engineering are very similar to engineering schools and colleges around the world; they train engineering students. The "Faculties of Technical Education" are similar to the "Schools of Applied Sciences" that many European countries have. The graduates of these schools are either employed at high schools as teachers at technical or vocational high schools, self employed or employed at other governmental organizations as technical staff. Due to the employability problems that the graduates of these schools have faced in recent years and the suggestions made by the The Council of the Higher Education of Turkey (CoHE), Turkish parliament has recently took a decision to close down these colleges and open new colleges called "Faculty of Technology" in November of 2009. According to the CoHE, these new faculties will train engineering students. The graduates of these faculties can also become teachers at the technical or vocational high schools if they get teaching certificate. This paper discusses the content, outlook, and prospects of this recent reform.

1 The Background

Following the establishment of Turkish Republic, there was a need for the qualified technical staff for the newly established technical schools. Since then, at the secondary education, students have two choices when they graduate from compulsory education. They can either continue in general high school track or vocational high school track. The existence of vocational high schools naturally created a need for the vocational teachers in the appropriate fields. In 1937, the first Vocational Technical Education College (VTEC) has been given a start, to educate the young republic's first vocational teachers at bachelor level. With small variations -in the names of the colleges and curricula-, these colleges managed to reach to the 21st century, by fulfilling an important task (i.e. educating the prospective vocational teachers with the up-to-date technology). The number of these colleges reached 27 by the year 2009.

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Vocational and Technical Education Colleges were four-year institutions that offer bachelor degrees. These colleges train teachers to be employed in public vocational and technical high schools. They are namely:

- FTE: Faculty of Technical Education
- FIAE: Faculty of Industrial Arts Education
- FTTE: Faculty of Trade and Tourism Education
- FVE: Faculty of Vocational Education
- FVTE: Faculty of Vocational and Technical Education

As table 1 shows the number of the colleges of vocational education has risen from 1 to 27 during the period of 1937-2009. Due to the lack of coordination, these colleges have had many matching programs and curricula, that are either very similar (i.e. in different types of colleges) or even the same.

Table 1. The number and the types of vocational colleges in Turkey

College Name	**Numbers**
Faculty of Technical Education (FTE)	**19**
Faculty of Vocational Education (FVE)	**2**
Faculty of Trade and Tourism Education (FTTE)	**3**
Faculty of Industrial Arts Education (FIAE)	**1**
Faculty of Vocational and Technical Education (FVTE)	**2**
TOTAL	**27**

Before the closure of these colleges, there have been 19 technical vocational teacher training institutions in Turkey (i.e. FTEs). These colleges were training technical teacher candidates in several fields. The number of student enrollments, the total number of students and graduates for these colleges are listed in table 2. As it may be observed from the table, every year about 5000 students are graduated. And, last year the number of new enrollments was about 6700. Along with the other 8 vocational colleges the total enrollments for the vocational teacher training colleges reach 10.000. And this corresponds to the %3 of the totally available places in Turkish universities at bachelor level. As it will be mentioned later, due to the decreasing enrollments at the secondary level technical vocational education and reduction in certain jobs in the job market requiring secondary level vocational graduates have reduced the need for technical teachers in certain fields. However, about ¼ of the curriculum of the relevant colleges were consisting of education related pedagogical content. And, this was –along with the other reasons- preventing the vocational technical teachers to be employed at different positions (i.e. due to their affiliations as 'technical teachers' not engineers) either in the government or private sector. This was forcing the graduates to be either self employed or be employed with other diplomas that might have been obtained during their study period (e.g. technician certificate).

Table 2. The student data corresponding to the VTEs

DEPARTMENTS	2008 - 2009						2007 - 2008		
	NEW ENROLMENTS			ENROLLED STUDENTS			GRADUATES		
	T	F	M	T	F	M	T	F	M
GRAND TOTAL	6736	815	5921	28529	3586	24943	4982	762	4204
MECHANICAL EDUCATION	2000	107	1893	8715	470	8245	1534	100	1434
CIVIL EDUCATION	788	168	620	3297	767	2530	547	127	404
ELECTRICAL EDUCATION	872	15	857	3916	91	3825	504	15	489
ELECTRONICS AND COMPUTER EDUCATION	1459	278	1181	6118	1160	4958	1303	296	1007
FURNITURE AND DECORATION EDUCATION	250	1	249	967	27	940	183	13	170
FURNITURE AND DECORATION EDUCATION (PART TIME)	109	5	104	302	19	283	49	6	43
METAL EDUCATION	769	14	755	3131	87	3044	545	20	525
PRINTING EDUCATION	73	49	24	344	209	135	57	38	19
PRINTING EDUCATION (PART TIME)	72	53	19	302	168	134	75	31	44
TEXTILE EDUCATION	180	114	66	813	526	287	161	116	45
MECHATRONICS EDUCATION	81	2	79	250	6	244	24	0	24
CONTROL EDUCATION	83	9	74	374	56	318	0	0	0

2 Problems of Teacher Training Colleges

The developments in the last decade hit the popularity of secondary level vocational education. In 1999, the CoHE took a controversial decision by changing the way the university entrance exam scores are calculated. The new calculation method favored the graduates of general high schools. Many considered this new method to be unfair and unreasonable; indeed many think that this decision was ideologically motivated. According to new method, even with the same exam results and same high school grades, a graduate of general high school was getting a far higher score than a graduate of vocational high schools. Due to this new method, students started to migrate from vocational high schools toward general high schools. The change of the total number of students in general and vocational high schools is shown –for the last 10 years-in table 3.

As it may be observed from Table 3, in 1998 the total number of students in both vocational and general high schools is about the same. However, after the decision of the CoHE in the same year, this ratio dramatically crumbles against the vocational high schools. The consequence of this is, naturally a negative implication on the employability of the graduates of technical education faculties or technical teachers in short. This has not been the only reason for the decline of the employability of the technical teachers. As the ministry of education has adapted ISCED 97 [2] for the vocational education, some of the obsolete programs have been either removed from the curricula or altered totally which in turn could not be addressed by the graduates of vocational technical colleges in certain fields.

Table 3. The change of total number of students in general and vocational high schools [1]

School Type	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
General Secondary Education	1098254	1179371	1323349	1494340	1583912	1711573	1685025	1817172	1860791	1733957
Ratio in Total (%)	52.4	56.3	60.2	62.3	64.2	63.5	61.9	63.2	61.4	59.6
Vocational Secondary Education	998071	916438	875238	906456	886649	987287	1039651	1059210	1172030	1177219
Ratio in Total (%)	47.6	43.7	39.8	37.7	35.8	36.5	38.1	36.8	38.6	40.4
TOTAL	2138298	2095809	2198587	2400796	2470561	2698860	2724676	2876382	3032821	2911176

Another consequence of the regulation made in 1998 is that, families have become reluctant to send their bright children to the vocational high schools. As a result, only the students of lesser competency and ability were encouraged to go to these schools. The graduates of these schools were given extra points (i.e. which is added up to the final university exam results) when they choose to go to Colleges of Technical Education. As a consequence, the quality of the students going to these schools decreased dramatically. This naturally generates a closed loop where less successful graduates automatically placed to the colleges of technical education in turn the graduates of these colleges becomes vocational teachers and so forth.

In addition, the graduates of all Colleges of Vocational and Technical Education are only supposed to be employed by the Ministry of National Education as teachers. In the past, most of them have been able to become teachers in public vocational and technical high schools. However, this has been dramatically changed as only about 5 per cent of the graduates have been appointed as teachers to public schools in recent years. The number of FVE graduates appointed as teachers by the ministry of education in years is shown in figure 1. This college's job appointment rate is regarded high, when compared to the other vocational teacher training colleges that are listed earlier. Coupled with the unsuccessful graduates from the vocational high schools, the need for the chance has become stronger.

Figure 2. shows the success rate of the secondary level vocational students at the university entrance exam. As Figure 2 shows the university entrance success rate for the secondary vocational education graduates is gradually reduced despite the fact that the overall number of available places at the universities nearly tripled over the past 15 years. This is as a result of the problems which may be listed as:

- The effect of negative coefficients that are enforced for the graduates of vocational high schools when entering the university exam,
- The downgrading of the profiles of the students that are attending to the vocational high schools,
- The success of the vocational technical teachers that are employed in these schools.

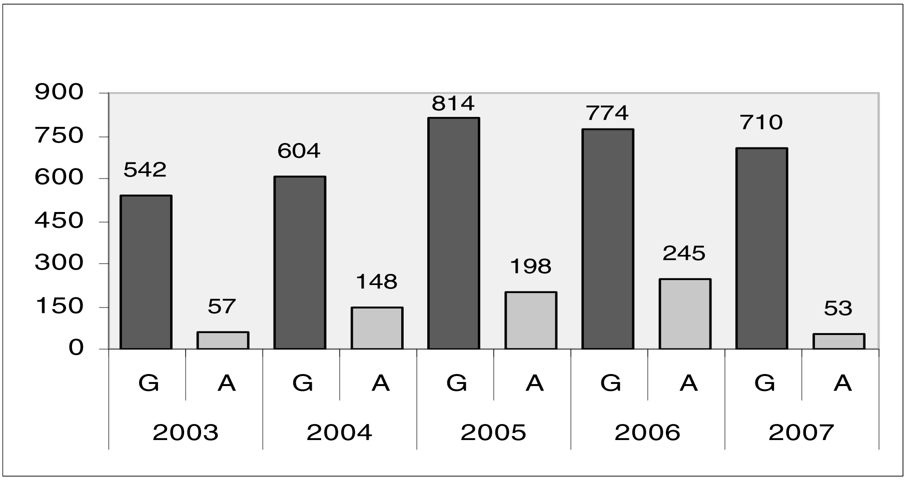

Fig. 1. The job placements for the graduates of FVEs (i.e. by the Ministry of Education)

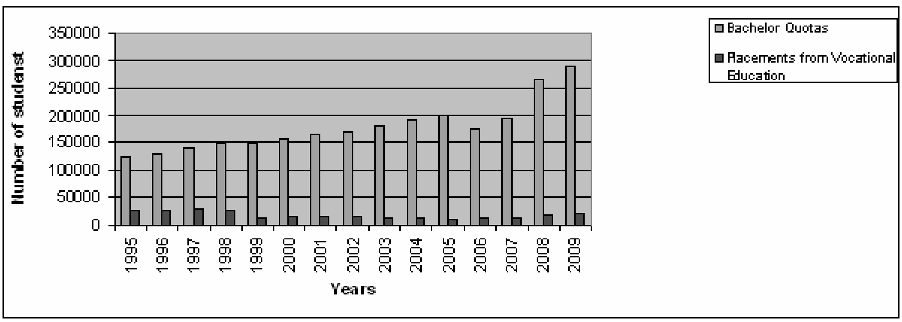

Fig. 2. The total number of students placed to the universities coming from vocational secondary education

An unexpected result of the changes (which was adapted by CoHE in 1998) has been the effect on the gender population in these schools. The negative effect of the decision which has been made by CoHE in 1998 is even mentioned in OECD 2007 report on Turkey [4]. As Figure 3. shows the number of females entering the vocational secondary level education has dropped dramatically over the last 12 years. This was despite the fact that, many of the secondary level vocational education is normally more suitable for females than the males (e.g. such as nursing). But, families fearing that their children may not continue their education at university level due to the negative coefficients forced on the graduates of vocational schools caused this change in their attitude.

The problems summarized above has forced the CoHE to take measures to reform the university entrance exam so that it is justified and the results are not disputed, along with the presentation of a new approach for selecting and educating vocational

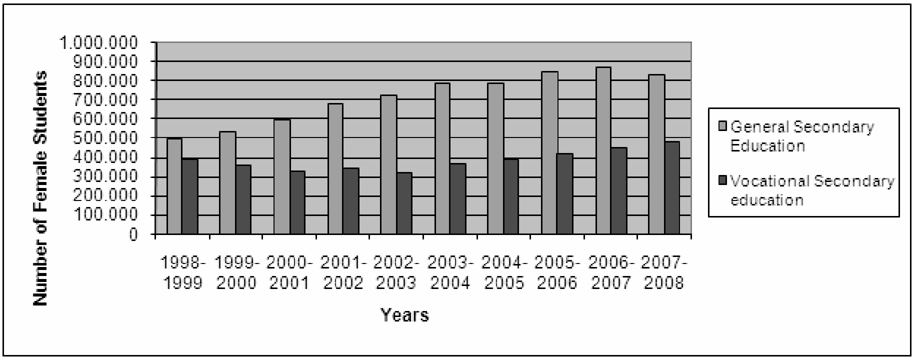

Fig. 3. The change in the number of female students (i.e. following the vocational path) in secondary education [3]

teacher candidates. One other strong force behind this decision is the Lisbon Strategy [5] where European Council takes a decision to make Europe a competitive economical area with high employment rate in the world by the year 2010. This strategy document stands on three main bases; one main idea is that the growth rate of the European economy is behind the growth of USA. Therefore, the changes in the community must be supported by means of research and developments. We believe that the suggested changes for the vocational teacher training matches with the ideas of this document.

The following section presents a summary of the new vocational teacher training procedure that will be valid in Turkey by the following year.

3 New Approach to Educate Vocational Teachers

The CoHE has taken two steps to solve the briefly discussed problems above. Firstly the university entrance exam has been modified to allow the vocational high school graduates to be able to select and placed to the colleges of engineering provided that they are successful in the entrance exam. Secondly, the council decided to close down the faculties of vocational education. The regulations made by the CoHE may be summarized as:

- By this regulation 5 types of vocational and technical education colleges are closed down (i.e. FTEs, FIAEs, FTTEs, FVEs, FVTEs). Three new colleges are opened to fulfill both the vocational teacher requirement of the Ministry of Education along with the industry's requirement of more application oriented engineers. These colleges will provide bachelor level of education. And they will train the students in the appropriate technical or vocational field. The need of vocational and technical teachers of the ministry of education will be met by these graduates who take pedagogical education (i.e. extra two semesters) following the bachelor degree.
- The newly founded colleges are 'Faculty of Technology', 'Faculty of Tourism', and 'Faculty of Arts and Design'.

- The students of these colleges will attain ‘workplace training’ for one semester. In addition, the school training will consist of 7 semesters. In addition, 72 days of apprenticeship at the workplace in the summer is essential.
- Institutions having FTEs or FVTEs will have ‘Faculty of Technology’, universities having FVEs will have ‘Faculty of Arts and Design’, while the universities that used to have FTTEs will establish the new ‘Faculty of Tourism’.
- Finally due to the program duplications, FIAE is closed down and no new colleges are planned to fulfill their duties.

Table 4. lists the current departments of the FTEs and planned departments of the newly founded FTs. As the table illustrates, most of the departments that are planned in the FTs are originally classical departments of the engineering colleges. One might think that, is this all about closing certain type of colleges and opening ordinary engineering colleges? Actually this is not the case; as figure 4. shows the structure of higher education will be different in many ways as will be described in the following sections.

Traditionally, these colleges have a strong application based background when compared to the classical engineering colleges. However, on the other hand, they lack the necessary calculus based engineering mathematics. In addition, the graduates of these schools are very good at field when applying the current technologies but, lacking the new and innovative design and construction capabilities. At the time of the closure of these colleges, there were about 700 faculty members and 40.000 students in 27 vocational teacher training colleges. According to the proposal new engineering faculties are started. The new engineers graduated from the newly formed “Faculties of Technology” will fulfill two main tasks: namely, to supply application oriented engineers that are demanded by the Turkish industry and also meet the demand of vocational technical high schools teachers requested by the ministry of education.

Originally the VTECs curricula contain about 20% pedagogical content. Under normal circumstances this may be regarded quite normal, however when the employment rate as vocational teacher flattens a revision becomes a must, because 20% of the curriculum becomes a burden. Therefore, the CoHE has decided to take out all the pedagogical content of the current curricula, while introducing 1 full semester workplace education apart from the regular apprenticeship (i.e. normally 72 working days). Also, differing from the classical engineering, all of the lectures regarding to the field will contain lab work. This lab-work is normally about 20% in engineering programs. The graduates of these newly formed colleges will take an extra 1 year pedagogical education if they decide to become teachers. Also, ordinary engineers will be able to become vocational teachers if they fulfill this requirement as well. CoHE currently works on setting a curricular framework for the new Colleges in line with the Accreditation Board for Engineering and Technology (ABET) standards. The framework will also take into consideration the Bologna process which Turkey is a participant.

Table 4. The current departments of FTEs and planned departments of FTs

DEPs of FTE	DEPs of FT
Mechanical Education	Automotive Engineering
	Mechanical Engineering
Metal Education	Materials Engineering
Electronics and Computer Education	Electric and Electronics Engineering
	Computer Engineering
Electric Education	Electric and Electronics Engineering
Civil Education	Civil Engineering
Furniture and decoration Education	Furniture and decoration Engineering
Printing Education	-
Mechatronics Education	Mechatronics Engineering
Textile Education	Textile Engineering
Industrial Technology Education	Industrial Engineering

The newly founded colleges are a breed between the colleges that train application engineers in many European countries and colleges of engineering education in the United States. On one hand the graduates of the newly founded colleges will have more theoretical mathematical background, unlike their American counterparts (i.e. the graduates of the engineering technologies). On the other hand, they will be more application oriented when compared to the classical engineering graduates. Moreover, the 240 ECTS requirement of the bologna process is still fulfilled.

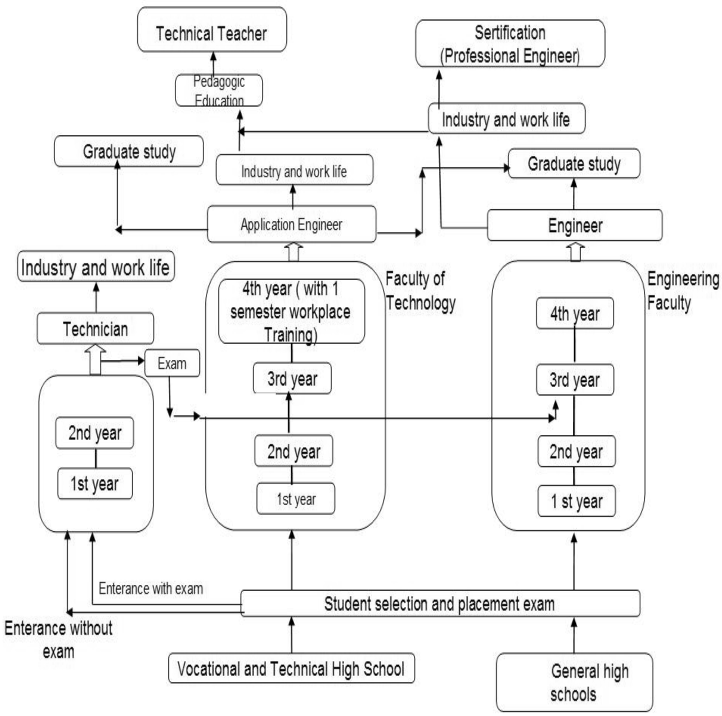

Fig. 4. The Structure of the Turkish higher education system

4 Results and Conclusions

Turkey has taken a step toward by re-shaping its vocational technical teacher training approach by the inauguration of new colleges of engineering named Faculty of Technology. Before the establishment of the new colleges most of the stake-holders have been consulted. The consensus is that, both the industry and vocational high schools need engineers/teachers of more application oriented yet, still having a strong theoretical background.

Turkey's expectations from the potential impact of the regulations summarized above are high. The CoHE is expecting that, the student profile of the secondary vocational education will rise sharply since the students are allowed to pursue an engineering degree if they are successful enough at the university entrance exam (this has not been possible for the last 10 years). The quality of the vocational teachers will also rise sharply due to the fact that the prospective teacher candidates are going to be the graduates of engineering programs and thus will have a strong background in both theory and application in the relevant field.

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Multicultural Interdisciplinary Handbook (MIH): Tools for Learning History and Geography in a Multicultural and ICT Perspective*

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Abstract. Despite official educational guidelines, improved linguistic skills have been limited in all partner countries due to cuts in their national budgets. As a consequence CLIL experiences have been lessened, to the sole benefit of those involving English. Another reason for this project resides in the difficulty in modifying the guidelines of national programmes, which are often short-sighted as far as other cultures are concerned.

Finally, all European reports point out the shortage of materials and ICT-based contests suitable for interdisciplinary and multicultural education in school. The MIH (Multicultural Interdisciplinary Handbook) project meets these needs by providing new tools that will help teachers and pupils to plunge deeper into the culture and the language of another nation via its memorials, its history and its landscape/geography. Moreover, it intends to promote the common European identity, as it introduces a European perspective in the schools' History and Geography programmes, which are usually confined to national borders.

Keywords: History & Geography, CLIL, ICT, Learning Objects, Multicultural perspectives, e-learning.

1 Introduction: Project Overview

The aim of this Project is to build and share a set of tools that includes a Handbook, Digital Modules and a Teacher Training Course. They will offer a structured path through European contemporary History and Geography where the countries concerned will be those of the Project partners.

Today, it is generally national guidelines that determine school programmes; school handbooks and Didactics are based upon them. Going beyond the limits of the

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national programmes, and furthering the understanding amongst young people and their educators of the diversity of European culture, languages and values –the principal objective of the Comenius– we plan to operate at the level of the handbooks and Didactics. The main purpose of the entire MIH project is to offer a tool for studying events through an approach that is both comparative and interdisciplinary: historical content will be organised based on underlying geographical realities dealing with such topics as borders, migrations, landscape and resources.

The cooperative work of selecting and drawing up the key topics, a major activity of the project's core members, will provide the materials for designing a training course addressing current and future teachers that will emphasize the European dimension in teacher training.

The Handbook, available in the five languages of the partnership plus in English, can be used both by teachers interested in multicultural learning as well as by those involved in CLIL projects [1]. In the latter case, teachers will have at their disposal the consistent path, the original documents and a general methodology that recent reports have shown to be missing. They will promote language learning.

The Digital Modules will be the final tool of the project. The modules will be available as free video podcasts, web-based contents (HTML) and standard-packaged Learning Objects (SCORM – IMS) in order to use them in any Virtual Learning Environment, so in class or for independent study by pupils; they will motivate pupils by supporting listening comprehension and oral production and represent an important contribution to the development of digital educational content.

The project introduces at least five innovative elements in schools:

1. The Handbook is simultaneously a learning tool and an integrated and consistent presentation of historical events related to the transformation of the territories considered, completed by a methodological analysis.

2. It addresses CLIL classes (or similar) [2] but also regular classes, and can be used whenever a teacher chooses to make pupils aware of historical events as seen from the viewpoint of other nations.

3. The range of countries involved, including Spain and Italy as well as those further north, goes beyond that in the Franco-German handbook, which addresses bilingual regions and institutions involved in Franco-German cooperation.

4. The range of "foreign" languages in which the material will be available – beyond the three most common: French, German and Spanish – may increase interest in these languages; they include full support for both Italian and Polish.

5. The digital modules –based on selected excerpts of the Handbook- will be freely downloadable as podcasts. Key targets are teachers, who can use them in class, and students, who can use them for independent study. Other users who currently have no equivalent available can also use them. As a tool, it presents a number of advantages: it can motivate students and provides practice for listening comprehension; it is well adapted to ubiquitous learning principles; it widens the potential users and opens new paths for the exploitation of the results.

The Project life is from October 2009 to September 2011. We expect to release the first beta products by September 2010.

The Project website is http://www.mihproject.eu.

2 Objectives and Results Expected

The main objectives of the MIH Project are:

- Further the development of a common European identity by having schools participate in the culture of other countries using their languages and their collective symbolic imagery;
- Contribute to the creation of a new generation of school Handbook and ICT-based contents that can support teachers involved in CLIL experiences, or who are simply interested in them;
- Implement digital educational contents in schools.

The "Products" or Results will be:

1. A HandBook and Digital Materials, which deal with a choice of historical and geographical topics, selected among those that have had an important impact in the national imagery in the last two centuries. The final version of Handbook and Digital Modules will be available in all the languages of the partner countries.
2. A Teacher Training Course addressed to both future and in-service teachers. The training develops the topics dealt by the handbook and explains its methodology and issues.

3 Quality of the Consortium: Institutions Involved

The University of Salamanca leads the initiative and has well-documented experiences in international projects. It is involved via its InterAction and eLearning Researching Group (GRIAL), currently focusing on the production of educational podcasts and Learning Objects for both e-learning and b-learning contexts.

The German Universities of Augsburg and Siegen contribute with long expertise in Didactics of History in the fields of multicultural dialogue, methods and contents for teaching History in bilingual classes. They will share the responsibility for piloting the complete toolset.

The Department of History of the University of Venice contributes with scholars involved in teacher training, as so as in History and Geography Methodologies and Didactics. They are responsible for the state-of-the-art Studies and the Methodology for content developing.

The Polish Academy of Management has a language unit and also provides training for teachers. The Academy has vast experience in managing European projects. All the staff is competent in inter-cultural education.

The trainers at the IUFM of Créteil, a public teacher-training institute currently attached to the university of Paris XII, have already developed school handbooks as well as participated in European cooperation (MOBIDIC project). They are responsible for the layout of the Handbook.

Hafelekar Agency staff is responsible for the evaluation programme, dissemination and valorisation. They will collaborate closely with the University of Salamanca in order to ensure the highest quality in the whole processes.

The Paedagogische Akademie of Innsbruck staff is expert in both teacher training, especially as related to the design of curricula, and language teacher training. They will design the TTC.

4 Impact

Immediate beneficiaries, who will also be involved in evaluation and pilot testing, are:

- Future teachers of Languages, History and Geography enrolled with the partner institutions.
- Teachers currently in service in associated schools as well as those that can be reached in the course programme.

Teachers, students and anyone interested in European multi-cultural issues constitute the future beneficiaries. Depending on national programmes, the project deliverables will be used in the final year of lower secondary school, and the first two and the final years of upper secondary school. It thus addresses students ranging from 12 to 16 years of age.

Despite political statements and official educational guidelines illustrating a certain comprehension of the importance of mutual understanding, improved linguistic skills and ITC–based content have been severely limited in all partner countries due to cuts in their national budgets. This is perceptible in the reduction of the teaching of German and French languages, and even more so for other language classes to the sole benefit of English, where governments currently concentrate their financial resources.

While we cannot influence "national limits" set on school programmes, we can increase and adapt the didactic tools and have them correspond both to the goal of European integration and the desire of teachers to have available traditional and innovative classroom tools. This is precisely the objective of the MIH project, which will not only support teachers in developing interdisciplinary subjects and multi-cultural approaches, but also prepare them during their own training. They can use the hard-copy Handbook as well as the Digital Modules, knowing that these are available in both their "national language" and the alternative "foreign language," depending on the objectives they assign to their teaching. The project may participate in reviving interest for European languages than English and contribute to redefine the contents of school programme.

5 Workplan

The Project consists of six steps:

1. Define key topics and methodology based on comparative studies and collaborative engagement.
2. Draft initial version of the handbook and implement quality evaluation.
3. Write the final version of the handbook in English and in the five languages of the partnership.
4. Develop a storyboard of the modules and produce the podcasts.
5. Design the teacher-training course.
6. Run a pilot study of the toolset and related quality evaluation.

Six milestones have been fixed to monitor the process; the milestones correspond to the deliverables from the above steps: 1. study report; 2. draft of the Handbook; 3. final English version; 4. translations; 5. design of the TTC; 6. production of the Digital Modules. The final milestone is planned to occur 18 months after the start of the project, after which the tools will be subjected to a six-month pilot-test and quality survey in associated schools.

The quality of the products will be assured by:

1. Peer reviews.
2. Evaluations delivered by associated schools.

6 Conclusions

Although the Project is now beginning its researching activities, we were able to confirm the claim for some kind of new learning tools and methodologies for History and Geography with a multicultural, CLIL and ICT approach. In the age of Google Maps and Google Earth, the possibilities for developing multimedia, interactive and multicultural learning contents should let us build such materials with a new methodological approach. After setting up the state of the art of the learning materials actually used by pupils in Europe, we will be able to develop the main structures of this methodology that will guide us through the main historical and geographical facts and contents in order to show different, multilingual and multicultural perspectives in the same learning content (that is particularly interesting regarding the History of Europe), enriched by new ways to present History and Geography by mixing audio and video clips, maps, documents, studies and statistics in a very attractive format.

We expect to explore and experience new methods and to find a very interesting approach to renew some learning contents regarding History and Geography with these perspectives: multiculturality, CLIL, ICT.

Acknowledgments

With the support of the Lifelong Learning Programme of the European Union.

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A Process for Improving Course Quality Based on Mid-semester Feedback

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Abstract. Quality control mechanisms are becoming more important in higher educational institutions. Student evaluation of teaching is typically used to obtain feedback from students about a learning experience but its effect in the course may take too long. Fast feedback mechanisms, in exchange, look at obtaining feedback in order to apply corrective measures quickly. In this paper a process is described to obtain feedback from the students about a course, analyze the received results, and identify the most significant aspects. The process has been applied to a course and led to some adjustments that had immediate impact on the course.

Keywords: student evaluation of teaching, quality improvement, course evaluation.

1 Introduction

Under pressure to increase the quality of their services, higher educational institutions are exploring the implementation of total quality management procedures as well as continuous quality improvements. Student Evaluation of Teaching (henceforth simply SET) is typically included among the procedures that are part of quality assurance programs. But the overall feedback process has a cycle larger than the course and the results are usually more oriented toward teacher promotion or salary increase processes than course quality increase.

Mid-semester feedback or fast feedback [1,2] is a mechanism with a shorter latency. This technique consists on obtaining feedback from students at different times during the semester. Results reach the teaching staff quickly enough to consider immediate adjustments. However, this type of SET is challenging to deploy because it needs an unobtrusive feedback gathering procedure, quick post-processing time and fast response by the teaching staff. Furthermore, no formal process to analyze the answers is used.

This paper describes a process to implement a quality assurance mechanism in a course where feedback is obtained using multiple unobtrusive mid-semester student evaluations. Answers are classified through a subjective categorization

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process. The most significant aspects of the course are then analyzed for potential corrective actions. The process has been deployed in a course in which the teaching methodology shifted from conventional lecturing to active learning, learning outcomes about teamwork and self-learning were included, and grades were obtained with continuous evaluation paradigm. The analysis of the obtained results has proved that this process facilitates adjustments while the course is being taught.

2 Related Research

Quality of services in higher educational institutions is becoming a very important issue. However, implementing measures to achieve this quality is a complex task to the point that multiple organizations have joined efforts to describe and formalize quality management procedures [5]. Classroom assessment techniques [1] are designed to gather information about the activities in the classroom so that instructors can know the most effective measures to improve the overall learning process. These techniques are themselves part of a wider area known as "Student Evaluation of Teaching" (SET).

Looking at the large body of literature about this area, the correlation between SET and the quality of a course is, to say the least, controversial (see, for example [10]). Numerous scientific studies praise the benefits of SET to improve a learning experience, and an equally important number of authors cast doubts about its true value. Two conclusions about SET appear consistently in the related literature. First, a reliable measure of teaching effectiveness is elusive because of its multidimensional nature [8]. Second, results obtained with SET highly correlate with other measures obtained from sources such as peers, alumni or administrators [6]. As a conclusion, it can be stated that SET is a reliable measure of teaching performance [9].

A special case of SET are the mid-semester student evaluation, informal early feedback, or classroom assessment [1] techniques. The idea is to deploy a mechanism by which feedback (sometimes informal) is collected from the students with a frequency that allows the instructors to reflect upon the answers and deploy, if needed, any corrective measures. This type of evaluation is specially recommended when teaching a course for the first time, or when there is a significant change in methodology, to detect strength and weaknesses during the semester [7]. But recommendations for processing fast-feedback results are simply to browse through the answers, take student comments seriously and let students know what, if anything, will be changed.

Instructors rarely have full awareness of what is truly happening in a course and are inclined to misread how are students perceiving the course as a whole [3]. Fast-feedback answers are a tool to obtain an accurate and reliable measure of the course perception. But if open questions are used for this type of evaluation, and the number of answers is large (more than 20), informal analysis techniques might not reach information that is easily obtained with simple formalized procedures.

This paper describes a process starting with mid-semester student evaluation. The answers are categorized to identify those aspects that are having a significant impact in the course. The method to obtain the student feedback is inspired by the classroom assessment techniques described by Angelo *et al.* [1], but the forms were requested three times during the semester in an approach similar to the one described by Felder [7].

A categorization step is then applied to classify the answers and identify those aspects of the course with a significant impact for the students. With this information, the instructors may consider adjustments to be applied to the course.

3 The Process

The proposed process consists of four steps as depicted in Figure 1.

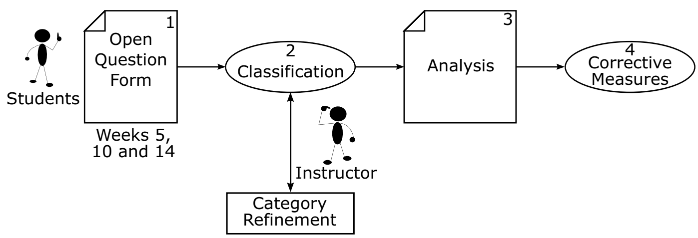

Fig. 1. Process Structure

Step 1: Obtaining Feedback from the Students

The form used in this step is designed as a compromise between the following aspects:

- The questionnaire should be brief and unobtrusive. A submission request with too many questions may have a low chance of being answered [4].
- There are numerous aspects to be monitored in a course. Any attempt to enumerate them produces a unnecessary long list.
- Students must understand the need and purpose of this questionnaire.
- The responses must be succinct to speed up the post-processing.

The resulting form starts with a succinct paragraph requesting the feedback and stating that the results will be kept anonymous, followed by two separated text boxes with the questions "Describe briefly the most critically positive (respectively negative) aspect that you encountered in the course so far". The form limits the answers to only 300 characters. The combination of open questions and a limit on the answer size forces students to briefly analyze all the aspects of the course, choose the most critical one (positive and negative) and state it succinctly.

Step 2: Categorization

A large number of these answers may mention an equally large number of course aspects, thus a systematic approach is needed to process them. In the second step, an initial set of categories is proposed corresponding with different "aspects" of the course such as "teaching methodology", "lab organization", "course organization", etc. All answers are reviewed and marked as belonging to one or more of these categories. Although this classification step introduces some bias, the obtained results highlighted certain aspects of the course so clearly that it was perceived as an improvement over simply browsing the answers.

Step 3: Analysis

After step 2 each answer is labeled with one or several course aspects. For each category three measures are derived. The number of positive and negative appearances, referred as the "positive" and "negative" ends respectively, and the difference between these two measures. With these numbers the issues are differentiated as follows:

- Issues with both high values on the negative end and the difference need to be analyzed for corrective measures.
- Issues with large positive and negative ends, but with a small difference are labeled as "controversial". They are considered to deploy adaptation measures.
- Issues with large positive end and large difference are ruled as positive.
- Issues with low values in all three numbers are ruled not significant.

Step 4: Corrective Measures

With this categorization and informal analysis, the issues that are most significant for the students are identified. Instructors may now decide if any corrective measures are needed.

4 Empirical Scenario

The described process was deployed in the first edition of the semester course "Systems Architecture", which is part of the degree in Telecommunication Engineering[1] The total number of students that initially signed for the course was 204 and were divided into four groups. Of those, only 166 (81.37%) remained after the drop-out deadline. The course contained the following learning outcomes:

1. Design and development of applications in the C Programming Language.
2. Use proficiently the tools for application development.
3. Apply team working techniques to develop an application for a mobile device.
4. Use of self-learning techniques.

[1] `www.it.uc3m.es/labas/syllabus_en.html`

Outcomes 3 and 4 refer to generic methodological aspects. Team work was used during the second half of the course (six weeks) in which groups of four students were created by the instructors to work in a project. Several documents about team dynamics were requested as readings and a class session was devoted to analyze teamwork, agree on a team contract and discuss the different type of conflicts that may arise. The measures to achieve outcome 4 were applied throughout the entire course. Each session had two sets of activities, previous and in-class. The set of previous activities required an objective that would be reviewed in the following class. Students found this methodology significantly different to those used in other courses.

The course followed a continuous evaluation scheme. Five partial examinations spread along the semester were combined with small exercise submissions. The goal was to engage students to regularly work in the course. The final course grade was simply the sum of all these partial scores; no final exam was given.

The course also had some additional complications derived from outcome 2. The use of development tools, combined with the blended learning approach (students had a significant workload outside of the classroom) resulted in the need of tools properly configured as a development environment.

5 Experimental Results

The 14 week course had a first period (up to week 8) where students worked in pairs and individually. For the remaining weeks, teams of four students were created to work in a project. The feedback was requested in weeks 5, 10 and 14. In all three occasions answers were accepted during five days. A message was also posted in the course forum stating the importance of the feedback, that the results would be kept anonymous, and inviting students to submit their answers. The obtained results are shown in Table 1.

The number of received answers were 67 (of 204 students, 32.84%), 44 (of 166 students, 26.50%) and 43 (of 166 students, 25.90%) respectively. The higher sample for the first questionnaire is because the deadline for course dropping (students sign out of the course with no effect in their academic record) was on week 8 in the semester. For each of the three surveys, the number of appearances of the aspect mentioned as negative, and mentioned as positive are shown. An empty cell means the category was not mentioned in the survey. The number of aspects mentioned in each survey changes depending on the methodology being used at that moment. The three aspects with the higher number of negative appearances are highlighted.

In the first survey, course workload was the most negative aspect, and was mentioned only once as the most positive aspect, thus pointing to an area that needed further examination. The categories referring to course evaluation policy and student participation in lectures had also a large number of negative appearances, but in this case, there is also a significant number of positive mentions. The use of development tools also had a high number of negative answers.

Table 1. Results after the categorization step

N	Aspect	Week 5		Week 10		Week 14	
		Neg.	Pos.	Neg.	Pos.	Neg.	Pos.
1	Use of mobile devices in the labs	0	4			1	3
2	Student participation in lectures	24	14	5	5	3	1
3	Number of exercises solved in class	4	4	3	1	2	0
4	Course workload	29	1	9	7	7	3
5	Study a new programming language	0	6	0	2	0	2
7	Use of course forum	0	3				
9	Course evaluation policy	10	13	8	3	5	0
10	Motivation received	0	3				
11	Laboratory infrastructure	4	1				
12	Teaching staff in the laboratories	5	4	1	0	3	2
13	Given development tools	8	1			1	0
14	Presence of material written in English	1	0	2	1		
15	Organization of course material	1	7	0	1		
16	Availability of the instructors	0	4	0	2	0	1
17	Work in pairs in the lab exercises	1	0				
18	Work scheme in the lab sessions	0	5	1	2		
19	Exercise resolution in groups	0	1	1	2		
20	Documents on team work			1	1		
21	Team work as course outcome			1	4	3	11
22	The course project			1	5	0	14
23	Perceived changes due to comments			0	6	0	1
24	Group creation criteria			1	3	2	0
25	Final session to present the project					1	4

In this second survey, the categories about course load, evaluation policy and student participation had a significant decline in both positive and negative counts, and new categories appeared mentioning the course project and team work.

In the third and last survey only the course load and the evaluation policy maintain values similar to the previous ones, although both of them experience a decrease. On the positive column, two aspects have a significant increase: team work, and the presence of the course project.

5.1 Adjustments Derived from the Survey

After analyzing the results of the first survey, the following measures were applied in the course:

1. An in-depth review of the workload estimations for the remaining activities.
2. Devote time in class to explain the type of working habits required by the course structure with special emphasis on the previous activities.
3. Reduce the frequency of evaluations in the schedule.

The problems with the tools in the development environment were due to some initial misconfigurations that were solved, so no new actions were taken.

These measures were applied between weeks 5 and 10 and their effects can be seen in the results of the second survey. Although the same three categories have the higher number of negative appearances, their magnitude decreases more significantly than the number of received answers. Furthermore, the deployment of these adjustments was itself perceived as the most positive aspect of the course by six students. This result shows how the proposed process may also capture the effects of the measures derived from previous observations.

In order to check the validity of the results obtained with this process, an interview with student representatives was held at the same time the first survey was being answered. The issues covered in that meeting were totally consistent with those shown by the survey: course workload was perceived as excessive, previous activities were not accepted, the evaluation scheme could be improved and the technical problems should be solved. This coincidence increased the perceived reliability of the process by the teaching staff despite the potential bias introduced with the classification step.

6 Conclusions and Future Work

In this paper a process to deploy a fast-feedback mechanism to improve course quality has been described. The obtained results showed valuable qualitative information about the course and prompted measures that were deployed immediately. The impact of these measures was also reflected in the results obtained by repeating this process during the semester.

By extending conventional techniques to obtain feedback before the semester end with a categorization step, instructors can easily identify those aspects in a course that are perceived by the students as most positive and negative. The classification procedure, although subjective, helps to handle a potentially large number of answers about numerous course aspects. The process has been used in a course, the structure of which included a significant amount of changes. Answers were obtained from the students using a simple, unobtrusive, open-ended based form. Answers were limited in size to encourage clarity and facilitate post-processing.

As future lines of work, we are currently exploring to increase the automation in the classification step by using techniques such as latent semantic analysis.

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The Challenges of Digital Literacy in the Context of the Spanish Government Educational Policies: The Statement of the Question

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Abstract. The "(r)evolution" of the literacy concept and our duty as Languages' Teachers' Trainers at the Faculty of Education and Social Work in Valladolid's University (Spain), guides this research in progress. Our research develops in the framework of the Spanish Higher Education System, within the development of the eight key competences established by the European Council, for the Education and Training of the European citizens for lifelong learning in the knowledge society. We focus on the competences 1, 2 and 4: Communication in the mother tongue, Communication in foreign languages and Digital competence, both as essential competences in the professional language's teacher's profile and as a challenge in the Teacher's Education and Training in the Spanish government policies context.

Keywords: key competences, teachers' training and education, traditional/ and digital literacy, multiliteracies, government policies.

1 Introduction

The Council of Europe formulated the necessity of establishing key competences as a basis of educational and training actions in response to the socio-cultural and economic changes in the XXIst. Century a global, knowledge-based society.

"*As globalisation continues to confront the European Union with new challenges, each citizen will need a wide range of key competences to adapt flexibly to a rapidly changing and highly interconnected world. Education in its dual role, both social and economic, has a key role to play in ensuring that Europe's citizens acquire the key competences needed to enable them to adapt flexibly to such changes"* `[14](…)

"*Key competences should be acquired by: (…) young people at the end of their compulsory education and training equipping them for adult life, particularly for working life, whilst forming a basis for further learning (…) adults throughout their lives through a process of developing and updating skills".* (Summary of Act)

The eight key competences were formulated as follows:

1. ***Communication in the mother tongue;***
2. ***Communication in foreign languages;***

M.D. Lytras et al. (Eds.): TECH-EDUCATION 2010, CCIS 73, pp. 387–396, 2010.

3. *Mathematical competence and basic competences in science and technology;*
4. ***Digital competence** "(…) involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet".*
5. *Learning to learn;*
6. *Social and civic competences;*
7. *Sense of initiative and entrepreneurship;*
8. *Cultural awareness and expression.* [16]

Specifically, our research focus on the competences 1, 2 and 4: ***Communication in the mother tongue, Communication in foreign languages*** and ***Digital competence***, both as essential competences in the professional language's teacher's profile and as a challenge in the Teacher's Education and Training in the Spanish context. Regarding the requirements of the three competences above mentioned, especially in our field, we have to look at the concept of *Digital literacy*, emphasizing the reading and writing processes. Having all those facts in mind, in the canvas of Higher Education, focusing at the construction of a Languages Teacher's professional profile, the traditional concept of *Literacy* has to be approached in a widener framework. [7]

We start from the following assumptions:

1. The concept of *digital literacy* has a multidimensional & multicomponential character. Therefore we approach it through three levels of detail[1], such as:
   - Level 1. Related to the socio-political dimension. We focus in some of its essential components, such as: the permanent technological (r)evolution as well as the building of a democratic European society; that places people in a challenging new culture with new socio-cultural requirements.
   - Level 2. Related to the educational policies dimension: (Central government, regional and local educational administrations) in which the essential components, that we chose, are: the changes in the concept of curriculum, into a cognitive, ecological, learner centered, context based model[19], [21], the (r)evolution and (re)direction from the traditional concept of literacy to a competencies based configuration, that relates to quality intellectual operations using digital technology.
   - Level 3. Related to the pedagogical dimension, with its essential components: the Planning (Syllabi), the classroom intervention, and the instruments & material resources [17] [18].
2. The (r)evolution of the *Digital & Information and Comunication Technologies literacy(ICT Literacy)* concept, as a perspective in the *Multiliteracies* approach with three parallel interdependent dimensions or perspectives:
   - 1. The sociopolitical dimension, expressed in the determinations of the European institutions for the knowledge society, in terms of key competencies [11], [15], [4].

[1] In this Paper we focus on the curricula components analysed in the two levels of Compulsory Education: Primary and Secondary (ages 5-6 until 14-15).

- 2. The educational policies dimension expressed in the determinations of the Spanish central Government in the form of legislative documents, emerging from the UE dynamics in Education and Training.
- 3. The pedagogical dimension expressed in the determinations from the Official Curricula that appear structured and organized in: goals, contents, "competencias básicas" (referred to key competences), methodological directions and assessment criteria [17] [18].

In this statement of the matter, our research tries to answer to a main goal that we formulate in a double/complementary perspective:

-A 1) To identify and to read into the determinations of a socio-political character, the determinations of educational policies as well as the determinations of a pedagogical order trough its declarations in legislative documents, orientations and recommendations of the Official European institutions, for the EU countries.

-B 2)To identify and to read into the traits and characteristics of its implementation in the different levels of the Spanish Education and Training system, trough the essential components of every pedagogical situation [8], such as the Agent, (teacher as a human resource and the pedagogical instruments & material resources); the Subject (learner, student in a classroom) and finally, the environment (institution, pedagogical infrastructures, supports, spaces, academic schedule).

Under this main goal, each perspective is approached like a unit of research that leads to an inquiry about a documental corpus as well as an empirical corpus. We are now developing the first research unit, using the institutional documents, the Spanish Law of Education and Royal Decrees of "enseñanzas mínimas" [17] [18].

Our research is oriented in a qualitative paradigm [1], [3], [6]; constructing an inquiry device for the implementation of the contents' analysis. The analysis units emerged from the identification and categorization of such manifestations containing notion indicators of the digital literacy concept. The data interpretation is realized, (in this first step) in terms of presence, distance degree, feasibility conditions; seen as completeness factors of the attention process to *Digital-ICT literacy.*

2 From Literacy to Multiliteracies: The (R) Evolution of the Digital Literacy Concept and the Identification of Its Dimensions and Components

Since the New London (New Hampshire) meeting [20], the term *Multiliteracies* refers to a pedagogical literacy approach that broadens the traditional reading/writing abilities- considered only as mechanical or cognitive skills-. *Multiliteracies* presents a sociopolitical and cultural mediated perspective; as well as an attention about the use and impact of the Information and Communication Technologies on reading/writing abilities and processes. The dual perspective of this approach: both in socio-cultural and ICT aspects, involved many lines of pedagogical treatment of literacy. Probably the two most relevant are: *Critical Literacy***,** which emphasizes the contextual, socio-cultural mediated character of every text, and *Information and Media Literacy***,** referred to the abilities required to communicate using ICT and its pedagogical handling, beyond the mere technical performance[2].An important issue related to both lines Critical & ICT Literacy is the look into the socio-cultural phenomenon named *digital divide*[3], pointing to the gap created between people that haven't access to the digital contents and the citizens that are able to use them.

The so named by the Council of Europe key competence number 4 ***Digital Competence*** is considered by policymakers as a main goal for Education and Training. As above mentioned; *Digital Competence* includes not only the technical aspects of using ICT, but also the skills related to communication and critical use of those technologies. Although, recent studies about Educational programs and government policies such as: The International ICT literacy Panel ETS Report [5] the OEDC TALIS inform [13], Peña López [15] and Cope and Kalantzis [2] suggest, that the ICT (digital) Literacy is been considered by the decision makers only in the perspective of technical resources and mechanical skills; forgetting dangerously the meta-cognitive, cross-cultural, meaning making aspects of Literacy. Consequently, the *digital divide* is seen in a quite restricted form; that of physical access, logistic problems, or resources; but in very rare occasions is approached in terms of understanding and handling with ICT, beyond supports.

3 Digital-ICT Literacy: A Central Curricular Concept

The multi-cultural plurilingual society of the twenty-first Century and its significant, socio-cultural changes, due to the increasing role of ICT as a global, technological revolution, broaden the concepts of text and social context referred by Wells [22]. Consequently, the word literacy entails, more than ever, being able to receive different cultural patterns and meaning channels, including the abilities required to communicate or create new ways of meaning and knowledge construction through digital contents & supports. Such an assumption should produce effective consequences in the Educational Curricula of the different Countries, in order to enable their citizens to the Knowledge Society, and in the same path, has to have a response

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[2] As defined by Kalantzis and Cope [7] "Multiliteracies is a term that refers to two major aspects of language use today. The first is the variability of meaning making in different cultural, social or domain-specific contexts. These differences are becoming ever more significant to our communications environment. (…)The second aspect of language use today arises in part from the characteristics of the Meaning is made in ways that are increasingly multimodal—in which written-linguistic modes of meaning interface with oral, visual, audio, gestural, tactile and spatial patterns of meaning. This means that we need to extend the range of literacy pedagogy so that it does not unduly privilege alphabetical representations, but brings into the classroom multimodal representations, and particularly those typical of the new, digital media".

[3] The "digital divide" concept emerged in the USA during the Clinton administration, to describe the problems of most of the North-American population at the end of the XX. Century to access to the Internet. The real author of this concept is unknown. An interesting overview about digital divide, provided by the United Nations is to find on: http://www.itu.int/wsis/tunis/newsroom/stats/

(R)EVOLUTION OF THE LITERACY CONCEPT

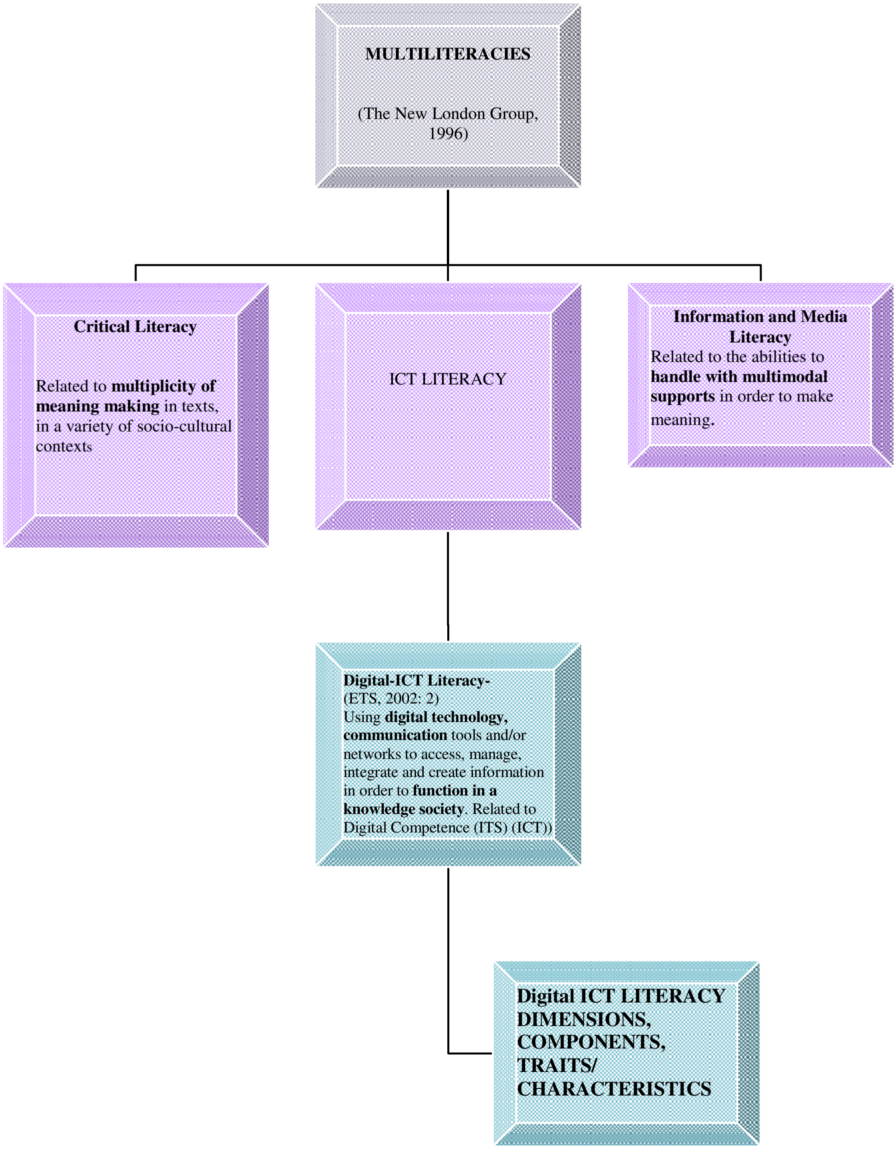

Fig. 1. The (R)evolution of the Literacy Concept

in the Teacher Training programs; because teachers are the first educational agents, essentially involved in the processes of teaching and learning literacy, one of the most ancient goals of Education, since School exists. Now; in the educational systems of the XXIst. Century, mastering *Digital-ICT Literacy* in a *Multiliteracies* perspective seems to be therefore, a decisive goal as well as a key content in the professional profile of every average new millennium teacher.

As we can see, the problem of forming competent readers/users of ICT, is marked by complexity, for its multidimensional and multicomponential character, as pointed out by policy makers -UN and OECD reports, Council of Europe decisions-, educators and researchers. Especially for us, Teachers' Trainers in the Spanish Educational System, the task of identifying and pursuing the dimensions and components of ICT literacy becomes relevant, in a country where ICT proficiency in educational environments is considered as a challenge by teachers and students [10][13].

4 Dimensions, Components, Traits and Characteristics of Digital-ICT Literacy

Having those facts in mind, Following Peña López [15] Cope and Kalantzis [2] and considering the ETS ICT international Report [5] we will try to isolate some components of ICT literacy, throughout the above mentioned dimensions: Socio-political, Educational Policies, Pedagogical. From each component, we look into traits/characteristics considering their presence in the official documents and decrees as well as their potential in Teachers' Education and Training.

Peña López [15] describes some concepts related to *Digital-ICT Literacy,* that we understand in terms of components.

- Technological Literacy: the skills to interact with hardware and software;
- Informational Literacy: the competences to deal with information, normally by means of ICTs (applying technological literacy).
- Media Literacy: skills and competences to deal with several media, make them interact and integrate themin a single output. A lower level could also be defined, multimedia, where interaction would be more mechanical, and an upper one, crossmedia, where interaction and integration would respond not to technical possibilities but to a strategic design.
- Digital presence: Is centred on the individual. These are the digital skills needed to monitor and establish a digital identity, and the skills to actively define it and use it for networking or interacting with other people digitally;
- e-Awareness: related to being aware of how the world and our position – as a person, group, firm, institution –varies because of digital technologies.

Peña López rephrases these components as: Technological Literacy HOW; Informational Literacy: WHAT, Media Literacy: WHERE, Digital Presence: WHO, e-Awareness: WHY (and What for).

For each of them, we pursue some traits/characteristics emerging as from the multidimensional character of Literacy: A Sociopolitical dimension, an Educational Policies dimension and finally a Pedagogical dimension. In this sense:

Table 1. Digital-ITC Literacy Components, Traits & Characteristics. Adapted from Peña-López [15] and Cope&Kalantzis [2].

DIGITAL-ICT LITERACY	**COMPONENTS**				
DIMENSIONS	**Technological Literacy: HOW**	**Informational Literacy: WHAT**	**Media Literacy: WHERE**	**Digital Presence: WHO**	**E-awareness: WHY/WHAT FOR**
Socio-political dimension	Technological (r)evolution Designers and Users	Technological (r)evolution Managers and Weavers	Technological (r)evolution Difference/divergence	Citiszenship through digital contents and supports	Building a democratic society
Educational policies	Developing competences based curricula	Developing competences based curricula	Developing competences based curricula:	Ecological, learner-focused, context- based model	Developing long-scale, quality assessment programs
Pedagogical dimension	Designing and Planning for/in Teaching And Learning (TAL) processes	Designing and Planning for/in TAL processes	Considering Synesthesia as an approach to manage multimodality in/for TAL processes Considering Divergence to confront difference for/in TAL processes	Regarding agents subjects (Classroom) presence/agency in the construction of ICT contents as well as meaning making for/in TAL processes	Conceptualiza-tion & meta-cognition about Digital-ICT literacy for/in TAL processes

- Technological Literacy HOW, is expressed for the Sociopolitical dimension by the Technological (r)evolution for Designers and Users, has an echo in the Educational Policies in terms of developing competences based curricula and requires designing and Planning for/in Teaching And Learning (TAL) processes, if we look into its Pedagogical dimension.
- Informational Literacy WHAT speaks about the needs of managers and weavers, created by the Technological (r)evolution (socio-political), expressed also in curricula by policymakers, and translated as designing and planning strategies in the Pedagogical dimension.
- If we look at the Media Literacy WHERE it is important to consider the impact of Media, showing *difference and divergence* [2] in a so pretended globalised, world (socio-political dimension). The political decisions revealed in the designing of curricula have an impact in the Pedagogical approaches. Cope and Kalantzis [2] point to Synesthesia as an approach to manage multimodality in/for TAL processes and Divergence to confront difference.
- Digital presence WHO speaks about the individual presence in /on ICT. A socio-political problem if we think about factors like community, society, country, cooperation, democracy, culture… Therefore, governments' policies adopt curricula based in a learner centered, ecological, context- referring model. Pedagogically, we have to speak about agency in order to guarantee the presence of agents and subjects within ICT meaning making.
- e- Awareness WHY & WHAT FOR is perhaps the highest component of *Digital-ICT Literacy*. It entails a conscious handling and being in/with/on ICT in order to discover the feed-back between the individuals and the Media (socio-cultural dimension). In the designing of curricula, has an answer in

the developing of long-scale, quality assessment programs for a better comprehension of the System (Political dimension). In a Pedagogical dimension, we may speak about conceptualisation and metacognition.

5 The Status of Digital ICT Literacy in the Educational Policy of the Spanish Government

In a first phase of research unit A)- (in progress) we analyzed the implications of the socio-political dimension of *Digital-ITC Literacy,* where its components are described in Table 2. This Analysis is based in the *Ley Orgánica 2/2006, de 3 de mayo, de Educación* (Fundamental Law of Education). A document that reveals the compromise and challenge accepted by our society regarding *Digital-ITC Literacy,* through Education, the institutional field par excellence. Our *Ley Orgánica*, -in the Preface text, as well as in Chapter I: Principles and Ends of Education (pp. 17158- 17165)- offers the indicator of notion of these components. We used the techniques and supports of the contents análisis as a method to obtain an ensemble of significant data that we describe and interpret in terms of presence and distance degree.

Table 2. Digital-ITC Literacy Components and Dimensions Adapted from Peña- López [15] and Cope&Kalantzis [2]

DIGITAL--ICT LITERACY	**COMPONENTS**				
	Technological Literacy: HOW	**Informational Literacy: WHAT**	**Media Literacy: WHERE**	**Digital Presence: WHO**	**e-Awareness: WHY/WHAT FOR**
TRAITS & CHARACTERISTICS	Interaction: dealing with Hardware and Software, Know-how	Management: obtaining and processing relevant information Know what where and how	Multimodality: multimedia & crossmedia implementation and designing Know what, how, where and what for	Agency The individual in/throughout digital supports and contents.	Conceptualization: meta-cognition

In a second phase we identify the status of *Digital-ITC Literacy* in the Educational policy of the Spanish Central Government, looping into the determinations emerging from the socio-educational dimension of *Digital-ITC Literacy,* wich components are established and described in Table 2. We analyzed the documents reflecting the transposition of compromise and challenge token by Education regarding *Digital-ITC Literacy,* through the structure and organisation of the curricula of the compulsory educational levels. The documents are: Royal Decrees [17] [18] in their Prefaces and articles 1 to 16 (Primary Education) and articles 1 to 18 (Secondary Compulsory Education). Those texts offer the indicators of the above mentioned components. We used the techniques and supports of the contents análisis as a method to obtain an ensemble of significant data that we describe and interpret in terms of presence, distance degree and feasibility conditions. In the same way we analyzed the Orders in their full texts [17][18].

In a third phase, looking into the determinations emerging from the socio-educational dimension of *Digital-ITC Literacy,* which components are established and described in Table 2, we identify the attention to *Digital-ITC Literacy* development in the educational policy of the Spanish Central Government, looking at the adaptative transformations of their components in order to configure the curricula elements: *competencias básicas* (referred to key competences), main goals, contents, methodological orientations and assessment criteria. The Analysis is based on the Royal Decrees [17] [18] Appendix I an II (Primary and Compulsory Secondary Education). We identify in the above mentioned documents the indicators of notion of the described components. Using the techniques and supports of the contents analysis as a method to obtain an ensemble of significant data that we describe and interpret in terms of distance degree and feasibility conditions. We analyze as well the Orders in their full texts [17][18].

In this first research unit, at the current development phase of our research, the data reveal the strong and weak points of an educational policy, in which the curriculum conception has evolved in line with the components of the socio-political dimension of *Digital ITC Literacy*. The main consequences arising for the Teachers' Education and Training.

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The Role That Web 2.0 Currently Has and Could Have in the Future in Supporting the Teaching of ICT Design for All

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Abstract. The main objective of the article is to highlight the role that Web2.0 currently has and could have in the future in supporting the teaching of ICT Design for All. According to this, first the concepts of Web2.0 and eLearning2.0 are clarified and connected. The new way of thinking about eLearning being inspired by the emergence of Web2.0, the term eLearning2.0 was introduced to identify a new paradigm. So, eLearning 2.0, by contrast to eLearning1.0 is built around collaboration, also eLearning2.0 assumes that knowledge is socially constructed. Related to the role of Web2.0 in supporting the teaching of ICT Design for All, the 4 steps involved by the ICT Design For All Teaching Principles are presented and detailed. Finally, some real world examples are shown, as evidence of how the new methods of communication offered by Web2.0 can be used to support students as they learn about Design for All.

Keywords: Web 2.0, eLearning 2.0, Interactive Information Sharing, Interoperativity, Design For All.

1 Introduction

General approach. The role of web 2.0 in supporting the teaching of ICT Design for All is referring both to the robust eLearning tools involved in the newest version eLearning 2.0 based on web 2.0 technologies, and as well to the assistance of traditional teaching of ICT Design for All by the communication and collaboration technologies issued from the web 2.0 context.

1.1 Web2 and eLearning 2. Terminology and Definitions

1.1.1 Web 2.0 is commonly associated with web applications which facilitate interactive information sharing, interoperability, user-centered design and collaboration on the World Wide Web[1]. Examples of Web 2.0 include web-based communities, hosted services, web applications, social-networking sites, video-sharing sites, wikis, blogs, mashups and folksonomies. A Web 2.0 site allows its users to interact with other users or to change website content, in contrast to non-interactive websites where users are limited to the passive viewing of information that is provided to them. [1]

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The term Web 2.0 is closely associated with Tim O'Reilly because of the O'Reilly Media Web 2.0 conference in 2004. Although the term suggests a new version of the World Wide Web, it does not refer to an update to any technical specifications, but rather to cumulative changes in the ways software developers and end-users use the Web. [1] Web 2.0 is qualitatively different from prior web technologies. The Web 2.0 features are very well detailed in [1] and [2], so here we will limit our presentation to specify only the list of them, which is: (1) Tagging; (2) Mashups and Portals; (3) Wikis; (4) Interactive Information Sharing; (5) Interoperability; (6) User-centered design (UCD); (7) Collaboration; (8) Hosted Services; (9) Social-networking sites.

1.1.2 eLearning. eLearning 2.0

E-learning (or **electronic learning** or **eLearning**) encompasses forms of technology-enhanced learning (TEL) or very specific types of TEL such as online or Web-based learning. Nevertheless, the term does not have a universally accepted definition and there are divides in the e-learning industry about whether a technology-enhanced system can be called e-learning if there is no set pedagogy as some argue e-learning is: "pedagogy empowered by digital technology". [2]

The term *e-learning* is ambiguous to those outside the e-learning industry, and even within its diverse disciplines it has different meanings to different people. For instance in companies, it often refers to the strategies that use the company network to deliver training courses to employees and lately in most Universities, e-learning is used to define a specific mode to attend a course or program of study where the students rarely or never meet face-to-face, nor access on-campus educational facilities, because they study online.[2]

The concept of eLearning is mainly connected with the web. The first years of eLearning were in the period 1995-2005, when e-learning was often focused on using the Internet to replicate the instructor-led experience of classroom teaching. [3] That was the period of e-learning 1.0. Content was designed to lead a learner through the content, providing a wide and ever-increasing set of *interactions*, *online discussion*, *experiences*, *assessments*, and *simulations*.

The new ways of thinking about e-learning being inspired by the emergence of Web 2.0, the term Learning 2.0 was introduced to identify the new paradigm. From an e-Learning 2.0 perspective, conventional e-learning systems were based on instructional packets that were delivered to students using Internet technologies. The role of the student consisted in learning from the readings and preparing assignments. Assignments were evaluated by the teacher.

In contrast, the new e-learning places increased emphasis on *social learning* and use of *social software* such as *blogs, wikis, podcasts* and *virtual worlds*. This phenomenon has also been referred to as Long Tail Learning. [3]

Learning 2.0, by contrast to e-learning 1.0 is built around collaboration. Learning 2.0 assumes that knowledge (as meaning and understanding) is *socially constructed*. Learning takes place through conversations about content and grounded interaction about problems and actions. Advocates of social learning claim that “one of the best ways to learn something is to teach it to others”. [3]

E-Learning Technology include: Learning management system (LMS) and Learning content management system (LCMS), Computer-aided assessment, Content Issues. A learning management system (LMS) is a software for delivering, tracking and managing training/education. LMSs range from systems for managing training/educational records to software for distributing courses over the Internet and offering features for online collaboration [3]. A learning content management system (LCMS) is a software for authoring, editing and indexing e-learning content (courses, reusable content objects). An LCMS may be solely dedicated to producing and publishing content that is hosted on an LMS, or it can host the content itself (remote AICC content hosting model) [3]. Computer-aided Assessment (also but less commonly referred to as E-assessment), ranging from automated multiple-choice tests to more sophisticated systems is becoming increasingly common. With some systems, feedback can be geared towards a student's specific mistakes or the computer can navigate the student through a series of questions adapting to what the student appears to have learned or not learned [3]. Content is a core component of e-learning and includes issues such as pedagogy and learning object re-use. [3]

1.1.3 Design for All

Design for All and Inclusive *Design* are important approaches that help designers to address the challenges and opportunities posed by the ageing population and the social and political demands for equal access by people with disabilities [4]. However, it can be difficult to incorporate them effectively into design courses, in a way that makes a real impact on the students. [5] As a definition, Design for All (DfA) is a design philosophy targeting the use of products, services and systems by as many people as possible without the need for adaptation. Design for All is design for human diversity, social inclusion and equality (EIDD Stockholm Declaration, 2004). According to the European Commission, it "encourage manufacturers and service providers to produce new technologies for everyone: technologies that are suitable for the elderly and people with disabilities, as much as the teenage techno wizard." [6] Closely related to the concepts of Inclusive Design or Universal Design, the origin of Design for All lies in the field of barrier free accessibility for people with disabilities, where it has been recognized that this provides benefits to a much larger population. [6]

1.2 Supporting the Teaching of ICT Design for All by Web 2.0 Technology

1.2.1 ICT Design for All Teaching Principles Implemented in the Context of Web 2.0 Facilities, Supposes 4 Steps as Follows:

Step 1: [5] Making students to:

- Understand the breadth of human diversity.
- Articulate and promote the business, ethical and legal cases for inclusivity.
- Critically evaluate the impact of diversity on managing business activity.

This step may be performed even traditionally (so by traditional teaching), but it is more effective to involve some social network services of web 2.0 (facebook, Hi5, etc). In this way, students may meet on the web persons with a wide range of impairements, in order to ask him about their special needs. Also they may contact organizations dealing with elderly or disabled people, to receive and share usefull information for each of the 3 topics mentioned above.

Step 2: [5] Introducing the Idea of Design for All in ICT:

- Considering the hardware needs of the computer, at the level of peripheral devices, according with the special needs of a wide range of people.
- Considering how information can both collected from and presented to a wide range of people, at the level of software implementation. As involving Web 2.0 features to support this step of teaching ICT Design for All, Gill Whitney show in [5], the way to use the facilities of „you tube" in this context. [7]

Step 3: Teaching the implementation of the Idea of Design for All in ICT, based on Web 2.0 and eLearning 2.0 features:

- In the context of the academic curricula, there are some dedicated disciplines like „User Interface Design" and „Interactive Systems".
- In case of Romanian universities (as a particular example), these disciplines are placed in the last years of study, when the maturity of the student is already consolidated. The general context of academic curricula for the last years of study of the Faculty of Automation and Computer Science / Technical University of Cluj-Napoca (Romania) is presented bellow [8]:

(a) Program of Study, Computer Sciences, *year 4*: •Knowledge Based Systems; •Operating System Design; •User Interface Design (UID); •Parallel and Distributed Architectures; •Pattern Recognition Systems; •Translators Design; •I/O Systems and Peripheral Devices; •Parallel programming; •Database Design; •Computer Networks Design; •Marketing; •European Culture and Civilization.

(b) Common courses for Master_CN&DS, Master_AI&V, Master_SE (*Elective*)*:* •Algorithms and Calculability; •Statistics and Probabilities' •Formal Languages; •Communication Networks; •Distributed Systems; •Intelligent Systems; •Software Engineering; •Artificial Vision; •Interactive Systems (IS).

In the context of the two highlighted disciplines, the traditional approaches of UID and IS are enlarged by involving UID for Web 2.0 technologies based DFA. Students are trained tu design computerized equipments that enable the universal access to the IT technology of a wide range of people, including disabled and elderly people. More concretelly, this is the sense of the teaching of multimodal interfaces.

The same manner to extend the traditional content of these disciplines is applied at the level of the eLearning portal of the Distance Learning Department. Being updated yearly, this portal is implemented according to the eLearning 2.0 generation features, so is based on Web 2.0 technology principles. In this context, the knowledge related to DFA oriented User Interfaces and DFA oriented Interactive Systems are shared using Web 2.0 features.

Step 4: Assesing the results of teaching Design for All principles in ICT based on Web 2.0 and eLearning 2.0 features:

The assessment tool generally consists both in traditional or electronic (on-line) examination, based on on-line questionaires, and based on the usage of special DFA teaching tools that involve appropriates assessment modules. Such a method is described in [5] by the team of Engineering Design Center/University of Cambridge , reffering to the online inclusive design toolkit posted at the Internet address [9].

1.2.2 Tools for General Purpose Digital Media File Creation Offered as *Wiki University Learning Resources* for Digital Media File Creation and Editing, in Web 2.0 Context

Media types:

(1) text - in order to introduce texts, Wikiuniversity offeres the access to a free word processing application (such as Writer from Open Office)**;** in order to assess the editing skills, Wikiuniversity offeres a link to Word processing challenges
(2) HTML – in the context of Wikiuniversity see links at Topic:HTML.

(3) images

- GNU Image Manipulation Program (GIMP) : an image manipulation package managed by gimp.org ; available for Linux, Windows, Mac OS X; the user is free to use, copy, study, modify or redistribute GIMP as free software [10]
- Inkscape: a useful illustration program; requires X-11 on the Macintosh
- Adobe Photoshop: accessible on-line in the context of School of Graphic Design's Adobe Photoshop Department of Wikiuniversity[11]
- Details about 2D Animation process: pre-production, production and post-production; tools accessible on the link WikiU Film School

(4) audio

- Audacity - Free sound editor for recording and editing
- Wiki Campus Radio - Live internet chat and podcasts
- Podcasting - including video podcasting
- Apple GarageBand - Macintosh software for manipulating digital audio

(5) video

- Landscape rendering - computer-generated landscape scenes
- Rendering models of living organisms - computer-generated characters
- Lesson:3D Storyboard - at Narrative film production, Wikiversity Film School
- Course: Digital Puppet Animation - 3D computer-generated animation

2 Real World' Examples as Evidence of How the New Methods of Communication Offered by Web 2.0 Can Be Used to Support Students as They Learn about DESIGN for All

2.1 Pedagogical Approach (General Guidelines)

Pedagogical elements are an attempt to define structures or units of educational methods. For example, this could be on-line lessons, assignments, multiple choice questions, quizzes, discussion groups or a case study. It may be also web 2.0 supported communication methods, such as video conference podcast, forums.[3]

It is possible to use various pedagogical approaches for eLearning [2] which include:

- **instructional design** - the traditional pedagogy of instruction which is curriculum focused, and is developed by a centralized educating group or a single teacher.
- **social-constructivist** - this pedagogy is particularly well afforded by the use of discussion forums, blogs, wiki and on-line collaborative activities. It is a collaborative

approach that opens educational content creation to a wider group including the students themselves.

Laurillard's Conversational Model is also particularly relevant to eLearning, and Gilly Salmon's Five-Stage Model is a pedagogical approach to the use of discussion boards [3]

Cognitive perspective focuses on the cognitive processes involved in learning as well as how the brain works.

Emotional perspective focuses on the emotional aspects of learning, like motivation, engagement, fun, etc.

Behavioural perspective focuses on the skills and behavioural outcomes of the learning process. Role-playing and application to on-the-job settings.

Contextual perspective focuses on the environmental and social aspects which can stimulate learning. Interaction with other people, collaborative discovery and the importance of peer support as well as pressure.

Taking into account Gilly Salmon's Five Stage Model of eLearning, we can identify the following steps in communicating on the web with the target to get knowledge shared by the teacher in the field of DFA by means of eLearning 2.0 context:

Step 1: Access of the web resources containing DFA knowledge, and motivation

- *Student activities:* Setting up the appropriate computerized context and accessing the targeted content
- *Teacher activities:* Welcome and encouragement; Guidance on where to find technical support for DFA.

Step 2: On-line socialization

- *Student activities:* Sending and receiving messages
- *Teacher activities:* (1)Introduction; (2)Ice-breakers;(3)Ground rules; (4)Nettiquette.

Step 3: Information exchange about Design for All

- *Student activities:* (a)Carrying out DFA activities; (b)Reporting and discussing related findings.
- *Teacher activities:* (1)Facilitate structured activities; (2)Assign roles and responsabilities; (3)Support use of DFA learning materials; (4)Encourage DFA related discussions; (5) Summarize findings and/or outcomes

Step 4: DFA Knowledge construction

- *Student activities:* (a) Conferencing about Design for All; (b)DFA course related discussions; (c) Critical thinking applied to DFA subject material; (d) Making connections between models and work-based learning experience.
- *Teacher activities:* (1)Facilitate structured activities; (2)Assign roles and responsabilities; (3)Support use of DFA learning materials; (4)Encourage DFA related discussions; (5) Summarize findings and/or outcomes

Step 5: Development

- *Student activities:* (a) Use of conferencing in a strategic way; (b) Integration of CMC into other forms of learning; (c) Reflection on learning process; (d) Becoming critical face to the problem.
- *Teacher activities:* (1) DFA support; (2) Respond only when required; (3) Encourage student reflection about the subject; (4) Less active- hands over to the student.

2.2 Communication Technologies Used in e-Learning

Generally speaking, communication technologies are categorized as ***asynchronous*** or ***synchronous***. In Web2.0 context, ***asynchronous*** activities use technologies such as blogs, wikis and discussion boards.

Definition of **asynchronous** *communication*: participants may engage in the exchange of ideas or information without the dependency of other participants involvement at the same time. As an example, electronic mail (Email) is also asynchronous in that mail can be sent or received without having both the participants' involvement at the same time. *Definition of* **synchronous** *communication: synchronous* activities involve the exchange of ideas and information with one or more participants during the same period of time. A face to face discussion is an example of synchronous communications. *Synchronous* activities occur with all participants joining in at once, such as: online chat session, virtual classroom or meeting. *Virtual classrooms and meetings* can often use a mix of communication technologies [3]. In many models, the writing community and the communication channels relate with the E-learning and the M-learning communities. Both the communities provide a general overview of the basic learning models and the activities required for the participants to join the learning sessions across the virtual classroom or even across standard classrooms enabled by technology. Many activities, essential for the learners in these environments, require frequent ***chat sessions*** in the form of ***virtual classrooms*** and/or ***blog meetings***. Lately context-aware ubiquitous technology has been providing an innovative way for written and oral communications by using a mobile device with sensors and RFID readers and tags [3].

2.3 Ways to Use the New Methods of Communication Offered by Web 2.0 in Order to Support Students as They Learn about Design for All

The paradigm of Design for All in ICT is perhaps more challenging than other software design paradigms, due to the complexity of the context which is to be known and analyzed, also due to the necessity to interact with specialists of other domains and with people with various types of impairments if needed.

Learning about Design for All, that means for the students to be able to identify the necessity to involve in the normal design process, such elements and components that are the most appropriate to enable the usage of the designed product by a wide range of people, including people with various types of disabilities. That involves, obviously, an interdisciplinary approach, so the communication facilities with psychologists, specialists in psycho-pedagogy, as well as targeted people representatives, are very important. Sharing experience with other people involved in DFA processes, in educational or even industrial contexts, represents another requirement in this field, that being possible mainly by means of communication facilities assured in the context of the web.

As real word example, students from Technical University of Cluj-Napoca (www.utcluj.ro) being involved in various DFA projects connected with specific disciplines such as **Software Engineering** (3^{rd} year of study), **User Interface Design** (4^{th} year of study) and **Interactive Systems** (1^{st} year of Master studies), must use various communication contexts, realized based on Web 2.0 communication technologies. Here, the most interesting aspect is the fact that a small group of 3 or 4 teachers (one or two computer scientists, a psychologist and a specialist in psycho-pedagogy) lead the students, by means of on-line communication facilities, to reach and to put together the necessary knowledge according to the concrete subject of their

DFA projects. Obviously a mix of communication technologies is used, structured as follows: **student blog** on the subject of the project, in order to enable experience sharing between students with similar DFA projects; **forum** that enable the synchronous discussions between the student/students and the interdisciplinary group of teachers; **online chat session**, as facility to discuss directly and individually with each member of the teacher's group, if needed.

Each student must have a small **discussion group** with representatives of targeted people, this group being contacted and connected also with the help of the interdisciplinary group of teachers.

This manner to work is realized based on a very close collaboration between the involved teachers from Technical University, a group of psychologists and specialists in psycho-pedagogy from the University "Babes-Bolyai" (www.ubbcluj.ro), a group of teachers from a Special School for Hearing Impaired, and a group of teachers from a Special School for Blinds.

In this way, very good projects are realized by the students, the most interesting being implemented and used in the above mentioned schools.

3 Conclusions

Taking into account the considerations presented in the previous sections, it is obvious that the main advantage of using the new methods of communication offered by Web 2.0 in teaching DFA, consist in the possibility to put together groups of teachers with the students and with DFA beneficiary people, in the context of an applicative educational context. On the second hand, the on-line courses focused on the new Design for All paradigm, extends the traditional context of the educational portals in more and more universities, according the continuous extension of the EdEAN network. As a consequence, the need to use a mix of communication technologies like that described in the previous section (see items (1) to (3)), enforce the rapid evolution of the educational portals in the direction of the eLearning 2.0 generation. The direct benefit of this evolution is, in fact, the increase of the efficiency of the whole educational process.

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Measuring Technological and Content Knowledge of Undergraduate Primary Teachers in Mathematics

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Abstract. Twenty-five final-year undergraduate students of primary education who were attending a course on mathematics education participated in a research project during the 2009 spring semester. A repeated measures experimental design was used. Quantitative data on students' computer attitudes, self-efficacy in ICT, attitudes toward educational software, and self-efficacy in maths were collected. Data analysis showed a statistically non-significant improvement on participants' computer attitudes and self-efficacy in ICT and ES, but a significant improvement of self-efficacy in mathematics.

Keywords: undergraduate primary teachers, educational scenarios, TPACK, attitude, self-efficacy, mathematics, ICT, educational software.

1 Introduction

The 2003 reformed Greek National Curriculum in Mathematics has been implemented in the nine-year compulsory education since 2006, as "*Cross Curricular/Thematic Framework, CCTF*". One of its general principles is "*to prepare pupils to explore new information and communication technologies (ICT)*" [1]. The Pedagogical Institute has developed a compulsory national mathematics textbook for each school year, which is accompanied by a National Educational Software (ES) [2, 3]. Meanwhile, it is well known that recently, research in educational technology has suggested the need for "*Technological Pedagogical and Content Knowledge*" (TPACK), which is based on Shulman's [4] idea of "*Pedagogical Content Knowledge*", so as to incorporate technology in pedagogy [5, 6, 7, 8].

Therefore, from a constructivist viewpoint [10, 11], educational software integration into undergraduate students' teaching practice is a crucial factor for teachers' future "establishment" and improvement in classroom practices. During the 2008-2009 spring semester, a course on primary maths teaching during practicum was organised with the aim of incorporating ICT and especially-designed mathematical scenarios [11] in students' teaching approaches.

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Taking into consideration the significant research relation between the development of Technology Content Knowledge (TCK) and self-efficacy and attitudes towards Mathematics, ICT and ES [12] we ran a six-month research project investigating themes: a) students' attitudes towards ICT, b) students' attitudes towards ES, c) students' self-efficacy in ICT, and d) students' self-efficacy in Mathematics on the development of Technology Knowledge (TK), Content Knowledge (CK) and TCK. Moreover, with qualitative methods we gathered data regarding their TPACK development. In this paper we present quantitative results concerning the above four research themes.

2 Theoretical Background

Recently, research in educational technology suggests the need for "*Technological Pedagogical and Content Knowledge*" (TPACK), so as to incorporate technology in pedagogy [6, 7]. This interconnectedness among content, pedagogy and technology has important effects on learning as well as on professional development. Mishra and Koehler [7] suggest "*…a curricular system that would honour the complex, multi-dimensional relationships by treating all three components in an epistemologically and conceptually integrated manner*" (p. 1020), and they propose an approach which is called "*Learning Technology by Design*".

Apart from ICT availability in schools, teachers' positive attitudes towards ICT and ES are also important so as to include them in the every day school curriculum [15]. The development of TPACK and the incorporation of educational software into the future teaching practice are directly correlated to the attitude of the undergraduate primary teachers. Attitudes depend on a variety of issues such as the usefulness of ICT and ES, training and knowledge of ICT, anxiety and confidence in using them [15, 16, 17].

However, as has already been mentioned, undergraduate primary teachers' self-efficacy in using ICT constitutes another factor in the formulation of their attitudes and eventually in incorporation of ICT in the classroom. In order to have a complete student-teacher profile, the ICT and the Mathematics self-efficacy of undergraduate primary teachers [18, 19, 20, 21] formed one more parameter of our research.

Taking the above in consideration, the aim of this study was to explore if there would be changes in undergraduate primary teachers' self-efficacy and attitudes towards Mathematics, ICT and ES during the teaching course and how these changes would relate to the development of Technology and Content Knowledge (TCK). Data collection methods and research results are presented in the following paragraphs.

3 Research Methods

In order to explore the development of TPACK, we have employed design experiments which constitute an effective methodology for studying teacher development in the setting of an education university department [22]. The researchers have taken a triangulation multiple-method approach (qualitative and quantitative) to ensure greater validity and reliability.

The participants were 25 final-year undergraduate primary teachers (16 females and 9 males) in the Department of Primary Education at the University of the Aegean, who were attending the compulsory course "Teaching Mathematics - Practicum Phase" during the 2008-2009 spring semester.

Two researchers had a three-hour meeting with the undergraduate primary teachers in the mathematics lab, twice a week. The need for a technologically elaborate working environment that would encourage undergraduate primary teachers to use technology, led the research team to use many technological tools.

The research work was divided into five stages during the spring semester 2008-2009:

1. During the first stage and before the beginning of the first lesson, quantitative data regarding undergraduate primary teachers': a) Background (studies, family background, etc.), b) Individual learning style according to Felder & Silverman's instrument: Index of Learning Styles [23], c) Attitudes towards ICT, based on Roussos' Greek Computer Attitudes Scale (GCAS) [24], d) Self-efficacy in ICT according to Kassotaki & Roussos' Greek Computer Self-efficacy Scale [25], e) Attitudes towards ES; for this purpose we designed a scale (Educational Software Attitudes Scale, ESAS) which was based on Roussos' Greek Computer Attitudes Scale, as well as f) Self-efficacy in Mathematics according to the content principles of the CCTF were gathered. The same data were gathered from the participants at two more instances (after three months and at the end of the semester), in order to measure possible quantitative differences.
2. The Paul Cobb 's et al. [22] experiment design procedure
3. Undergraduate primary teachers had to complete an assignment.
4. Undergraduate primary teachers' had to create an educational scenario.
5. Semi-structured interviews were conducted very frequently.

In the next section, the results from the study concerning students' attitudes and self-efficacy are presented.

4 Research Data Analysis and Results

This section presents the analysis conducted on undergraduate primary teachers': a) attitudes towards ICT (GCAS), b) self-efficacy towards ICT (GCSES), c) attitudes towards ES (ESAS), and d) self-efficacy towards Mathematics (MSES) to explore the effects of the stage of measurement (beginning, middle and end of semester).

The 30 items of GCAS [24] were summed to provide a total score representing the participant's overall attitude toward computers (scores ranged from 30 to 150). Descriptive statistics of the three GCAS scores are reported in Table 1. As can be seen, the results show an improvement of undergraduate primary teachers' attitudes toward ICT. However, this was not statistically significant [$F(1.4, 32.28)=2.28$, $p=.13$].

Table 1. Means and standard deviations of the four scales for the three measurement stages (beginning, middle and end of semester)

GCAS	Measurement Stages	Mean	SD	N
	1	103.08	20.61	24
	2	106.58	15.80	24
	3	109.25	18.60	24
GCSES		**Mean**	**SD**	**N**
	1	109.17	24.12	24
	2	110.08	19.89	24
	3	113.46	20.74	24
ESAS		**Mean**	**SD**	**N**
	1	106.54	14.25	24
	2	108.75	14.32	24
	3	112.54	18.89	24
GMSES		**Mean**	**SD**	**N**
	1	22.58	5.70	24
	2	23.83	5.00	24
	3	24.21	5.32	24

The GCSES scores represent the participants' self-efficacy toward ICT (scores ranged from 29 to 145). The results (Table 1) again show a statistically non-significant improvement [$F(1.57, 36.26)=1.43$, $p=.25$].

Similar results were obtained from the Educational Software Attitudes Scale, (ESAS).The ESAS scores ranged from 31 to 155. The results (Table 1) showed that undergraduate primary teachers' attitudes towards educational software improved, but the improvement was not statistically significant [$F(1.75, 40.34)=2.37$, $p=.11$].

Finally, in order to explore undergraduate primary teachers' self-efficacy toward Mathematics, we used the seven (7) content principles of the CCTF (Problem solving, Numbers and operations, Measurement and Geometry, Gathering and processing data, Statistics, Ratios and proportions and Equations) [1]. The GMSES provided a total score representing the participant's self-efficacy toward Mathematics (scores ranged from 7 to 35). The results (Table 1) showed that undergraduate primary teachers' self-efficacy towards Mathematics improved significantly during the semester [$F(1.58, 36.44)=3.98$, $p=.036$]. Post hoc comparisons using t-tests with Bonferroni correction demonstrated a statistically significant difference between the first and the second measurement stages (p=.021). Moreover, the second measurement stage and the third one did not significantly differ (p=.81).

5 Discussion and Conclusions

Research results from a study of undergraduate primary teachers' self-efficacy and attitudes towards mathematics, ICT and ES, are presented in this paper.

With regard to their attitudes and self-efficacy towards ICT, it seems that the participants had already acquired the necessary knowledge of ICT usage before entering university or during their university studies and were comfortable with their use. This finding was consistent with the Bahr et al. [26] results, who reported that pre-service teachers had positive attitudes towards technology integration. Moreover, it seems that the participants of the present study had Technology Knowledge (TK). This finding is consistent with the Wentworth et al. [27] results.

Moreover, it seems that the course experiment design and the involvement of undergraduate primary teachers with educational software of mathematics helped them to improve their self-efficacy towards Mathematics and their mathematical content knowledge (CK). It seems, therefore, that undergraduate primary teachers' attitudes and self-efficacy constitute a force that needs strengthening if ICT is to be incorporated in their teaching [7].

Further questions rise concerning classroom use and we believe that further research is necessary on training teachers. Moreover, research is needed on the impact these research findings have on pupils' maths skills acquisition.

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The Workbook Service in a Learning Virtual Communities' Platform

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Abstract. The paper describes the development of a new service within the collaboration platform "Online Communities", entirely designed and implemented by our working group at the University of Trento. The system is able to track the activities performed by each participant of a learning community. The service, called "workbook", represents the first of a series of innovations that we will introduce in the system to improve the collaboration level between its participants. The metaphor of virtual communities, in fact, allows us to develop and expand the services' scenarios. Even the workbook service itself benefits of this community approach.

Keywords: learning virtual communities, e-learning, lifelong learning, collaboration.

1 Introduction

The word "community", in addition to being widely used in social settings, is becoming increasingly important also in the studies of technology-related environments and educational contexts. Real communities as social structures have been widely studied by the major sociologists. Usually, in sociological writings, the concept of "community" is seen in relation to the concept of "society", where the distinctive features of the two social structures (analytically) are the degrees of freedom of the individuals. Indeed, in a community it is possible to observe a higher quantity of ties than in a society. This ought to have an effect on the intensity and extension of ties in the various spheres of existence and, consequently, ought to indicate a minor degree of freedom.

Among the authors of social subjects who have most seriously analysed the relation "community" vs. "society", the different approaches are not really suitable for explaining the phenomenon of virtual communities in their multiform configuration that can be really observed. For various reasons the approaches given to the question by Tönnies [1], Durkheim [2], Schmalenbach [3] and finally by Turner [4] would not succeed in under comprising the entire variety of virtual communities. More generic is in fact the approaches given to the problem by Max Weber [5] and by Parsons

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[6],[7]. The approaches of the two authors do not, however, lead to a single interpretation since the question was approached in different ways.

Nonetheless, it is in the difficulty encountered in the definition of the concept "community" that we find the first aspect linking it to its telematics equivalents [8], [9],[10],[11],[12],[13].

In the academic context, or in general in the education institution, "communities" are organised around the idea of "Course", which is projected into the virtual through the adoption of particular e-learning systems. If the system is adopted by an entire educational institution (not just a university) we can generate not only a variety of learning virtual communities (Courses) but also other types of communities, for example related to a common learning path or to a specific interest. In this way, the services that should be provided by the platform to its users are not merely related with learning goals, but will be more focus on supplying collaboration services. Then, educational activities could be seen as a subset, a specific collaboration shape where two subjects act with the specific objective of learning.

One of the objective of a virtual community (or, in general, of a community) is also to last over the time; for this reason an e-learning system must somehow meet the needs of the participants with services that could be used not only in a closed timeline (the courses). Again, when we talk about "learning" and "collaboration", in a life-long learning perspective, the differences between the two concepts are fuzzy. Teachers and learners become two subjects that collaborate along the different steps of a learning process.

Based on these considerations, our research has been directed towards the developing and managing of an e-learning system based on the metaphor of learning virtual communities, called "Online Communities". The system provides to the users the capability to organise their work in groups of subjects that cooperate for a particular scope: this environment is precisely defined as a "community".

In this work we will describe in details the benefits related to the use of the metaphor of learning virtual communities inside a collaborative Learning Management System, and how this approach stimulates the creation of new services that are more sophisticated than those supplied in a traditional LMS. The work is organised as follows: the second section will describe the technological base of our discussion, On Line Communities, a platform based on the metaphor of learning virtual communities. The sections three and four will describe in details the Workbook service, a tool that provides to the users the possibility to create their own space in which keeping track of what has been done during the lessons, or collaborating with the other participants to achieve a goal (a task, a project, etc.).

2 On Line Communities

In the previous part we have shown the reasons for the development of new collaborative architecture of our system. In this section we will recap the main features of On Line Communities portal [14], the Virtual Community System used in our projects. The collaborative approach [15],[16] is a very strong incentive for us for the development of On Line Communities. In fact, the system was initially (in 1998 until 2002) a traditional Learning Management System. The approach in rebuilding the whole architecture and functionalities was to allow the exchange of users' experiences within a virtual environment, and within well-defined areas known as "communities". This approach is very different, for example, from the traditional ones of other e-learning applications (such as those cited above). Our work started before the boom of web 2.0 [17], that has now invaded and changed the way people think and build services on the net.

The complexity of managing virtual communities is objectively quite different from managing a course. It requires a different approach also in the management of roles/permissions related to people and role/permissions related to the service available. There is an ever increasing need to provide, in the logic of integrating systems, a single moment of aggregation of the various services in order to enable subjects and systems with different interests (if they are not divergent) to access the same object, acting according to their own competences.

The architecture of On Line Communities is based on five fundamental classes: *Person*, *Community*, *Role*, *Permission and Profile*, which is the combination of the roles and permissions for each user.

The objective of the current version of On Line Communities system was to create a collaboration space for people connected to the web, where it could be possible to widen the virtual space for relationships among the actors. The system is built around the metaphor of "virtual community". The main characteristics of a community could be summed up as follows:

- each Community avails itself of a certain number of services;
- the services are general applications that enable the users to communicate in synchronous and asynchronous way, to publish contents, to exchange files, to coordinate events, etc.;
- the potential services of a community are activated by a manager of the community according to the needs, and the users of a community can use them with different rights and duties;
- the communities can be aggregated into larger communities with hierarchic mechanisms and infinite nesting levels;
- the communities can be aggregated in an arbitrary way into larger communities disregarding the possible position of a hierarchical structure;
- all users are recognised.

Therefore, the community is a container ready for didactic processes, but not only: research teams, recreation groups, friends, secretariats, board of directors, colleagues, anything that could be an aggregation of people around a scope using virtual spaces on the web. The core of the application is composed by some abstract entities, i.e., Virtual Communities as aggregation of People to which some communication services are available in order to obtain certain objectives. In detail, a virtual community [10] is a space on the web devoted to a collaboration objective, populated by people who communicate among each other, using a series of communication systems. With this approach, it could be possible to represent all the hierarchical relationships between different types of communities (such as Faculties, Didactic Paths, Master Degrees, Courses, etc.).

On Line Communities had been experienced since 2003, and was finally released early in 2005. As from 2005 it was used by the whole faculty of Economics of our

University in all its components (students, teachers, dean, secretaries, administrative staff, external partners) and others faculties are using the system in many courses. At present the system has more than 1700 active communities, 10000 users and about 1.5 million unique accesses since November 2005.

3 The Workbook Service

Considering the decision to shift Online Communities toward the typical approaches of the web 2.0 world [18], we are developing a group of services characterised by a high degree of collaboration between users.

As previously described, Online Communities is used by various organisational entities: universities, high schools, public bodies. For example the Autonomous Province of Trento (a Public Administration with about 10.000 employees) has decided to adopt the system as the official training platform for its employees; the system follows a Lifelong Learning approach providing a service available from the early experiences at school until the completion of the work cycle and further. In fact the structure of the virtual communities is enough general to be adapted to different organisational context.

The *Workbook* service is something more than just a blog. Like a blog, the information contained into a workbook follow a timeline. Like a blog, some sharing tools (RSS, API, etc.) and the possibility of customise the interface (graphical aspects, arrangement of contents, etc.) must be available also into a *workbook*. The difference is inherent to the purpose, the functionalities and user roles; definitely the difference lies in the organisational context in which the workbook is used.

The first observation concerns the actors that use the application. While in a general context of social networking all the actors are considered at the same level, in a training environment this parity doesn't exist. Online Communities already consists of a set of sophisticated functionalities to manage the users' roles and permissions, and this mechanism is adopted also in the workbook service.

A change in the educational context, such as from a university to a school, creates a problem of "age", which means to re-define the user's rights and duties. All the users of Online Communities, in fact, are of all age and profiled, so it is perfectly legal to provide them a set services to share their knowledge into a personal workbook. In a high school context it is not legally possible, unless we involve the legal representatives (parents) in the service's administration. A second issue concerns the purpose which the users manage a personal workbook; in a university's context the workbook is the perfect instrument used by a teacher to describe the topics covered into a course. It can be equipped with the possibility to download Learning Objects with notes, etc. The essential point is that the teacher's workbook is useful to the work of the students, but they have no obligation to read it but only a *utility*. In a high school the context is more prescriptive; usually the students must study at home what has been discussed in the classroom and normally is required an additional work normally classified as "homework". For these reasons the teacher's workbook can be enriched with the functionality to assign some homework, or tasks, to the respective participants, and this of course can be extended not only to educational settings, but especially in collaborative settings like, for example, the writing process of a shared document where different parts are assigned to different people and due for a deadline.

A third issue concerns how the activities can be shared between the community's participants. E.g. in an academic context a teacher that use a workbook for his/her activities doesn't have some kind of cooperative relations with other teachers. The situation is different in a school context where the educational activities are organised into classes where many teachers coexist (in the class council); the workbook could be shared with the other teachers who have equal rights to insert and modify the activities. The granularity of permission in Online Communities shows all the differences from the general implementation of the "permissions" in the traditional LMSs, where doesn't exist permissions outside "writer", "reader" or "creator", i.e., generic permissions for generic roles.

4 The Workbook of Online Communities

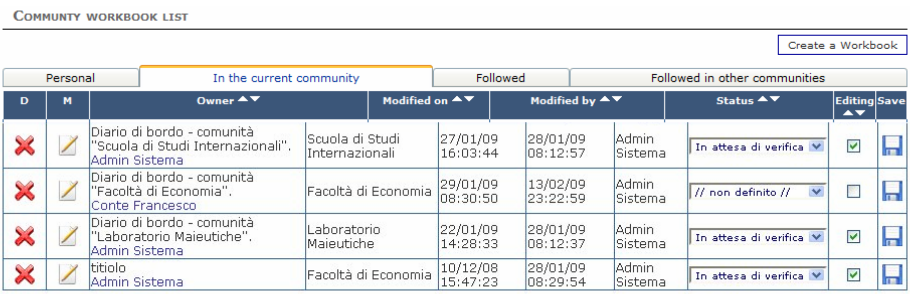
Following the above considerations, in this section we will describe the new functionalities we implemented in our collaboration platform. The workbook service is the typical example of service that is half way from teacher and student. The concept of "workbook" itself can be interpreted in a LMS in different ways. We could in fact refer to:

- Personal workbook: a personal workspace made available by the platform, in order to informally store our observations and notes on the lecture, a task to be completed, an event etc.
- Shared personal workbook: a workspace shared with one or many persons within a parity relationship, even coming from different communities, who can contribute autonomously (ex. Users of a "friends list", member of a community in which we contribute etc.)
- *Personal community workbook:* a personal workspace contextualized in a specific community*:*
  - o *Individual community workbook:* a personal workspace contextualized in a specific community that, differently from previous one, is visible to the administrator of the community, i.e., in a learning community to the teacher(s). In this workbook, the system stores the activities done by a certain community and that will be evaluated by the respective responsible. This is the typical case of homework, an assignment from the teacher to the different members of a class (the students).
  - o *Shared community workbook:* same as above, but other people can participate and evaluate

Among all of these possibilities, the most interesting implication inside a collaboration platform in educational contexts is the community workbook. The main characteristics of a community workbook can be summarized as follows:

- Inside each community, a user can have one individual workbook and one or more shared workbooks.

- The teacher can indicate, participant by participant or group by group, the activities to be executed.
- The teacher can validate the single activity done by the student.
- The teacher is allowed to manually insert some explication notes, thus motivating her judgment or suggesting improvements. On the contrary, students can't modify the appended information, after these have been evaluated by the teacher.
- Shared and individual workbook have the same functionalities: the only difference is related to the number of people that are allowed to write.



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		Diario di bordo - comunità "Laboratorio Maieutiche". Admin Sistema	Laboratorio Maieutiche	22/01/09 14:28:33	28/01/09 08:12:37	Admin Sistema	In attesa di verifica	☑	
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Fig. 1. Community workbook

Due to its nature, we decided to create a common interface for accessing the services, independently of the fact that a user is inside or outside the respective community.

The main problem is the exact management of what the user can and cannot do, and provide a good interface to manage the various options. The personal workbook management differs significantly from the management of community workbook. The owner of the personal workbook is allowed to add, delete or modify the activities and managing the authors completely autonomously. In the community this possibility fights against the permissions that every owner has due to the played role. In the community workbook, we decided that the freedom degrees of an "owner" are limited by:

- Permissions allowed on the workbook service, related to the role played by the user in that community
- The approval status of the single items (that could be "approved" or "not approved" by the responsible of the community, and thus not changeable"
- The approval status of the workbook, similarly to its items
- The possibility to edit or not the workbook: this feature can be deactivated by the community responsible

The following example could help to understand these principles. The owner inserts in her own workbook four items. Of these, only three can be edited, the remaining in fact has been already approved by the community responsible, and consequently cannot be edited again neither in the textual content (title, description, reference date) nor in the associated material.

The associated material, infact, can be approved or not approved by the responsible, in this way being able to evaluate precisely the material in the same way as the other items produced.

5 Conclusions

The paper briefly describes an example on how, in a collaborative logic approach of a virtual community's platform, it is possible to implement highly collaborative service connected to the community. The creation of the Workbook service certainly requires a strong upheaval of the mono-directionality of these kind of tools (teacher ⇨ participants), a significant increase of the quality and quantity of administrative activities, logging and versioning instrument typically non available in the LMSs. After the current version the service, strongly marked as workflow, will be integrated to a real task management service for the educational activities; we will definitely propose how a didactical process could be adapted to a business process with reports, activities, routes and rules.

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Representations of Disability: School and Its Cultural Effects

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Abstract. School plays a significant role in cultural production where representations of difference and disability are very important: educational and pedagogical practices (implicit and explicit) help to form cultural and social representations of the world and, consequently, to confirm some stereotypes too. In this regard the study of social representations linked in with disability assumes some importance: in fact disability becomes a difference excluded from educational and social dynamics as well as from full participation in citizenship. This research will try to draw some dominant social representations about differences and disability, through analysis of young university students stories and memories.

Keywords: Social Representation; Disability; Inclusive education; School.

1 Theoretical Background

Representations feature various areas of the humanities for nearly half a century. Social representations (Moscovici, 1989) embody ideas: they translate ideas in experience and interactions in the present and link the knowledge and skills to real life. Institutions (including schools) act in this regard as machinery that produce consistency and meaning.

Representation enters in different levels of the communicative interaction process and it is present both in coding and in decoding phase (Hall, 1981), connecting the meaning and the language to the culture.

Representation is one of the main practices that produce culture and an essential moment in the “Circuit of culture” (Du Gay, Hall et al., 1997). According to this perspective, culture is the process through which meaning is produced, circulated, consumed, modified, reproduced and renegotiated in society. Things and events have not meaning in themselves but the meaning is socially constructed and in this sense (as we try to do in this text) disability must be considered as a socially constructed (and shared) meaning.

Hall uses concept of representation as transmission medium of a cultural product (the language), but contribution of this concept becomes crucial when we consider the representation as reflective practice of re-processing, re-construction of an event, a social object through a socio-cognitive process. In this sense, then, the concept of

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representation can't be narrowed to a unilateral coercive action (external) or, vice versa, totally subjective (internal). Representation must be understood, of course, as inextricably linked in with the coding-decoding process circuit. Representational system, according to Jamaican sociologist, allows language to construct shared meanings, which allow the dialogue between participants in cultural construction and world interpretation. Forms of discourse come into play for the construction of representations. More specifically, discursive relations characterise the discourse as a practice, i.e. those relations which "determine the bundle of relations that discourse must execute in order to be able to talk about these and those objects, to treat, appoint, analyse, classify, explain them [...] These relationships don't characterise the language used by discourse nor the circumstances in which it takes place, but the discourse itself as practice"[1].

Existence of concepts and their representations are in this productive circuit, where discursive practices form the objects of which we speak and which we represent. In this sense, discourses are not merely systems of signs that signify something but they are practices that construct and build the subject they speak about.

Reflections of this paper are set within this framework: the onset of a representation, of a sense, is possible because there are conditions that allow, facilitate and contribute to build the representative function. Representations are then constructed, learned, produced and consumed and become people and cultural practices that will establish the boundaries of a symbolic framework through which we explain the world.

Several studies highlight social representations of disability. Among the most significant we must consider J.S. Morvan research (1988) that identifies five social representations of disability that affect social relationships with people with disabilities:

- representations that underlie and are underpinned by classifier principles,
- representations that are a source of exclusion and rejection of differences. It is thought that only certain places or activities are suitable for people with disabilities: in this case it is highlighted deficiency and lack; this produces the association still in force today that relates disability to the concept of incapacity;
- representations that reduce the disability into implants (technical or human): the idea of disability refers to the use of compensatory and substitutive instruments;
- representations that reduce disability into effects of suffering: the role of social context in determining suffering stages is neglected. The person with disability is relegated to his condition of suffering and this is limited because it denies her/his identity;
- representations that assimilate the disabled person to the child: they born from the idea of dependence and helplessness.

"The combination of these different social representations - concludes Mercier, recovering the contribution of Morvan - creates an image of disabled person: the disabled is child, classified, prostheses, rejected and suffering"[2].

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[1] M. Foucault, 1999:63.
[2] M. Mercier, 1999:57.

In Italian context, a research conducted in the CFP[3] in Bergamo[4] county (Medeghini, 2007) confirms outcomes proposed by Morvan and highlights some dominant categories about representations of disability. First that appears most commonly used is classificatory and of deficit one: this can be attributed both to the progressive implementation of medical specialist language in school community, that in the event of difficulties and problems replaces pedagogical language, and to the weight given to the type of deficit for planning, goal setting and work organisation in classroom[5]. Dependency is another category in teacher thinking, and it is considered a typical problem of disabled student, who requires the intervention of aid (special aid teacher).

2 The Research

2.1 Methodological Aspects

We adopted a Grounded Theory methodological approach. This allowed an active participation for interviewees stories in the construction of research (and in choice of indicators and interviews context-marks), of texts content during research process and not a-priori. The research was conducted in the 2007-2008 and 2008-2009 academic years in an attempt to restore the complex theme of scholastic integration (in Italy).

Through the memory of first year students at the University of Bergamo, we try to highlight representations of disabled people. In this research we investigate the effects of school integration through school life memories of Italian students we can define "integration children" (i.e. students who lived in the established practice of integration). In fact, they are devoid of historical and cultural tools and assumptions that led to school integration, and they studied and lived in an "integration way" organised school and they trained in this regard.

Methodological choice and attempt to build a research through students' eyes (who are the product of educational discourse, and of cultural and educational policy based on integrative approaches) is significant: their experiences, their practices, their lives in discourse of this school allow highlighting the production sequence of dominant representations.

2.2 Outcomes

Further emphases occur beside confirmation of representations highlighted by Morvan and of categories that Medeghini emphasises.

First, our research has shown that identification of what is "different" does not occur in a dialogical situation – in which exchange between individuals arises and brings out differences – but it is a situation (and a disposition) of difference in the subject characterised by lack (compared to the norm), need of help, dependence.

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[3] Centri di Formazione Professionale (Professional Training Centers).
[4] County in Lombardy, in northern Italy.
[5] R. Medeghini, 2007:68.

This separate and external to relationship idea is probably students' dominant representation: a dichotomy that defines difference between us and him/her, who is outside the system of practices and possible projects.

The institutional demand for "respecting" the planned and expected standards of learning that teachers pursue in their organisation harbours in behind this fear and rejection that provide a relational unbridgeable gap between disabled and non-disabled people. In fact, the presence of a person with disabilities is perceived as slowdown and disturbance of normal classroom development, and it produces in representations of boys and girls interviewed a "not like us" that requires further "things", "his things", "his duties" to achieve the unattainable normality.

A conception of learning linked to the individual development idea is dominant. It intertwines and shares its epistemological roots with the theoretical model that sees disability as personal tragedy, placing within the individual instead of considering the socio-spatial context of disability.

Some lexical and semantic coordinates mark difference, overall:

- the concept of dependency: rather than dependency in context, it tends to emphasise the dependence on an outside "agent", itself an autonomous and capable of independence. The apparent dependence that characterises global society has a different connotation when it refers to disabled person. In the latter case it refers to a dependency due to social policies relating to disability.
- the discomfort: often presence of disabilities in classroom inspires a feeling of discomfort (that is sometimes reciprocal). Discomfort of disabled person would depend on knowledge of fewer opportunities which characterised his/her trajectory as well as the increased effort needed to achieve (school and social) results provided for him/her. Discomfort of non-disabled person, however, is primarily due to fear of new, anxiety of not knowing what to do and to say in the face of disabled person and not knowing what to expect from him/her. Second, threat arises, that a person affected by an unfair destiny exercises on security and "right world" concepts that everyone has; the tendency to see and consider disability as something tragic adds to this threat and discomfort.

  Sense of discomfort stems from inappropriate categorisations which we rely in social situations in which it is involved someone who has (or is believed to have) a stigma. And "the embarrassment of self and self-consciousness expressed in the pathology of the interaction, as "not-feel-at-home"[6].
- the idea of disease: person with disability is often defined by his/her condition that makes him/her different from others. This involves magical healing ideas, possibility to recover a normal health. A psychological distress agrees with a medical malaise: "the disabled person lives badly his illness"[7].
- the idea of fatigue: difference characterising a person generates more physical and psychological exertion in learning, because she is "unable" to support "customary" and "normal" times and ways. In this sense, the dominant perspective is a compensatory one: person with disabilities, for example, should attempt to compensate for his/her lack through extra work (i.e. out of class to repeat a few things made by his comrades, to brush up, to fill gaps), almost he/she had to expiate a guilt, a kind of

[6] E. Goffman, 2003:29.
[7] As an interviewee revealed us.

retaliation related to “ease” with which it will be “carried out” (in school life). The effort, in this sense, is equivalent to the gap that separates disabled student from “normal” student and, therefore, it is required in an attempt to re-take disabled to be normal.

In scholastic organisation discourse produces knowledge and representations, which provide a sort of “homogeneous difference” (a single category that includes various differences). This, in turn, becomes the causal factor of exclusion from social and cultural (and educational) context. School (such as social micro system highly significant in the trajectory of each one) generates (in students and teachers) an idea of hierarchical differences based on different possibilities, skills and abilities (crystallised and organised on the principle of “productive autonomy” that would allow full adaptation to the world given), enabling “disabled people not to recognise their differences as equals and indexing it as inferior”[8].

Exclusion of “the other” from relationship determines his/her subordination and the distance from the norm becomes an identifying element of a category. A clear problem is that disabled people are confined in the statement of object, of diversity as category that is able to objectify them. This prevents a project of subjectivity, of personal identity that goes beyond the disability.

Disability continues to be housed in a reference category that shows as “lamentable suffering of an isolated subject that requires medical treatment, if possible, or a health cover suited to his/her particular weaknesses. Treatment and care are the answers that are being promoted, ignoring the fact that disability is configured as the existence of subjects, far from being isolated, we see them limited from the structures of their own life context”[9].

The exclusion device takes place, so, in the regulation of relations, in the measurement and justification of (cognitive, emotional and physical) distance well within the system classroom. Once identified the gap from norm, disabled student suffers, then, an attempt at standardisation, starting from his/her ability to adapt him/herself to organisation and to study the lessons. The attempt at re-educating body and mind is to reduce the gap between disabled and non-disabled people. In this sense, disability is the lack of ability to obey rules, behaviour and normal capacity. The whole classroom is governed by a cultural system that links and entangles students in a often crystallised and poorly participatory network, which requires subjects to the most extensive and rigorous assimilation.

Representation of disabled people comes from the comparison with the “able prototype”, so as to disabled people are allowed to find and build their identity “in discrepancy” with the normal, so the able person defines disabled comparing his/her distance to the ableist standard and hierarchically situated on a scale of skill levels.

Ableist paradigm also dominates the pedagogical level of relationship in school: this is tantamount to teaching way, organisations, (also physical) arrangements which emphasise the inevitability of an ableist discourse. Disability is therefore a “problem” of the individual recognised as “not able to do what we do”[10].

[8] M.A.V. Ferreira, 2007:12.
[9] M.A.V.Ferreira, 2007:12.
[10] As an interviewee revealed us.

School is an ableist institution, which does not consider the whole range of mental and physical capacity of all pupils. Ableist ideology generates a hierarchy of spaces (which establishes the school as an "environment of social adaptation"), through the exclusion of disabled students from the spaces shared by classmates in order to receive therapeutical assistance. "The construction of 'disabled spaces' on the spatiality of the school - Holt (2004) argues - also served to reproduce disabling difference"

Segregation of some disabled students in groups or special places also assumes homogeneity among students that does not actually exist. This practice is based largely on the belief that the difference shown in respect of peers will be a difference that also characterise their adult lives. It builds some difficulty, by their classmates to represent the disabled partner in this and to recognise possibility of a life project (which exceeds the needs arising from its deficit).

Memories of interviewees show a solidification of the stereotype of difference as a "negative quality", in which the lack of ability (and never the recognition of different abilities or cultures, always within a hierarchical structure of individuals and "symbolic territories" which they bear) or the increased difficulty (to be normal) play a significant part in balancing the possibilities of participation or exclusion. The difference is in fact designed as a distance from a norm and distance to be healed (as if it were a wound, a laceration in a ideal and mythical unit) through practices (educational organisation plays a crucial role in the specific). These practices, however, reinforce starting positions and offer explanation and root to some stereotypes that result in different social recognition, or rather, a different disposition in the social context.

In school this dynamics become discursive practices through which disabled and non-disabled people "suffer" a positioning of their citizenship, and generate awareness, normality and norm which ratify the "boundary penalty" of a difference that is problem or resource, disability or ability, disease or normal. Apparatus (the teaching), spaces of relationship (left) possible and productive-educational practices appear as symbolic tools developed under the rules of the "language". It is in this discursive form that the circulation of the 'product' and the construction of subject positions from which you can make sense take place.

3 Conclusions

The research highlights the way school integration and organisation serve as a supporting device of stereotypes and "juxtaposition" of differences. This damages a possible relational "inclusive" context that bases its practice in the "re-organising", re-equilibrating competence of systems involved.

To adopt inclusive perspective implies changing, deconstructing and evolving with practices, mentalities, attitudes, images, ideas about disability and the implicit exclusion that often distinguishes. For inclusion it is necessary questioning and transforming dominant representations.

If we consider the "circuit of culture" is then possible to identify the role of school and the possibility of moving within the productive circuit of disability an area of resistance. Decoding of the message passes, as mentioned, from the "consumption" of meanings.

In this space education should be situated to deconstruct stereotypes and implicit benefit of a new construction of meaning and significance.

It merges, therefore, as the nodal point, the possibility to lie *in* the difference (and not to locate it, and to distance it). Difference is to be understood as relational interface that allows the construction of new cultural forms, new practices that are situated in relationships of maps (Bateson, 1972) and not so much on subject / meaning / territories.

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Adaptative Peer to Peer Data Sharing for Technology Enhanced Learning

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Abstract. Starting from the hypothesis that P2P Data Sharing in a direct teaching scenario (e.g.: a classroom lesson) may lead to relevant benefits, this paper explores the features of EduSHARE a Collaborative Learning System useful for Enhanced Learning Process.

The goal is to reach an improved interactivity between several actors playing in a common lesson scenario; we also expect an increased student concentration due to a more interesting and interacting lesson.

Keywords: P2P, Peer to Peer, Technological Enhanced Learning, Data Sharing, MobiSHARE.

1 Introduction

The last decade of research in Technological Enhanced Learning field demonstrated effectiveness of interoperability between classic teaching techniques and technological instruments for an improved and simplified learning process.

Due to having many benefits, P2P is attracting the attentions to investigate effectiveness of applying data sharing as a learning help.

Even if learning activity is supported via a fixed infrastructure like a web learning platform, we assume a mobile learning scenario in which students and teacher are connected in a dynamic way through a wireless network. In absence of any fixed infrastructure it could be useful to explore the way to use of mobile P2P file sharing to support learning activity.

Convinced of the goodness of this approach, we decided to take advantage of an existing mobile P2P file sharing tool (MobiSHARE) that could be extended with an adaptive sharing mechanism for classroom handouts and dynamic feedback issues by means of built-in advertising system.

The new system is called EduSHARE and its use as P2P adaptive mobile learning tool will be described in the next section.

2 EduSHARE System Description

Data sharing is often supported with replication algorithms, especially since the introduction of MANETs [1] and mobile computing. In this scenario, all communication

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run over wireless connections, but on the other hand there's no need for infrastructure set up and single point of failure problem is avoided.

Due to its general usefulness, file sharing is usually supported in mobile application tools. Implementing file sharing on mobile environment leads to two main issues:

- Connection stability: wireless connection are known not to be stable and this can impact on file transmission success;
- Fast context variation: due to limited resources available for mobile devices, mobile nodes change their state in short time intervals.

These issues impose some implementations to be integrated in file sharing mobile applications:

- Disconnection Management: mortality of a device has to be predicted (i.e. with energy level measurements), so that even mortality of files can be ranked in order to act automatic replications;
- Context Awareness: all algorithms have to be supported by awareness of actual device status; so that status has to be formalized and monitored.

Convinced of the goodness of this approach, we decided to investigate effectiveness of applying a P2P data sharing application as a learning help.

To take advantage of P2P mobile systems to enhance learning systems we assume a mobile learning scenario in which students and teacher are connected in a dynamic way through a wireless network. In general learning activity is supported via a fixed infrastructure like a web learning platform. However in absence of any fixed infrastructure it could be useful to explore the way to use mobile P2P file sharing to support learning activity. For instance the following issues can be implemented:

Adaptive file sharing

- Handouts could be shared by the teacher by simply putting them to a shared folder in the lecture
- By means of P2P advertising system files are propagated to other students in a dynamic way

Context Feedback from students

- Teacher can submit tests to students using advertisements as submitting tool
- Collected student's scores compare the actual context for the classroom by the location point of view.

To obtain a P2P adaptive mobile file sharing tool tailored to enhanced learning we give a more detailed description of the EduSHARE system behavior in terms of use cases and software organization. To this purpose we first give a brief recall of MobiSHARE system description and then we show how it will be upgraded to EduSHARE.

2.1 MobiSHARE

MobiSHARE has been developed both in Java and C#, and it's supposed to run for a small number of peers connected via a MANET and placed in a low extended area.

Peers are identified by a member id and members are organized in groups.

Features derived from application user requirements are: other peers (and groups) discovery, specific peer search, file sharing, remote file downloading, local file sending, message sending.

These features are represented in four user oriented use cases MobiSHARE project provides: share file, send file, send message, browse shared files (leading optionally to download use case).

2.2 EduSHARE Description

In order to enhance advantages of P2P Data Sharing in a learning scenario we developed a new application called EduSHARE implementing other new features of MobiSHARE.

EduSHARE implements the following issues: allowing teacher to interact in an easy and continuous way with students, to simplify exchange of contents between the participants to the lesson, moreover to submit tests to students in order to evaluate lesson comprehension and keeping a high attention level.

Another characteristic of EduSHARE is the possibility, both for students and teacher, to visualize tests results in order to enhance competitiveness. In fact is proved [4] that competition in a classroom can improve learning results.

2.2.1 EduSHARE Features

The most important features of EduSHARE implemented in MobiSHARE are related with activating send of questions and questionnaires. The format for this contents is significantly different from the ones' already implemented in MobiSHARE, cause it will be really form like (in the case of questionnaires) or multiple answer tests like (in the case of questions). Moreover, both of them expect an answer from the student, that has to be managed correctly.

Single question send

Introducing this feature will allows teacher to send individual questions to all students online and present in class, at any time without stopping the lesson. The questions will be chosen within a predetermined set. The question will appears to the students as a popup, the student response will be managed by the system that will store the value of it and the response time so that the system could create a ranking table of the best students. The response time is a key question of interest, so it's necessary to create a synchronization method by which the question appears on the devices for all students at the same time. The synchronization mechanism is implemented using the already known features of MobiSHARE, as in particular the cyclic advertisements.

Sending of questionnaires

The sending of questionnaires is very similar to sending single question. Even at this time, the questionnaire will be chosen on a predetermined set and there will evaluate the correctness of the response and the time necessary to complete the questionnaire and it is finally necessary to ensure that all students will receive the questionnaire at the same moment. Unlike the single question, however, the questionnaire will be presented as a form with several questions to be completed, then reasonably be done during a break in the pre-lesson.

Contest among students
Another interesting feature to implement is the contest between students. By processing the results from individual questions and through questionnaires compile, we will compile a ranking of the top students and, at each new question or questionnaire, the ranking is updated. Obviously, this classification must be visible to both teacher and students. Through this feature, students are stimulated in competitive spirit and they're encouraged to do every time better.

2.2.2 EduSHARE Architecture

The figure 1 shows the EduSHARE component diagram. As you can see most of components are also included in MobiSHARE architecture. In fact, the structure of EduSHARE remains the same as that of MobiSHARE with the addition of some components implemented ad-hoc, such as the Learning Engine.

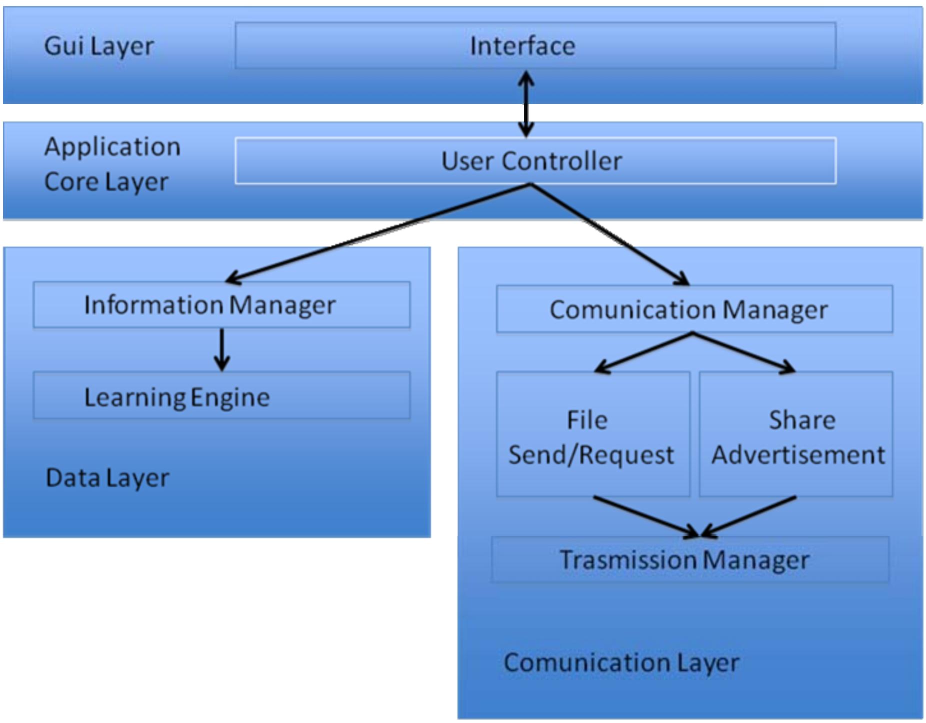

Fig. 1. EduSHARE Component Diagram

The architecture of EduSHARE is divided in three layers: *Guy Layer, Application Core Layer and Communication and Data Layer*

GUI (Graphical User Interface) Layer: includes all classes responsible for user interaction and information visualization;

Application Core Layer: includes all classes implementing algorithms, controlled by upper level requests;

Communication Layer: includes all classes responsible for network communication and low level data management.

Data Layer: includes all files to share and peer context-type information.

The figure 1 shows the overall high-level architecture of EduSHARE by means of the corresponding Component Diagram.

2.2.3 EduSHARE Use Case Diagram

The figure 2 shows in a more detailed view the user operations carried out by each user when interfacing with EduSHARE component. There are two external interfaces with MANET sub-system component at communication level and with Multimedia Editor Component at file interface level.

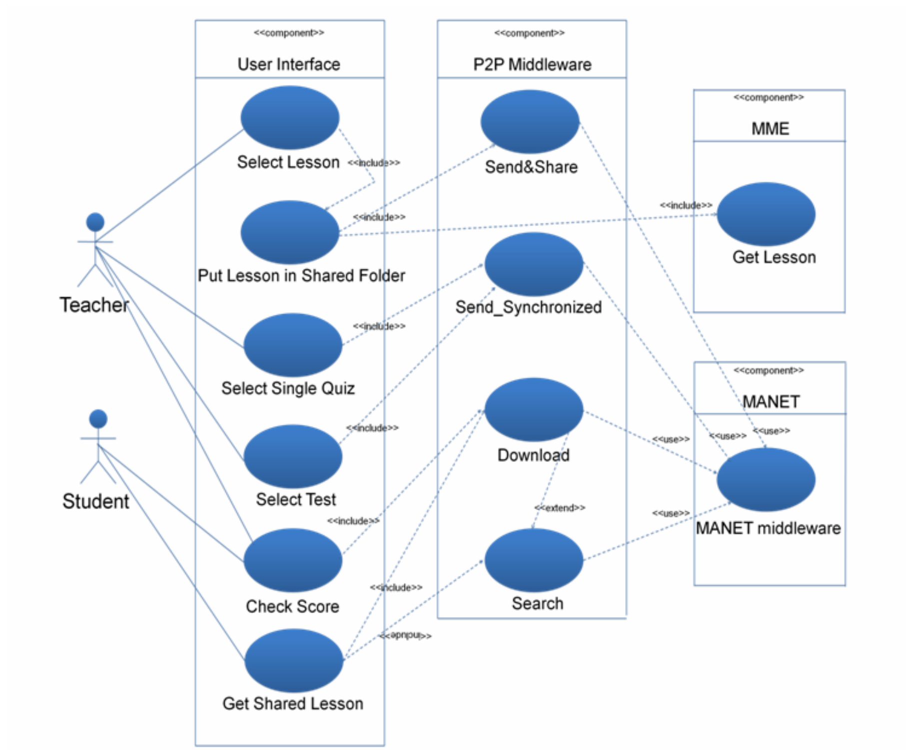

Fig. 2. EduSHARE use cases diagram

We have distinguished two main components: the P2P middleware component and the main user interface component. File sharing operations are activated by the teacher, he/she select the lesson to share with the students and the system put the selected lesson into the shared folder. The student, on the other hand, download the lesson through browsing operation carried out on the file shared folder. The P2P network allows students to download the lesson from other students and not only from teacher, to distribute the traffic on the network. Moreover the teacher has the ability to send to all students quizzes or tests (User Interface level).

The P2P file sharing operations (SEND&SHARE, DOWNLOAD, SEND _SYNCRONIZED and SEARCH) are performed in the corresponding P2P middleware level. Note that in this way it is possible to easily redesign a different component for other P2P middleware.

3 Conclusion

Recent researches in Technological Enhanced Learning field demonstrated effectiveness of interoperability between classic teaching techniques and technological instruments for an improved and simplified learning process. In fact [4] and [7] show how a lesson supported by technology leading to an increase in attention of the student and then an improvement in learning.

It is known that P2P file sharing systems have become the most popular class of Internet applications in this decade. Therefore the use of EduSHARE in the academic field during a classroom lesson may bring great benefits.

The next step is devoted to verify the impact of EduSHARE as a competitive e-learning tool. To this purpose it is necessary to observe the learning degree of students after a lesson supported by EduSHARE and compare it with the learning degree that would occur without this tool.

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E-Learning as an Opportunity for the Public Administration

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Abstract. In this paper we will describe the results of a learning project in the Public Administration, highlighting the methodological approach based on a blended training model in a context that has never experienced this type of activities. The observations contained in the paper will be focused on the evaluation results of this experience and the redesign elements in term of alternation between the classroom and distance training, methodologies, the value and use of the e-learning platform and learning evaluation. The elements that emerge will also provide the basis for the design of future teaching actions for this context (in which at this moment we are involved). The objective is to identify a "learning model", related also to the use of technological tools that are able to support lifelong learning and to define dynamics and process relating to facilitating learning activities of teachers and tutors.

1 Introduction

In this paper we will report our experience in managing a distance learning initiative that, from 2007 until 2009, has been conducted together with the Department of Innovation of the Autonomous Province of Trento (PAT). We believe that this experience represents an interesting opportunity to understand the exact applicability of distance learning to the public sector, due to the number of subjects involved, the temporal extension of the project, the extension of topics faced during distance learning sessions and the involvement of the organization in all the activities of distance learning. The first project, started in 2007, has been called "Esperto - E-learning for the development of e-procurement in Trentino".The methodological approach tested during the project has been a blended approach. The second project, that substantially is a prosecution of the previous one in terms of structuring and philosophy, is called "Elle3 - Life Long Learning". It aims at the development of an integrated environment to design, manage and enlarge the learning resources available for the PAT. For this reason, some training courses have been chosen from the courses catalogue of the PAT: a) an introductory course on Microsoft Excel™, largely used in the public administration offices; b) a course on safety issues in building sites;c) a specific course on using the ERP software for purchasing; d) a course on certified Electronic mail.

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We involved in these activities approximately 1.500 people, with different amount of course engagement: some courses were short (4 hours), others were much longer (10 days).

2 Objectives of the Distance Learning Initiative

In public administrations, e-learning has been successfully tested all around the world: conferences and journals report many different experiences of successful e-learning usage in public bodies [1] [2] [3]. However, at least from our perspective, some dark points need to be clarified. First of all, there must be an extensive usage of these technologies, not just isolated experimentations devoted to simply solve logistic problems when huge numbers of people must be trained. Second, the distance learning activities must have a continuity in the organization, not be just a spot about new technologies used by some experimenter. In this sense, the idea of life-long learning could be an interesting perspective especially in a workplace that normally does not see a relevant turnover. As a third element, technologies and methodologies used are not neutral: there must be a closer look to what is really needed, depending on the target, on the content, on the context, on the technology available, on money available for training purposes. Our two projects have clearly demonstrated the relevance of these elements and their correct mix. In both cases, the objectives of the educational approach have been the following [4] [5]: a) extensive usage of e-learning technologies b) attention paid not only to course details or learning achievements, but also on the methodological experimentation, with the objective of a life-long learning; c) design of evaluation processes in which the responsibility of obtained results is equally distributed among teachers and learners.

The project focus is the experimentation of a formative model that pays attention to different life-long learning aspects. The first aspect is related to the proactive involvement of participants through all the steps of the learning process. A second aspect that has been tested during the projects is the extensive usage of collaborative approach through group activities in classroom and in distance-learning. Group activities used during exercises and simulations allowed participants to discuss the development of new professional practices, but also to find new collaboration spaces even outside the classroom, by exchanging and matching respective professional and organizational experiences. A third element is the usage of distance learning techniques and tools with a blended approach, that has been set to 70% of time in the classroom, and 30% in remote classrooms connected through video-conference to the central room where the teacher was presenting live the lecture. The reason for this choice has been carefully evaluated, and is not easily extensible to different contexts and situations. The last aspect is the usage of an evaluation model through all the learning project: before the course, at the beginning of the course , during the lectures, at the closing of the course and as follow-up after few months from the closing.

In the first course, distance learning has been realized through video-conferencing tools, by creating remote meeting points deployed in crucial geographical points of our Province and equipped with professional VC stations. This allowed to divide the classroom in sub-groups, avoid movements on the territory, strengthen the process of creation of a learning community, (paradoxically) increase the direct discussion with colleagues and teacher and finally understand the quality of service needed by real-world users in order to remove cultural and psychological barriers to these new technologies. Besides, the choice of investing on a multi-conference lecture with sub-groups scattered in different places at the same time has fulfilled the request from many participants to be detached from the working place, in order to be concentrated on the lecture. In fact, an initial scenario was the possibility to deliver the videoconferencing directly on the desktop of the participants, as we were able to do this thanks to a good level of computer and network equipment in PAT's offices.

In both projects we used a collaborative platform called "online communities" that represents an extension of the e-learning platform developed by our research team and used by the University of Trento. *OnLine Communities* is a dynamic web application, created by our team, based on the metaphor of virtual learning communities that guarantees cooperation mediated by ICTs to user groups, named Communities. [6]. A virtual community (VC) is defined as a communication space that is shared by a certain number of people, for whatever reason not only related to educational aspects. Each community has at least one coordinator, and the participants are not anonymous. "*OnLine Communities*" offers different kinds of communication services: whiteboards, forum, chat, calendar, lesson schedule, mail, LO download/upload, sticky notes, agenda, syllabus, work areas, etc. These services are part of traditional Learning Management Systems (LMS), but in our case they have been renewed and re-designed according to a collaborative approach, with more added value on collaboration among members of a community. We also provided an asynchronous version of the lecture, through the creation of SCORM [7] packages with the video-recorded lectures, the possibility of browsing them sequentially or reaching a precise point of the lecture thanks to an audio/video index. All learning materials and learning objects used during the project have been published using the SCORM standard, in order to enable interoperability, accessibility and reusability of the material.

3 Emerging Results

As premised, during the project "Esperto", the main distance technology used has been the Videoconference (VC) distributed in different groups, employed both during face-to-face lectures and during more interactive lectures like laboratories, simulations, group activities, case studies. Furthermore, VC has been extensively used thanks to the particular favourable infrastructural conditions of Trentino. In all VC sessions we found a very good level of interaction, particularly high during sub-groups activities, where participants divided by meeting points had the possibility to work initially in autonomous way, and to share their experiences with the other participants remotely, under the supervision and coordination of tutors and the teacher. This method has been recognized by participants as efficient and profitable, especially from those located in the meeting points. On the contrary, not all the participants have recognized the VC as an appropriate moment for the discussion with other participants, due to the overhead in terms of interaction management that inevitably the VC has respect to in-presence classrooms. Nevertheless, all the participants have perceived the potential of VC and remote interaction, especially in interactive session and with adequate tricks. One of the main elements emerged from the field and feedback analysis of the teachers perception of the distance learning experience, is to consider the poor familiarity of teachers with an interactive lecture where the VC is part of the lecture. This problem has been faced "along the way", by stimulating the teacher to re-think some steps of the lecture and of her teaching style and behaviour, by giving a higher importance to the time spent to create some communication self-rules with participants, and concentrating the attention on the creation of educational material that should be transmitted and used in real time by remote people. Among the many services available in the collaboration platform, those mainly used by the participants were: a) the notice board of the community b) File download c) lesson diary d) Video-cast. The typical services, like forums have been underused, and the reasons for this behaviour can be synthesized as follows:

- From participants' perspective, the usage of the VC has been of great help in entering in the distance learning perspective, in following the course and in stimulating participation. However, due to the quality, the interactivity and the comfort in using VC, the research of other communication and collaboration tools has been discouraged.
- The infrequent usage by teachers of the various services offered by the platform in order to support the follow-up activities. Many teachers, especially from the Academy, are used to this type of interaction and tools, and don't consider them a crucial part of the success of a training activities. Another element to be considered is the fact that no reward has been expected for these extra activities.

This latest aspect has revealed to be crucial in the success of a distance learning project: teachers should be required to act as a sort of "after sales" service, using collaboration and web 2.0 tools, and for these activities they should be paid clearly and precisely. So we have two problems: on one side how to quantify the needs for this type of service from the teacher, on the other side how to pay this type of hours. We are developing a new costing model that tries to face this issue [8] that must respond to an urgent request both from teachers and organizations. In our opinion, this is a critical factor for the diffusion of e-learning approaches, otherwise teachers will be not stimulated to work on e-learning, and organizations will not be ready to give the right value to teachers' activities. It is evident that a good revenue for well-designed, multi-faceted learning activities is the necessary step for a large scale implementation of distance learning.

Going back to project's results and comments, the collaboration platform has been recognized as useful, easy and valuable in distance learning settings. This factor is relevant considering that many participants had never followed a distance course, and that once understood the potentiality of the methods, some of them have autonomously activated with tutors and teachers in order to receive adequate material and support for self-training on some relevant topics. Based on this request, the "link" service has been used to collect a set of URLs to be provided to participants, also for future editions of the courses.

During the ex-post auditing and monitoring phase, we investigated the possibility of using the platform as a working tool after the end of the course. Although almost everyone declared to not have used the platform after the end of the course, many participants recognized the potential benefits of a lifelong learning activity, and the potential of some services (in particular, the video-cast service) as a tool for transmitting knowledge to colleagues and responsible that did not follow the course, or to have a knowledge base available in every moment. We noticed a general curiosity in a more collaborative usage of the platform, as a place where to share experiences, best practices, formal and informal opinions and judgments. Nevertheless, we are convinced that, without a constant support from the institution, it will be difficult to see spontaneous and autonomous usage of the platform. This phenomenon is well-know in bibliography especially for forums, and has been very clear also from our empirical evidences. For this reason, in the next chapter we will present those elements that we are considering as pillars for designing other blended courses for the Public Administration, considering what emerged from "Esperto" project, and most of all considering suggestions and behaviours of participants in the activities following the end of the classroom period (that is, 4 months after the end of the course).

4 From "Esperto" to "Elle3": What Type of Evolution?

The results emerging from "Esperto" clearly demonstrate the necessity to reinforce face-to-face moments and distance learning activities in all the three aspects: content, methodology and evaluation. Since the beginning of the training activities we used all the potential of devices, technologies and platforms, creating a visible and structured "accompaniment" to their usage, all this made by tutors and (some) teachers. In this way, we wanted to stimulate the creation of a network that could survive also after the conclusion of the training path. In the following we propose a model that includes the steps of creation of a learning community, trying to summarize the few researches we found on this specific topic, and adapting to our specific needs [9] .

The initial phase of the course is crucial in order to set the pillars for the community's birth, to create the conditions for the transformation of a "pending" community to a "working" community. For this reason, it is necessary to sustain the creation of the identity of the group and to create the basis for the creation of interconnections among the members. This step is performed through moments of mutual knowledge both in the classroom and at distance, thus stimulating the users to find "connections" and common interests with the other participants. In "Esperto" project this phase has been followed through a moment where all the participants presented each other: a) the respective role; b) training experience on the specific topic of the course (e-procurement) and on distance learning c) on expectations about the course; d) on professional practices.

The collaboration platform has been presented during a specific moment, without any specific relationship with contents or group activities. In the "Elle3" project, on the contrary, a deeper attention has been devoted, in terms of activities performed and expectation regarding the future usage of knowledge acquired during the course. Moreover, this activity has been supported by the creation of a personal professional profile to be added to the platform since the beginning of the course, and to be updated constantly. In this phase we concentrated our attention on the following aspects: a) a closer mutual acquaintance, activated since the first lecture and followed in the next sessions through the discussion of the individual's practices respect to lectures' topics, thus allowing a close examination of the professional profile of the participant b) the continuous stimulus of the tutor in the design and update of the participant's profile, and the support of the teacher to analyze and report best practices starting from discussions and meetings (face-to-face and online) with the participants; c) the pervasive usage of web 2.0 and asynchronous communication with participants from the early steps of the various modules.

The mutual knowledge and the identification of the other are key factors for the creation of the community. The participants move from the "who are you" to the "who are we", and these dynamics is constantly consolidated from mixing classroom, remote, face-to-face, personal and group activities, with a following share of the information, questions and doubts that arised during the various tasks. The objective is to give a sense to a community membership. The usage of collaborative services has not been promoted, while we privileged the usage of forum, chat, wiki etc. These services have been introduced gradually, after a careful design of the collaboration activities in order to facilitate the building of the community. In this phase, the crucial points have been mainly two: a) implementation of collaboration using distance learning services from the very beginning of the course, and for all the learning modules b) a repository created by the participants, at the beginning with the help of the tutor, afterward with some degree of autonomy.

The management of knowledge within the community should lead to a mutual learning process among participants (consolidation phase). We move from the "who are we" to the "what can we build together". These learning processes have been only partially developed in the "Esperto" project. The experience has been positively evaluated by the participants, useful to expand their knowledge in discussing with the teachers, enabling the discussion of some practices used by learners in their workplace. All these positive elements could be improved in terms of close examination of details, often left to further discussion outside the classroom without any support by teachers or tutors. Consequently, in the "Elle3" project we have intensified the common examination and discussion moments, stimulating the analysis of case-studies, or self-case studies progressively proposed by participants. These moments have been anticipated and therefore not left to a final moment or follow-up. We believe that these activities produced a clear awareness of being part of a community of practice, rather than being "merely" part of a learning community simply related to the course. In this phase, the important elements were: a) The assumption of responsibility by participants in producing knowledge and generating feedback for the other members of the community; b) The implementation of a repository becomes a recognized asset of the community, from which drawing and generating knowledge. In conclusion, we believe that stimulating the discussion inside virtual communities needs a precise planning from the very beginning of the training process: a) Follow-up activities, both in classroom or in VC after the conclusion of the modules b) the presence of a tutor expert on contents, whose role is to boost and follow the discussion, at least for some months after the end of the course, and to support the collaboration among participants.

5 Conclusions

In the evaluation of the results of the two projects presented in this paper, we tried to understand the competencies and knowledge needed by teachers and tutors to efficiently and effectively manage a blended course in a life-long learning perspective. For this reason, in the “Elle3” project described in this paper we activated relevant tasks devoted to follow the classroom and the teachers in a specific micro-design of the whole training activities. [10] [11] [12] This complex task had the following implications. First, the teacher participated not only to face-to-face activities, but also to the design of the whole course. The transfer of the expertise in something usable in e-learning requires a relevant attention to the design. The delivery phase allows to monitor the effectiveness of the project assumptions, and to have multiple “tools” to self-evaluate the efficacy of the learning activities. Second, the idea of being extremely flexible not only in the delivery of contents, but also in the choice of the right tools, in the availability to respond when consulted, in the capability of being reactive and proactive, in the ability of being focused not only on reaching the objectives of the various modules but also in enhancing the collaboration within and among participants, in the ability of helping participants to find the possible connection between notions and implementation on the workplace. From this perspective, the choice of the different tools, the familiarity with their usage before the course, are relevant issues, but similarly, the design of didactics based on exercise that could be done singularly or in group. Third, a training process that should take care of personalization and push the self-training [13]. Last element, the attention to the management of collaboration activities and to the role of facilitator in the exchange process The tutor integrates her competences and role with the teaching activities, by facilitating as much as possible the methods and process chosen for the training activities, providing methodological support during design and implementation steps, technological support during lectures and distance learning activities, and some training to teachers and participants that have no confidence with a collaboration platform.

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Embedding Educational Design Pattern Frameworks into Learning Management Systems

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Abstract. Educational design patterns describe reusable solutions to the design of learning tasks and environments. While there are many projects producing patterns, there are few approaches dealing with supporting the instructor/user in instantiating and running those patterns on learning management systems (LMS). This paper aims to make a leap forward in this direction by presenting two different methods of embedding design pattern frameworks into LMS: (1) Supplying custom LMS components as part of the design patterns, and (2) Configuring existing LMS components based on design patterns. Descriptions of implementations and implications of these methods are provided.

1 Introduction and Background

In our times of fast-paced change, traditional approaches to designing and delivering education are too rigid and inflexible when it comes to adapting to new needs. Twenty-first century education calls for more flexible approaches and technology that succeeds in facilitating teachers and teaching practitioners on the one hand, and in satisfying increased quality demands of our students on the other hand. Considering this background, designing and delivering technology-enhanced education is becoming increasingly complex, particularly for novice designers and teachers. Put very simply, they need to transform educational goals into executable learning designs. This includes proper selection, definition and delivery of learning tasks and environments to achieve intended learning outcomes [1]. Within the scope of this paper we essentially see the task of the educational designer as one of effectively integrating appropriate technologies into educational processes to enhance student learning experiences.

In the field of architecture, Christopher Alexander was the first to capture, describe and disseminate expert design advice in the form of design patterns. Essentially, a design pattern provides a generic, reusable solution to a recurring design problem or situation. The key is to describe the solution in a way that makes the solution reusable for similar problems [2]. Alexander described patterns at varying scope, an example of a small-scope pattern being ‘Things from your life’, which deals with what you should place on your cupboards or pin to your walls. A pattern on a very large scale, for instance, would be ‘Agricultural valleys’, which deals with creating a self-sufficient co-existence of cities and towns on hilltops and farmland for crops in the

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valleys. During the 1990s, computer science educators began to transfer the concept of design patterns to the educational domain [3] [4]. Today there are many design pattern initiatives and projects dealing with educational design patterns, e.g.:

- The Pedagogical Patterns Project [4] was one of the pioneers; it produced a number of pattern collections related to various aspects of teaching and learning, e.g. patterns for seminars, active learning, experiential learning, feedback, etc.
- E-LEN [5], providing patterns for learning resources and learning management systems, life-long learning, collaborative learning, and adaptive learning.
- Kaleidoscope [6] is a network of excellence, partly dealing with the provision of design patterns for games-based mathematics education [7].
- The TELL [8] project provides patterns for networked collaborative learning.
- The PCeL pattern repository [9] provides patterns for implementing technology-enhanced learning based on a person-centred educational philosophy.

One of the main problems of existing educational design pattern approaches is the missing support for pattern users; there is a lack of tools and integration into existing learning management systems (LMS). The reason is that most of these projects also focus on reusing design, but not actual tools. For instance, in engineering, as the awareness of the need to reuse both design and functionality increased, and after a decade of using design patterns, software engineers started developing *application frameworks*: tools that combine the two types of reuse [10]. We have proposed elsewhere a similar concept for education [11]. Another fact is that there are few, if any, initiatives dealing with actual integration of these tools (implementation of patterns) into existing LMS. However, we believe that this is an essential aspect for promoting the use of educational design patterns among educators. This paper picks up on this issue by proposing and investigating two promising and feasible methods of integrating educational design patterns into LMS.

The paper is structured as follows. The next section describes the concept of e-learning frameworks, and how they increase reusability following ideas taken from software engineering. Section 3 describes the problem of integrating design patterns into LMS and proposes two distinct methods of approaching this problem. Section 4 presents implementations of the two methods, and section 5 concludes the paper with a summary and an outlook on further research directions.

2 E-Learning Frameworks

E-learning frameworks aim to improve the reusability of design and implementation by following the practices originated in software engineering. Within these well established practices, software components are built so they can be reused by a programmer who does not need to know how the component is implemented, and only needs to know how the functionalities the component provides can be accessed. This is done by what engineers call *abstractions*. Components must be easy to connect with each other to make new systems that are customisable and efficient.

In education, practitioners reuse learning materials mostly in an unstructured / manual way or by using Learning Objects. LMS also provide tools that allow students to perform common tasks (e.g., participating in a discussion or submitting an assignment), allowing teachers to incorporate these functionalities into their learning designs. In both cases, systems allow teachers to reuse objects or activities, without prescribing a design, or even scaffolding the design process. Teachers must redesign the overall learning activity from scratch for every new course.

Engineers have brought together both types of reuse (design and implementation) in the form of application frameworks; these can be considered as the skeleton of an application that can be customized by the application developer. In the case of e-learning frameworks, instead of an application developer we have learning designers or teachers planning the application, i.e. a course or activity. In engineering, frameworks are often domain specific. We will describe two e-learning frameworks, Beehive which is focused in synchronous collaboration patterns, and PatMan which is of more general nature. The pattern integration tool can be built as an extension to the LMS, where all the components are provided by the LMS and integrated by a proxy tool; this approach is followed by PatMan. Another approach is to have a framework built as a separate tool, and then integrated into one or more LMS. The components in this case do not need to be inside the LMS, as it's the case for Beehive.

3 Frameworks and LMS

As an example of the ways to integrate an e-learning framework into an LMS, let us consider the case of virtualising 'project-based learning': this pattern describes a high-level pedagogy making use of complex, iterative problem solving processes in the context of authentic student projects. The pattern is completed by applying related pedagogical strategies such as teamwork, online learning journals, and other support activities. Now consider we want to apply the luxury version of this pattern using project work supported by virtual team workspaces, asynchronous online communication facilities for teams, online diaries for logging project activities, and web-based evaluation procedures for self evaluation and peer evaluation of projects. Currently, the misery would be that there is little or no support of putting the patterns into practice using an available LMS. The pattern user is left alone figuring out how to support the environment suggested by the patterns be configured on his/her LMS.

Basically, there are two basic methods of building the activity on existing LMS:

1. **Provision of tailored LMS components:** the idea is that e-learning frameworks come with software components that implement the patterns and are optimally integrated or pluggable into an existing LMS. The major advantage of this approach is that it potentially enables optimal support for the patterns, as the components can be tailored to provide a precise implementation of one or more patterns. The disadvantage is that each new pattern potentially requires the implementation of a new LMS component. Additionally, this approach may require that the LMS provides (a) an open API for integration or (b) some form of a plug-in architecture. Examples of such LMS include Moodle [12] or dotLRN [13]. Following this approach, a framework might for instance present a solution to organizing virtual discussion groups and include a tailored software component that implements the exact features required by this pattern.
2. **Configuration of existing LMS components:** this method, instead of providing custom components, takes the existing LMS package as given, and provides

information on configuring available LMS components to support one or more patterns, optimally in the form of tools (e.g. wizards) that support the instructor in instantiation of a pattern. The major advantage of following this approach is that it does necessarily require the development of additional LMS components as part of the framework. Disadvantages include that patterns/frameworks often require features which are not available on a given LMS. In such cases the framework would have to use workaround solutions to achieve its goals. As an example, consider a framework suggesting team-based peer evaluation of project documents. Optimally, the LMS would offer links to peer evaluation forms directly from the document folders of the project teams. However, this is usually not offered by current LMS, so that we would often need to implement a workaround, e.g. uploading peer evaluations as attachments onto a discussion board.

4 Integrating Design Patterns into LMS

This section includes a working and available implementation for method (1) in Section 4.1, and a working prototypical implementation of method (2) in section 4.2.

4.1 Beehive – A Framework Approach

Beehive is an application framework, combining pre-built software components into patterns, setting default values for those components, and allowing the designer/teacher to modify these values. Beehive was implemented after modelling research-based pedagogical techniques (brainstorming, debate, and jigsaw). These techniques require common tasks to be performed, such as forming groups, provisioning topic information, voting, group discussion, etc. These tasks where implemented as ‘task’ components [11] [14], that can be reused to form many other well-known pedagogical techniques (group nomination, group discussion, round-table discussion, role playing, etc.). These tasks are implemented using commercial off the shelf (COTS) software components that can be automatically mapped to these tasks, hiding the technical difficulty from instructional designers. Beehive implements 14 design patterns that are customisable sequences of tasks. The tasks repository includes the 29 common tasks organized in five categories. Fig. 1 shows some of these patterns in the designer’s interface for configuring the pattern. These tasks can all be implemented with combinations of 12 resource components and access to standard LMS APIs. The resource components include Static Info Viewer, Dynamic Info Viewer, Text Chat, Whiteboard, Shared Pointer, Timer, Voting, Audio, Video, File Uploader, and Slide Presenter. The tasks sequence has to be described in a language that ‘scripts’ the activity (sequence, timing, etc.) Beehive uses an XML Learning Design schema based on the IMS Learning Design specification [15].

The advantage of this approach is that it can be more easily integrated to any LMS, as long as they provide APIs for authentication, access control, etc. The disadvantage is that it has to provide a basic set of ‘core’ components, some of which might already be available in the target LMS. Beehive was built using Adobe Flash Communication Server, and integrated to dotLRN and Sakai LMS.

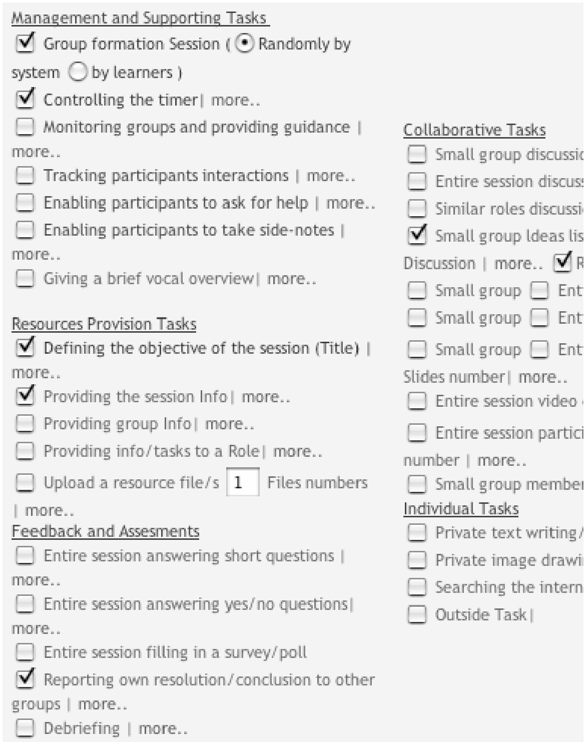

Fig. 1. Screenshot of the (partial) tasks page of the Group Nomination Technique

4.2 PatMan – A Proxy Approach

PatMan (short for "Pattern Manager") is a tool that was implemented as a component of the CEWebS [16] LMS. PatMan acts as a proxy object for the instructor/administrator, helping him/her to set appropriate configuration options for the LMS components that are needed to implement a particular pattern or set of patterns. The underlying idea was to hide the technological details of an instance of a pattern from the course designer. PatMan is based on the PCeL pattern repository [9] and was implemented as a prototype supporting the application of several patterns on CEWebS, including 'blended evaluation', 'diary', 'peer evaluation', 'project-based learning', 'team workspaces' and so forth. The main page of PatMan for a particular course is divided into four sections, of which two are relevant to the pattern user:

1. **Currently active patterns.** This section provides an overview of the current course's structure, containing a list of currently active patterns (i.e., those that have previously been instantiated) in the course. Currently active patterns can be viewed and edited during design and runtime.
2. **Instantiate a pattern.** This section shows a dropdown box for choosing a pattern to instantiate. The user is then directed to the selected pattern's instantiation wizard, which guides the user through the necessary configuration steps. Essentially, the pattern instantiation wizards take a user-friendly stepwise approach

of presenting configuration settings for the pattern, which the PatMan subsequently translates into configuring required LMS components according to pattern settings.

As an example of employing the ‘peer evaluation’ pattern in the final stages of the ‘project-based learning’ pattern, consider Fig. 2: the user is provided with options for entering his/her preferences of instantiating the ‘peer evaluation’ pattern. After this simple one-step wizard is completed by clicking the ‘Finish’ button, PatMan publishes the properly configured evaluation form to the LMS and creates a link to the evaluation form in each team’s project workspace during the period specified for the peer review activity. So instead of having to manually set these low-level configurations, the instructor only needs to complete the pattern instantiation wizard.

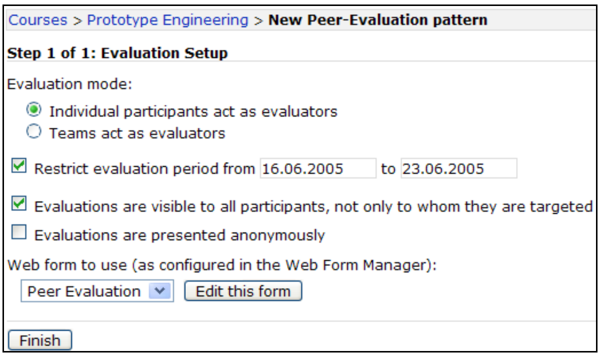

Fig. 2. Instantiating the Peer evaluation pattern

Following this approach the PatMan enables the pattern-driven instantiation of LMS components, which increases the usability and the intuitiveness of putting educational designs into practice on LMS. The major drawback, of course, is that in order to support multiple LMS, the PatMan would have to be implemented separately for each LMS, redeveloping the framework to the target LMS’s and its components.

5 Conclusions and Future Research

This paper aimed to make a step towards enhancing the usability and use of educational design patterns by taking the framework approach from engineering to the e-learning domain. We examined two different methods of supporting the implementation of educational design patterns on existing learning management systems (LMS). One method is based on the provision of custom LMS components complementing the design patterns; this method was demonstrated using the patterns and components created in the Beehive project. The other method takes the LMS as given and provides wizards on configuring existing LMS components to support particular educational design patterns; this method was demonstrated by the PatMan prototype, which implements a layer on top of an LMS. Both methods have their advantages and disadvantages; however, we propose that future educational design pattern initiatives should integrate either one of these methods as part of their design patterns deliverables, thus increasing the user-centeredness and usability.

A further step, which would take the approach presented in this paper to the next level, is the conception and development of a pattern-driven, extensible LMS based on an e-learning framework approach as proposed in this paper.

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A Technology Enhanced Learning Model for Quality Education

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Abstract. Technology Enhanced Learning and Teaching (TELT) Model provides learning through collaborations and interactions with a framework for content development and collaborative knowledge sharing system as a supplementary for learning to improve the quality of education system. TELT deals with a unique pedagogy model for Technology Enhanced Learning System which includes course management system, digital library, multimedia enriched contents and video lectures, open content management system and collaboration and knowledge sharing systems. Open sources like Moodle and Wiki for content development, video on demand solution with a low cost mid range system, an exhaustive digital library are provided in a portal system. The paper depicts a case study of e-learning initiatives with TELT model at IIITM-K and how effectively implemented.

1 Introduction

In last several decades, due to the technology advancement and the availability of high bandwidth Internet connections, there is a tremendous transformation in the philosophy of education system worldwide. The classical approach of education, merely classroom learning and exam centric system as a pursuit of knowledge has undergone a signifiicant change. However, it is obvious that the present education system consisting of the colleges, universities and institutions, governed by a system of government bodies are only regulatory bodies, but hardly sufficient to touch upon quality of education.

Providing quality education, or education with relevance to current and emerging trends still remains a dream worldwide. Quality of higher education by imparting quality learning, supporting teachers with instructional tasks, generating more quality teachers, equipping colleges and universities with resources to manage the instructional processes are some of the challenges in education system. Many leading universities e-contents initiatives like MIT Open Courseware, Carnegie Mellons Open Learning, Open University UK, National Programme for Technology Enhanced Learning (NPTEL), INDIA are noteworthy.

Technology Enhanced Learning and Teaching (TELT)is a pedagogy Model framework for content development and collaborative knowledge sharing system

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that provides learning through collaborations and interactions as a supplementary for learning. TELT addresses the current issues in education system, that aims to provide quality education to all independent of geography with the spirit of Enable, Educate and Empower every Citizen and Community through Knowledge. The model is supplimemented with a web based e-learning environment in the context of instructions for both learners and instructors for effective communication and learning. The model is designed with the following motives.

1. Learning is about building the capacity to see the abstraction, understanding patterns, to arrive at informed decisions and to take appropriate action
2. Learners need sense of purpose, motivation, direction in the form of instructional objectives
3. Instructional should be approached with a tacit process with real world activities.
4. Reduce the gulf between what is taught in the course and the way it is used in the real world

2 Technology Enhanced Learning and Teaching

There are several pedagogic frameworks available with considerable overlap in their approach and scope. Learning objects, web based coursewares, computer aided educational software are a few. David Merrill(www.id2.usu.edu) LaTeX [2] describes a pedagogic model, dividing the courses into series of learning modules. Each module is divided into four real world problem based Learning[PBL], which include introduction, activation of cognitive processes, demonstration, application and integration into knowledge domain. PBL has the advantage of a larger umbrella framework in which component pedagogic models may be imbed as suited to the learning objectives and methodology in a given topic. Fig 1 Shows the David Merill's model of PBL.

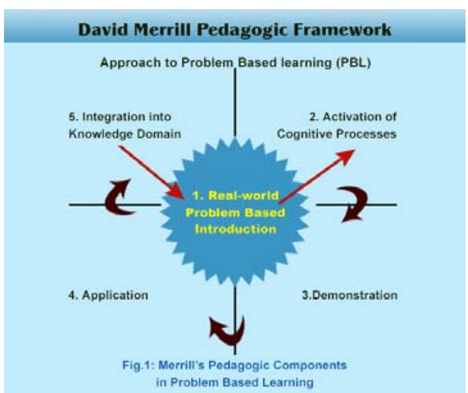

Fig. 1. David Merrils's Pedagogy Model

In recent years, the problem based learning, combined with technology enhanced instructional Design techniques appears to be gaining popularity for web-assisted learning. This paper proposed a pedagogic framework as a combination of Merills model and Technology Enhanced Instructional Design. In TELT model, web based collaboration space, knowledge sharing, Interaction with experts, on-line quiz, assignment, evaluation and contents were developed with quality matrix and content generation standards LaTeX [1]. TELT is a unique pedagogy model with content creation standards and matrix for quality content development and implementation. Compared to any other models, TELT provided a dynamic and collaboration environment, that enhanced the capacity of learning methodology.

The LELT model is depicted in Fig. 2.

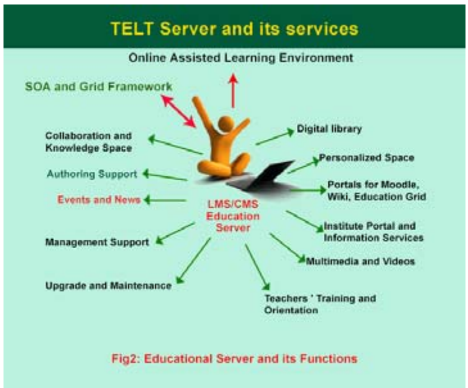

Fig. 2. TELT Model

As depicted in the figure, the main components of the TELT model is server based with Learning Management System as the main component, and is enriched with Digital Library, Collaboration Space, Multimedia based video lectures, Personalized desktop, etc and some of the main components are described below.

2.1 Learning Management System

Learning Management System also known as Conent Management System is the core part of the entire model. TELT model is not restricted to only one LMS, rather a suite of software systems used to address the total TELT management. The suite of systems approved are compliant with (i) FOSS (Free and Open Source Software) licenses; (ii) adoption of open data/information standard; (iii) Service Oriented Architecture (SOA) compliant; and (iv) aligned closely with rapidly evolving and emerging technology environment. The major content development is done with a free and open source e-learning software platform called MOODLE. It helps eduactors to create online courses with oppurtunities for rich interaction with modular functionalities and is extentensible. It provides a distributed learning environment with dynamic knowledge and collaboration space that supports group discussions, collaboration and interaction among teachers, tutors and students in a class, personalization of the course content as suited to the college or learner, upload question banks, online assignments, quizzes and exams and other such facilitations needed to run the courses effectively within the colleges.

Wiki is a piece of server software that allows users to freely create and edit web page content using a web browser. Wiki supports hyperlinks and has a simple text syntax for creating new pages and crosslinks between internal pages on the fly. You can create courses, reports on activities, news, minutes, collaborative groups etc using wiki, which provide open access and editing. The pages created for courses in wiki is known as Course-Wiki, is also used for necessary content posting and logistics supports to create and maintain the courses. The concept and system of Course-Wiki is a key innovation and it plays a central role in adopting TELT, mainly for open content. Course-Wiki is actually a technology assisted pedagogic template for syllabus management that is updated frequently. This helps keep the curriculum up-to-date and ensures concurrent capacity building in the teachers who are assigned to teach the course. Course-Wiki is maintained as an open web-accessible document for the people at large to see and comment.

2.2 Knowledge and Collaboration Space

Advocates of social learning is the best way to learn and most of the conventional e-learning platforms are static and no interaction is possible. The key contributions of TELT model is the Knowledge and Collaboaration space using interaction tools such as message board, news, Asking to Expert online, chat etc. Students can post questions and doubts, and expert or the student community shall answer the question and is rated properly.

2.3 Digital Library and Information System

Online Library and Information System is a vital component of TELT model. The digital library contains a large volume of digitized information that suppliment the course management system. E-books, Collection of Software, e-journals, video lectures, e-newspaper, e-reports are the major collections in the digital library. The institute Digital Library houses a galaxy of video lectures from eminent faculty and industry experts on information technology related areas. All classroom lectures, seminars, invited lectures of the Institute are digitized, synchronized with presentation slides and made available to students and teachers. An open source software WINISIS was chosen for database creation of digital library on web through GENISISWEB, which can be easily configured with Apache web server. It provides the efficient management of the digital library by providing an advanced search.

2.4 Video on Demand Services

A video on demand service is provided through the portal. Classroom lectures, seminars, and workshops are digitized into required compressed formats, synchronized with presentation slides and made available to the server through the online multimedia library using advanced SMIL multimedia and streaming technologies and video compression. The steps involved are capturing, encoding, synchronization using high-end digital equipments like digital camera, DV interface capture card, and high-end encoding/editing systems.

3 e-Learning and Content Development Standards

e-Learning Maturity Model(eMM) is a quality improvement framework based on the idea of Capability Maturity Model (CMM) and Software Process Improvement and Capability determination (SPICE) methodologies LaTeX[4]. The eMM suppliments the CMM concepts of maturity levels, which involve five dimensions Delivery, Planning, Definition, Management and Optimization. (http://www.utdc.vuw.ac.nz/research/emm/index.shtml For content , Content Maturity Model (cCMM) that provide a periodic health check on the quality of E-Courseware developed. This is based on David Merill's model and he prescribed a star rating based on the Problem based introduction, Activation of cognitive processes Demonstration, Application and Integration into knowledge domain. A course having all in good condition is given 5 stars. CMM based appraoch is given as a guide to referees who are requested to evaluate a given module. An example of such a rating can be assigned is illustrated in the following table pertaining to the first component, i.e., Problem Based Introduction LaTeX [3],

Basis of Rating	Metric
a) Absent	0 (poor)
b) Inadequate (Poor)	1 (poor)
c) Relates to a real world scenario	2 (satisfactory)
d) Clear statement of learning objectives	3 (better)
e) Includes prerequisites and links	4 (good)
f) Includes refereed pre-diagnostic test	5 (very good)
g) Real world scenario is illustrated using quality visual, flash or applet material.	6 (high quality)
h) Includes anecdotal and historical information with links to classic papers in the area.	7 (Excellent)

4 Working Model

The institute developed a state-of-the-art e-learning portal using the TELT Model that are in tune with the emerging knowledge era. The work was carried out with a project, called *Kerala Education Grid*, funded by Higher Education

Department of Government of Kerala, INDIA. An attempt was made to establish a network of education institutions by setting up a Education Data centre at host location and three regional premier educational centres as resource centres. Experimented a Virtual Private Network to connect institutions with high bandwidth. All the centres were equipped with state-of-the-art server systems and content development tools. Deployed LELT Server with Moodle as Course Managemnt System with all supporting tools like wiki, digital library, video lectures, Knowledge space, delivered in a portal environment. The portal presently contains 1000+ hours video lectures, 12,000+ open source software in digital library, e-journals, e-books etc. The courses developed were available in the exclusive portal of IIITM-K href www.edugrid.ac.in, and hrefwww.iiitmk.ac.in/moodle and www.iiitmk.ac.in/wiki.

The National Programme on Technology Enhanced Learning (NPTEL) LaTeX [5] project by MHRD, a joint venture by seven Indian Institute of Technology (IITs) and Indian Institute of Science (IISc) of India. Under this, NPTEL is ready with content in the form of full suites of about 40 Recorded Video Lectures (RVL) in each course for 110 courses that are taught in the undergraduate engineering curricula of the country. Further supplementary web content is available in 120 courses. The portal is also enriched NPTEL content.

5 Conclusion

The project have immensely facilitated to a large number of people and organizations, also rejuvenated the entire higher education system using technology enhanced web based e-learning and collaborative systems. This is a unique framework for content development and collaborative knowledge sharing system with a unique pedagogy for Technology Enhanced Learning System as a supplementary for learning to improve the higher education is launched.

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A Hybrid Teaching and Learning Model

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Abstract. This paper aims at analysing the needs for a specific teaching and learning model for the National Defence University of Malaysia (NDUM). The main argument is that whether there are differences between teaching and learning for academic component versus military component at the university. It is further argued that in order to achieve excellence, there should be one teaching and learning culture. Data were collected through interviews with military cadets. It is found that there are variations of teaching and learning strategies for academic courses, in comparison to a dominant teaching and learning style for military courses. Thus, in the interest of delivering quality education and training for students at the university, the paper argues that possibly a hybrid model for teaching and learning is fundamental in order to generate a *one* culture of academic and military excellence for the NDUM.

Keywords: military cadets; constructivism; behaviourism; hybrid model.

1 Introduction

The adoption of teaching and learning theories at tertiary education is a critical agenda for many developing countries. These teaching and learning theories must complement one another in order to ensure a successful process of learning. Understanding these theories may not be a huge challenge; implementing them accordingly may be one. This is especially evident for a unique learning environment such as the National Defence University of Malaysia (NDUM), where the academic and military training run concurrently. Therefore, for this unique university, a hybrid model is a must. This paper attempts to demonstrate the significance of this hybrid model by analysing learning and teaching theories, and how they can become a hybrid model that could be adapted at the NDUM.

This paper aims at examining the needs for a specific teaching and learning model for the defence university. The main argument is that whether there are differences between teaching and learning for academic component versus military component at the university. It is further argued that in order to achieve excellence, there should be one teaching and learning culture at the university. Before further discussion, understanding the university's unique features is critical. In brief, the NDUM has three semesters, two normal or referred to as academic semesters and one short or affectionately known as a military semester, running from May to June every academic year. However, during the academic semesters, the military cadets are expected to

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attend military classes for theoretical understanding of military aspects. This study will focus on these military classes, to be compared with the academic classes. Practically, the military classes are conducted by military personnel, who will be referred to as military instructors, and the academic classes are conducted by civilian and military lecturers; the latter are also military officers.

The researcher gathered the main data through semi-structured interviews with 100 military cadets. The cadets were third year students, from the Class of 2005 and 2006, and they are attached to various faculties. In terms of gender, 84 respondents are male and the rest is female (the university has about 10% female cadets only). Data were transcribed manually based on themes identified earlier by the researcher. The duration of data collection was eight weeks, between the middle of February to April 2009. There were three main questions asked:

a) What are the main differences between military classes and academic classes?
b) How are military lecturers and civilian lecturers different in their teaching approach?
c) How would you like to be taught in both military and academic classes?

In concluding this first section, it is best if the overview of the whole paper is presented. This paper has four main sections. The second section examines the teaching and learning theories from various perspectives. The third section is the core section where findings from the interviews are analysed and points are discussed at length. The last section closes the paper with suggestions and future prospects.

2 Teaching and Learning Theories

There are two prominent learning theories used by scholars and educators in higher learning institutions namely behaviourism and constructivism. The earlier, traditional approaches to learning have been described by many as inspired by *behaviourist* approaches. The act of 'learning' was defined as something that took place when there was a change in the behaviour of the subject – a change in a manner compliant with the requirements of the instructor [6]. Implicit in these views was the notion that the 'teacher' had superior knowledge and was in control of a finite amount of desirable knowledge that had to be imparted to the subjects. It would be easy to assume that learning environments within a military context have always been dependent on drill-and-practice techniques [8]. These techniques, in turn, reflect the view that military discipline is best promoted by ensuring that military trainees acquire skills that enable rapid responses to command. Such assumptions appear to conform to behaviourist expectations.

"Constructivism is not a particular approach to teaching, it is a view of how learning occurs that has important implications for teaching and in particular for the student-teacher and student-student discourse that occurs in the classroom" [2]. This definition provides an important way of moving through the vast quantity of research reports that have been written on constructivism – much of it is misleading because it oversimplifies the implications of the teaching philosophies that emerge from it. Based on 26 years of research on the teaching process in classrooms, Mitchell establishes the key dichotomies: he speaks of transmissive and interpretative teachers. The latter is 'learner-sensitive' [2]. Underlying Mitchell's approach is one of the central assumptions of constructivism – namely that “knowledge must not be considered an objective representation of an external observer-independent environment or world” [9]. Rather knowledge is constructed by the thinker or the person who is learning – namely by students *and* teachers.

Today, the constructivist school of thought is divided into many sub-groupings which have even been described as ‘rampant sectarianism’ to reflect the passionate debates about how people learn [3]. Cognitive constructivists for example [4] have different perceptions of how the human mind works compared with social constructivists [10]. The former stresses the intellectual development and knowledge building of the individual while the latter requires readers to understand that a learning process as one that takes place within a social and cultural environment in which the individual is not a loner. Recent reviews of the constructivist school of thought describe the extraordinary explosion of literature about the learning process and what is needed in learning environments for individual seekers of knowledge to reach their highest potential. Inevitably the debate has extended to arguments about the learning environments in which students can perform to the highest level.

Comparisons are in order between learning and teaching theories. Teaching theories talk about how a teacher perceives him/herself in a classroom; this perception influences the way he/she conducts the lessons. There are three related teaching theories namely teaching as telling or transmission (‘transmissive’ in the term of Mitchell), teaching as organising students’ activities, and teaching as making learning possible (‘interpretative’ in the term of Mitchell) [5]. In the first theory, the tasks of teachers are just to pass on knowledge of authoritative content or to demonstrate procedures. Historically, these tasks began in the villages and towns of Malaysia and, as elsewhere in the days of the pre-industrial era, were didactic in nature: the providers of knowledge imparted their wisdom to students as part of a top-down, one-way communication process [7]. This process survived into the modern classrooms of Malaysia. Colonialism did little to undermine these conservative traditions of obedience to teachers who were assumed to possess superior knowledge. Modern criticism of didactic teaching appears to be entirely reasonable – didactic teaching could disseminate simple information but it simultaneously stifled independent thought, creativity and deeper learning processes [1]. Therefore, in this theory, students are the passive recipient of knowledge and have no say during classroom learning. Learning will occur as long as a set quantity of information (determined by the teachers) gets across to students.

In the second theory of teaching, the role of teachers is to supervise the process involving the transfer of techniques that will make certain students are able to learn. Students must learn actively because they have to participate in learning activities. “Improving teaching from this point of view is about extending a teacher’s repertoire of techniques rather than about changing his/her understanding of the techniques” [5]. This clearly suggests that the teachers are still the ‘main players’ in the classrooms because if they cannot understand the techniques, they are not able to ‘sincerely’ share their knowledge with the students. The third theory of teaching looks at teaching and learning as a process that complements one another. In this theory, the knowledge appears to be actively constituted and constructed by the students. The philosophy is student-centred learning, whereby, learning is something the students do, rather than something that is imposed or forced on them. All teaching activities are channelled towards building students' own knowledge. The teachers' roles, then, are facilitating students' learning by 'hinting' the possible solutions to some intellectual challenges; there will be no one single solution to the issues discussed.

In short, learning and teaching theories considered above present a framework used by some educators to select teaching and learning materials and assessments. What these theories fail to do is to fit all learning environments automatically. These are the issues examined in the next section using the data collected from the respondents.

3 Analysis and Discussions

This section is arranged based on the three questions posed to all respondents. Next, the overall analysis will be presented.

What are the main differences between military classes and academic classes? Out of 100 respondents, 88 agreed on two differences between military and academic classes. The first difference is the teaching and learning approach taken by the trainers and lecturers. These 88 cadets confirmed that their military classes are very rigid and regimented in comparison to the academic classes. There are no rooms for intellectual discourse in military classes because the floor is controlled by the trainers. The second difference is the arrangement of the classes. The academic classes are very small in nature, that is, the number of students is between the ranges of 20 to 30 students. In contrast, the military classes are divided according to military services and students intake. This means that one class could be between 60 to 100 students.

The rest of the respondents gave some variations to the differences between academic and military classes. Amongst the variations are the time the classes are conducted, the types of teaching materials used in classes and the after class consultations. It is arranged in such a way that the academic classes are conducted between 8 a.m. to 3 p.m. and the military classes are in the afternoon to late afternoon. Three respondents commented on the teaching materials used by both trainers and lecturers in terms of the diversity of materials. According to them, the trainers only use military texts and once in a while, power point presentations. The lecturers in academic classes use various teaching materials such as power point presentations, simulations and other multimedia aids within one period of teaching. Moreover, the respondents felt that the lecturers teaching academic classes are easily consulted for any further up discussion; the trainers for military classes are not.

In understanding the arguments above and in analysing them, the researcher would like to emphasise that some of the arguments are beyond the control of the individual trainer or lecturer. For example, the timing for classes and the number of students per class are managed by the university's administration office. The rest of the arguments may be justified accordingly. Firstly, the fact that the approach taken by trainers and lecturers is different can be contributed to the nature of courses taught. It is inevitable that the military classes are conducted by military personnel. Given this, the hierarchy plays a critical role in the classes. With that, comes the regimentation of the learning environment. The main aim is to make sure that mastery of skills is achieved. Drill and practice then is one of the key elements in military classes. Secondly, the teaching aids used by trainers and lecturers are a matter of personal preferences. If one is comfortable and familiar with multimedia tools, he may choose to vary his teaching aids. This is an issue that needs a different discussion platform because it involves the policy of training military trainers. Nonetheless, it must be stressed that this paper does not imply that military trainers are not able to teach; rather this paper would like to suggest that maybe the university should revisit this issue and consequently take appropriate measures.

How are military lecturers and civilian lecturers different in their teaching approach? All respondents synonymously agreed that there are differences between military and civilian lecturers albeit in small scale. The answers could be categorised into three aspects. Firstly, the difference is in terms of the variety of teaching materials used. According to 94 respondents, military lecturers tend to use one type of teaching material in comparison to civilian lecturers, who on average use three types of teaching materials per lesson. When asked to clarify the teaching materials used by civilian lecturers, students responded that apart from the main text, civilian lecturers use documentaries or films, extra handouts, posters, cue cards and articles from journal and magazines.

Secondly, the difference comes in the form of teaching deliveries. Again, the above pattern is evident between the military and civilian lecturers. 83 respondents confirmed that military lecturers rarely use any other teaching approach except the white board. Most of the time, the military lecturers just lecture and ask questions to students. The civilian lecturers were found to use several types of approach in teaching including power point presentation, group discussions, on-line strategies and problem based learning. Thirdly, the level of rapport in the classes conducted by both military and civilian lecturers differs. According to all respondents, civilian lecturers are more welcoming and warm in their approach to teaching. Although this is the case, they are very strict in terms of quality and quantity of work that students do. On the other hands, students commented that military lecturers are quite difficult to approach in academic classes. As a result, students tend to be very passive in classes and just listen to the lectures.

What conclusions could be drawn from these responses? There are many factors that could lead to these differences. The most important one, based on the researcher's understanding and observations at the university is the types and level of exposure to teaching and learning courses attended by both military and civilian lecturers. While the military lecturers have the advantage of participating in courses conducted by civilian personnel, the civilian lecturers have never attended any seminars conducted by military personnel. At this point, the military lecturers may find that their existing teaching repertoire will bring a lot of benefits to students; they have the opportunities to compare, contrast and employ the best strategies. This raises a very critical question? If the approach taken by the military lecturers is supposed to be the best, why did the students respond as such in the next question?

How would you like to be taught in both military and academic classes? 91 respondents would like to have a mixture of teaching and learning approaches in both military and academic classes. This does not support the presupposition from the previous question. If the military lecturers believe that by employing a single teaching approach and by using a single type material will bring advantages to students, clearly the students felt the opposite. For these 91 students, a combination of teaching approaches and media of learning hinder boredom in classes and at the same time allow them to experience with extra learning materials. These 91 respondents also confirmed that there is very little opportunity for them to speak in military classes. The same occurrence is also evident in academic classes taught by military lecturers. When asked roughly about the percentage of time spent on *intellectual discourse* (the cadets understood this as intellectual arguments and debates over issues in classes and freedom to express their judgements) in military classes, academic classes conducted by military and civilian staff, the responses were about five percent, 25 percent and 40 percent respectively.

For the rest of the nine respondents, they were not sure of what to expect in their academic and military classes. They believed that the lecturers know the best in terms of content, approach and media of teaching. The researcher suspects that this is a heritage of a didactic teaching approach where students are indirectly impeded to be active participants in their own learning processes. Unfortunately, this trend and belief cannot be encouraged. For one, as future leaders students need to articulate their thoughts and the best platform to practise is at the higher learning institutions.

What could then be summarised from the students' responses? The main plan is to integrate these responses into a teaching and learning framework for the NDUM. It needs to be stressed that this framework is for both academic and military classes. Based on all the above analysis, the university needs a hybrid model that will integrate key elements of the existing learning and teaching approaches.

It is evident from academic classes that the relationships between behaviourist and constructivist principles are demonstrated in such a way that the students begin their quest for knowledge by being exposed to a mixture of behaviourist and constructivist learning strategies first. The teachers appear to use their authority at this stage to dictate what the students should learn; however, minimal space is still given to students for self exploration. This trend can be explained by the fact that students at the NDUM have been exposed to the academic world since they are in secondary and primary schools. Hence, students are familiar with learning approaches for most academic courses. Given this, as they progress, the pedagogy used to teach them can adapt more of the constructivist principles, and the academics can use more of the last teaching theory suggested by Ramsden, teaching as making learning possible. The academics too can be more of interpretative teachers, as put forth by Mitchell.

On the other hand, the military classes are conducted in the opposite direction of the academic classes. The classes adapt the behaviourist learning strategies and teaching as telling approach for all levels of studies. Here, the transmissive approach to teaching is apparent. Justifying this, in military classes and training, behaviourist principles are the most appropriate at the beginning of students' life since they have never been exposed to military life, culture and discipline. Since the main concern at the beginning are mastery of skills and conditioning them for perfection, the behaviourist principles, together with trainers who act as information providers, allow new cadets to be drilled and thus to remember important elements in military life.

Nevertheless, as they progress in terms of years of studies, constructivist principles must be integrated in military classes. The roles of the academics too must change; to mould great leaders of characters, students must be equipped with soft skills including critical thinking, communication and problem solving skills. These could only be achieved by the introduction of constructivist principles in military training, and the trainers act more as facilitators rather than providers of knowledge. This is the gist of the hybrid model which has taken the best out of both existing practices in academic and military classes.

4 Conclusion

Putting across a new model to every academic and military instructor may prove to be strenuous. Before anything else, the same amount of exposure to these theories is critical. Debates that follow afterwards could be used to improve this basic model.

As a conclusion, the NDUM needs a stable and practical learning and teaching model in order to ensure both academic and military excellence. The proposed model may not be a new concept in education, but it is a new approach at the university being the youngest public higher learning institution in Malaysia. Before making this model an official one, a lot of work must be completed so that everybody accepts this model and eventually implements this in their teaching and learning schemes. This hybrid model should be applied across the curriculum and courses on campus; this suggests that all teaching staff, military lecturers and instructors as well as civilian lecturers should embrace the hybrid concept whole-heartedly in educating future leaders of characters; *one culture of teaching and learning* towards an excellent tertiary military institution.

Acknowledgments. The researcher thanks cadets who participated in the interviews.

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Integration of Subject Related ICT in Schools Is Failing; Could Revival of System Dynamics and Simulations Be an Example towards Improvement?

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Abstract. A recent survey of teachers in 172 different Norwegian schools reveals that the integration of new technology into different subjects is far from the goals set by the Ministry. A total of around 1000 teachers responded to extensive questionnaires particularly developed for each one of 8 school subjects. The dominant uses in classrooms are related to standard software and Internet browsers. Very few teachers indicate that they apply software or technology going deeper into their subject teaching, promoting understanding and insight.

Recalling the visions of software tools for construction of dynamic models, class discussions of flows and accumulations, mutual interactions of dependant variables etc. in the 1990-ies, a tempting idea is to revitalise these tools and ideas for better integration and involvement of ICT in the learning of several school subjects and topics. Increased computer capacity, broadband connections should count in favour of even better results in 2010.

Keywords: survey, ICT in schools, integration into subjects, system dynamics, examples.

1 Introduction

According to international comparative surveys, e.g. PISA[1], the Norwegian results in reading, scientific and mathematical literacy appear to be very disappointing. Norwegian students at primary and secondary level score significantly lower than the OECD average. On the other hand, Norway is on top using ICT in schools. Norwegian educational authorities have been searching for ways and means to mend the failing knowledge level among students - and perhaps taking advantage of the investments made in new technology for schools.

One of the Ministry of Education and Research's latest reforms in the 10-year compulsory school and in upper secondary education and training is called the *Knowledge Promotion* [2]. It introduced certain changes in substance, structure and organization from the first grade in the 10-year compulsory school to the last grade in upper secondary education and training. The reform took effect in autumn 2006.

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Under the Knowledge Promotion, schools are to prioritize the cultivation of 5 basic skills in all subjects. These basic skills that have been incorporated into all subject syllabuses, are as follows:

- *the ability to express oneself orally*
- *the ability to read*
- *the ability to do arithmetic*
- *the ability to express oneself in writing*
- *the ability to make use of information and communication technology* [3, p.7].

We note that the fifth basic skill is directed towards ICT literacy, and that all 5 skills - including ICT - are to be incorporated into all subjects.

2 Research on ICT in Schools

An ongoing research project called *Education, Curricula & Technology* (ECT)[4], is set up for the period of 2007 – 2010. It is supported by the Research Council in Norway and is closely related to the master programme in *ICT in learning*[5] at Stord University College. The aim is to study the relationship between ICT and education by developing a theoretically oriented and empirically based approach to research on utilization of ICT in education and integration into curricula.

The project is planned through several phases. After settling the research methods and structure, an extensive survey among 1000 teachers, teaching one of eight different subjects, was performed in 2008 - 09. Some of the first findings were presented in a symposium at the Earli2009 conference in September 2009. In his matrial for the session[6] dr Lars Vavik, who coordinates the ECT project, listed the team's starting assumptions, e.g.:

- ICT, in and of itself has no significant contribution to learning; the effects of ICT are to be found in the kinds of learning environments which they afford
- Similarly, the effects of ICT are to be found in the kinds of learning activities they activate or circumvent
- ICT's potential effects are interaction with learners' aptitudes and dispositions, interaction with particular contents in certain subject matter areas, and interaction with particular learning situations and contexts
- The potentially unique contribution of ICT lies not only in serving common learning goals but also, and perhaps more importantly – in offering and affording the attainment of novel goals hitherto unattainable

A set of research questions were worked out with these assumptions in mind:

- How can ICT in its various forms and in different subject matter areas be made to contribute to the design of effective learning environments that are inspired by current conceptions of "good learning" and the image of the desired graduate [7]

- What kinds of unique learning activities can ICT be made to activate or bypass in such a way that learning is uniquely facilitated and novel goals are attained?
- What are major individual differences with which ICT usages interact so that a deeper conceptual understanding of ICT's roles in learning can be reached?
- What are some unique learning goals that the use of ICT in different subject matter areas can attain? With whom? Under what conditions?

2.1 First Findings

After performing the survey some preliminary findings were presented in the same material[6]. Some of the characteristics that were common for all subjects were reported as correlations between issues.

a) *The schools have a very high level of access to ICT tools. There is evidence of consensus about what to teach, but in reality there is a large variation among teachers, schools and subjects on the use of technology*
a) *The level of technology infusion reported by the teachers correlates with a student centred approach on instruction. It is not only about how much the teachers use the computers but also how they use them*
a) *The findings show that the technology infusion and a student centred approach correlate negatively with the teachers' academic level. Furthermore, the expected correlation between the teachers ICT skills and high level of use of the technology was not supported by the data from the national survey.*

Most preliminary findings were as expected. The negative correlation between academic level and use of technology is not so surprising and may be explained in different ways. What is particularly interesting - and surprising - is the negative correlation between the teachers' academic level and the student centred approach to teaching; an opposite result was expected. Perhaps also a bit surprising is the fact that no significant correlation was found between teachers' ICT skills and the level of use.

The research team staged a symposium at the conference in Amsterdam, where also certain results from various school subjects were presented[6] and discussed.

2.2 More Detailed Analysis

Results were further analysed and are now being presented in a series of reports from the ECT research project. In addition to the general report by Vavik[8], there are 8 separate research reports authored by subject specialists in the research team. The survey is still based on the questionnaires to teachers in 172 different Norwegian schools. It reveals that the integration of new technology into different subjects is far from the goals set by the Ministry of Education and Research. A total of around 1000 teachers responded to the extensive questionnaires particularly developed for each one of 8 school subjects. Statistical analysis of the responses shows that - despite clear directions in the official curriculum guide lines - applications of ICT in subject teaching is far less than expected after several years with governmental policies and drives to take advantage of new technology in education. Further more, the dominant uses that exist in classrooms, are related to writing texts in word processors (e.g. MS

Word), presenting pictures and texts e.g. by PowerPoint, using learning management systems (LMS) and searching for information through Internet browsers. In other words, use of general software, not subject specialised or particularly developed for educational use. Very few teachers indicate that they apply software or technology going deeper into their subject learning, promoting understanding and insight.

In Mathematics[9] the survey shows that the teachers have high confidence in their own competence in mathematics, and most of them also claim they have high (informal) ICT competence. Spreadsheets are used for calculations, tables and graphs, but rarely for simulations, testing of hypothesis or other advanced applications. Dedicated software e.g. for geometry, is rarely used, and it seems that teachers lack the experience and insight to see the learning potential in application of advanced software. According to Tapan[10] knowledge of the software is not sufficient; it also requires competence within mathematics and ability to use the software in proper didactical and subject oriented ways. Teachers seem to be restricted by their own background and traditions in learning and teaching.

In social sciences[11] Internet is used for finding maps and statistical facts, PowerPoint is used to show photos and group work and Word is used to write up reports. But geographical information systems (GIS) applications are rarely used, simulations of populations or economic systems are hardly mentioned. 70% of the responding teachers claim that they are *interested* or *very interested* in applying ICT in their teaching. But a much lower fraction is actually using it more than as a communication or distribution tool through Internet and LMS.

In natural sciences[12] the findings are in the same categories. Reports from excursions are written in Word, illustrated by digital photos, but no simulations of e.g. food chains or marine balances are applied. Subject specific software and web sites are rarely used, and many teachers claim that there are many other and more important activities to fit into restricted time frames, than to *waste time on ICT*.

Reports on findings within *practical and aesthetical curriculum subjects*[13] [14] [15] and in *languages*[16] also indicate findings in the same direction.

General conclusions from this first part of the ECT project is that teachers are positive to the use of ICT in schools, they are fairly confident about their own skills both in subject matters and in ICT, but they stick to general software. LMS and Internet are not really integrating the new technology into their methodology or learning environment for students. Reasons they give for low infusion of ICT varies, but are very often related to lack - or even waste - of time, other and more important activities for the students, low beliefs in the learning effect of ICT.

2.3 Next Step

After the wide survey was analysed, a specific group of schools and teachers was selected for investigation in more details of what factors influence the learning outcomes. The approach chosen was to select 40 classes and teachers who year after year obtained high scores on national tests and exams, and the main research question was: What are the characteristics of learning styles, teacher's background, academic level, use of ICT and other tools in classes that represent *best practice* in the students' subject knowledge?

New questionnaires were sent out and in-depth interviews have been performed and data are now being analysed in 2010.

No results have been published yet and no conclusions reached. But what so far seems to be the main factor for success are the *teacher* and his/her way of handling curriculum and students. The involved researchers have scrutinised responses and answers closely to detect any correlations between uses of ICT and learning results without finding any clear conclusions so far.

What becomes more and more clear is that the teacher plays an important role, both through his/her way of addressing the students individually and as a group, their way of raising interest and enthusiasm, integration of ICT in natural ways - and the professional and academic qualification of the teacher. Solid subject knowledge on the teacher's side, being reflected in confidence, ability to understand and approach students' difficulties in different ways - and including the proper tools for different tasks, seem to be the magic key to success.

This corresponds very well with what Dough Brown from UK said towards the end of his presentation of *Experiences and trends in England for teachers' integration of ICT in teaching and learning* at the Fall conference for ICT in teacher education at Stord, October, 2001: "Sorry guys, all experiences show that the teacher is the most important factor for success in schools; ICT is just another tool to take into account."

Another interesting exercise in the same direction is a TV series going on in Norway now during winter 2010. It is called "Class 10b", reporting from the daily chores of a Norwegian 10th grade class that had bottom scores on the national tests for the last years. Now they are exposed to a completely new team of teachers, selected particularly for the task, among the best qualified teachers in the country. The goal is to raise the level of the class to top-three in the country. The main purpose of the experiment and the TV show is to follow the improvement of the students' performance during their last year in compulsory school. The results are still not revealed.

3 What Can Be Done for Real Integration of ICT in Learning?

Through reading reports and experiences quoted above, it becomes clear that teachers and their qualifications are the most important factors for success in schools. There are also indications that the influence of ICT is less than predicted and expected by its advocates. Can this be due to the way technology is mainly used, only as another writing and presentation tool, and as another form of library? Could teachers' attitudes, their engagement be altered by making other forms of applications easily available?

When the researchers asked teachers about the use of specific tools, they found that e.g. in music[14, p.12] only 7.1% of teachers let students use ICT tools for composing own music, only 6.1% for accompanying song or play, while nearly 40% use ICT for teaching music history. Similarly within other subjects, ICT is mainly used for theoretical parts of curriculum, not for practical or experimental tasks. Hence ICT becomes just another tool, not a revolution towards more active and investigating learning.

3.1 System Dynamics and Simulation

Recalling the visions of the developers of *system dynamics* and software tools for construction of dynamic models, a revival of this approach to learning becomes interesting. Class discussions of models with flows and accumulations, mutual interactions of dependant factors etc. seemed an activating and student engaging exercise. It is all based on theories by Jay Forester[17] at MIT and others, starting with his speech at The Club of Rome (1970) where he introduced the *World Model*[18], continued through several phases, e.g. by working with Gordon Brown [19] on learning strategies for all school levels (K-12), for better integration and involvement of ICT in the learning of several school subjects. Important for the widespread interests in system thinking is also P. Senge's book *The Fifth Discipline*[20].

New and more flexible tools have replaced the old versions of Dynamo[21], Stella [22], PowerSim[23] that introduced graphical interfaces for simpler implementation of models and simulations. Both teacher trainers and teachers of today should be offered the possibility to exploit system dynamics as an educational method, a way of investigating, studying and learning about complex systems, particularly in social and natural sciences, but also in other subjects like mathematics, phsyical education etc.

Already at the WCCE 90 in Sydney, Australia, in a paper on *System dynamics as an Educational Method*, it was claimed that

> *Our surrounding world consists of complex systems, too complex to be grasped by our minds without assistance. . . . Building and manipulating models help us to understand the dynamics of such systems. . . . Computer technology has made manipulation and calculations much easier, while authoring systems for simulations have made model construction simpler*[24].

Here experiences and recommendations were presented, including the three stages:

- Simple simulations of dynamic processes where students study effects of changing different parameters; the model is hidden, prepared by the software producer
- Model and simulation studies, where the model is graphically and/or mathematically visible, relations/equations may be altered and parameters adjusted for repeated running of the simulations
- Development of their own system dynamic models, based on subject knowledge, ability or creativity to see relations between involved variables and constants, then testing hypothesis through simulations of the model to see what is in agreement with nature or with other experiences

These stages are meant to gradually introduce teachers and students to complex systems related to subjects in question or cross-curriculum topics. The first stage, the black-box simulation, demonstrates - assuming that the model is correct and realistic - what the consequences are when changing one or more of the variable parameters, and provides training in systematic thinking and testing of models. It is a well known method and is the basis for a lot of computer games and training scenarios.

The real system thinking comes when students are able to go into stage two, having proper software and visible models available. They discover relations between variables in nature or other systems; they may play with the model construction and see what alterations lead to. Running the simulation for each change reveals what the results are. It is a perfect tool for group discussions and collaborative learning.

The real deep learning comes with the third stage, when students are challenged to construct their own models of complex systems they shall study, e.g. balance between prey and predators in an isolated system, or the economy of a youth club. This part requires access to a simplified interface to a software system, an authoring tool, that makes model construction simple even if the model is complex - and it requires solid subject or cross curricular knowledge by the students! Not only superficial knowledge is required, but an understanding of the system to be modelled. The role of the teacher is important, as a guide and provider of hints and ideas during the process. A simulation of the model follows to see if the results appear reasonable. The final proof of the pudding is a comparison or testing of the simulation versus the real world system.

By introducing these stages and methodology to teachers they may be convinced that there are options for learning environments that may lead to better and more efficient use of the technology. The ideas were tested with students in the 1990-ies, using the existing versions of Stella and PowerSim at the time. The responses and results were positive - even with the technology and software existing twenty years ago.

Today's increased computer capacity, broadband connections and better teacher knowledge of ICT, should count in favour of even better results in 2010. For support and professional development there exists a System Dynamics Society[25], there are annual conferences, particular providers for K-12 adapted learning environments for system dynamics, CLE[26], and there researchers and educators at all levels that works with system dynamics for learning purposes. There are also lots of online simulation games, e.g. Sim City, and many improved tools are available, both commercially and as freeware.

3.2 One of Many Ways to Integration and Exploitation of ICT in Education

The above "marketing" of system dynamics is only meant as an example of how certain tools and educational methods can increase the benefits and usefulness of ICT in education. There are many other dedicated methods and tools that work in particular subjects, topics and learning situations that can provide similar advancements towards better integration. Hopefully can teacher educators, in-service providers and others that work with ICT in schools offer introductions and access to such possibilities, and thus widen the teachers' visions and practice beyond application of word processors and presentation software in their classes. May be we will then find better learning effects related to the technology?

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Student Development in Higher Education: A Constructivist Approach

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Abstract. Sustainable education requires a new approach to knowledge acquisition and learning. This approach is manifested in merging student experience inside and outside the classroom, which eventually results in shaping the 21[st] century lifelong learner. This paper presents an innovative student development model based on the constructivist approach; showing the collaboration between student affairs and academics. Furthermore, it illustrates a unique experience implemented at Effat University for developing the student as a whole person. This is done to complement the student's academic experience with the necessary skills and abilities derived from Effat University mission that focuses on creating women leaders. The student finds herself in a journey of self development and growth throughout the course of her study until graduation. At the time of graduation, she is equipped with all what it takes to be a successful career woman and a leader of change in her society.

Keywords: Student Development, Leadership, Constructivism, Collaboration, Quality, Education.

1 Introduction

The cognitive and moral development of students as modeled in the various contemporary student development theories suggest that campus life is integrated in the formal and informal learning, which foster moral development and character education [1]. In an authentic environment, learners assume the responsibility of their own learning. They have to develop meta-cognitive abilities to monitor and direct their own learning and performance. Therefore, learners are engaged in their own knowledge construction [2]. The learning model in a constructivist approach emphasizes acquiring meaning through active participation. Collaboration brings a unique framework and perspectives to the activity. The student's learning process is constantly moving, and the learners construct new knowledge based on formerly learned knowledge [3].

In the present paper, the authors present an innovative model for student development based on the constructivist approach and the equilibrium model proposed by Sarirete et al. [4]. This equilibrium model ensures that students move from one level of learning to the next following progressive stages. This movement from one stage to

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another requires challenging the learner by posing a higher order of knowledge that is above his/her standard. For instance, the introduction of a new concept creates a mental disequilibrium in the head of the student that needs to be resolved to return once more to a new equilibrium stage, and have reconciliation for some time.

1.1 Background

As the 21st century opens, the external environment for higher education is quickly changing in significant ways. Communication among higher education institutions has become quite accessible which forces local institutions to adopt global approach to leadership. Effat University is actively shaping its own future taking advantages of all external conditions and developing strategic capabilities in a challenging status quo. The core values that are dictated by the university vision and mission are based on the four letters of the Arabic word IQRA (meaning READ): I: “Ibhath” – *Lifelong Research*; Q: “Qiyam” - *ethical social and educational values*; R: “Riyada” - *responsible and creative leadership*; and A: At-tawasul - *effective communication* [5]. The main mission of the university is to create leaders who are lifelong learners. Therefore, the Student Affairs Deanship at Effat University adopted an implementation plan of these core values by integrating extra-curricular activities with co-curricular activities that complement the academic curricula and are assessed similar to academic performance. The assessment plan devised resulted in developing the system of “Value Points” that is used to calculate marks for students.

In section 2 the present work will be positioned in relation to the literature. Section 3 presents the methodology. Section 4 evaluates the proposed model and discusses the challenges encountered during the implementation of the model. Section 5 discusses the results and some future work.

2 Related Work

The student development literature advocates that the engineering and computer science students are often not engaged in student activities outside the classroom such as student associations, student governance, or community service activities [6-7]. Furr and Elling [8] stress the need for student leadership opportunities. Majors such as education and social sciences are shown to be more involved in campus activities. Kuh [9] and McCluskey-Titus et al. [10] put forward that the socialization among students in the residence hall showed greater contentment in the overall college experience. Inman and Pascarelli [11] argue that the student involvement is a key to student development. The need for cognitive development at the highest levels has been advocated by Perry [12] in his research on students at Harvard.

Talking about the new generation of students called also "Y Generation", Astin [13] confirms that they are techno-literate and have expertise in the knowledge economy and study their career options carefully. They are familiar with their university’s marketing material and tend to have a clear sense of purpose on entering university. O’Banion [14] with his Humanistic Education reform movements resulted in creating learning college models based on six key principles which focus on changing the individual learner, learner engagement, providing options for learners, collaborative learning, focus on learner needs and reporting success.

Chickering and Reisser [15] state that the university plays an important role with students in developing their personal competence, their interpersonal relationships, their purpose, and their integrity. The university or college enivronment has a high impact on students. The student development opportunities can be determined by the institutional goals, the student-faculty relationships, and the educational environment as well as the offered leadership opportunities. Chickering and Reisser suggest that connecting academics to student affairs provides students with a meaningful supportive system. The satisfaction level with the student experience is enhanced when the student has an integrated experience. In the following the authors talk about the methodology followed in their university in shaping the students and integrating them in the university environment.

3 Methodology

Student Affairs at Effat University plays an integral role in reinforcing the core values of leadership by enhancing students' educational, professional, spiritual, intellectual, and emotional needs; and by providing career experiences through excellent services, opportunities and facilities. Historically, Effat College, (Effat University lately), presented lifelong learning opportunities for students early on. These opportunities were delivered initially in an unstructured manner. Activities (lectures, workshops, seminars…etc.) were selected on semester or year basis, and offered to the student body. It was usually left to the choice and discretion of the students to attend and make use of these opportunities. The advantage of this system was that it allowed them to take responsibly for their own learning. The disadvantage, however, was that many students never made the choice to undertake this responsibility for various reasons like lack of motivation, or interest, or lack of communication. Eventually when all students reached the time of graduation, they graduated with mixed abilities which affected their employability.

3.1 Stages of Developing the Student Development Program

By undertaking the responsibility along with academics to develop the student leadership potentials, important skills and areas of development that complement and enhance the academic, professional, personal and social experience of the student were identified and short listed as core competencies. In an attempt to improve students' capabilities and standardize their performance across levels, the core competencies selected were used to devise five co-extra-curricular programs that are graded from beginners' level for pre-college student to senior level students who are about to graduate. A constructive approach to the presentation of the core skills is used. So students learn the skill and relearn it at every level in a new form that hikes their understanding of the skill. This is based on the equilibrium model following the Arthur Chickering's psychosocial model [15] which states that development is not simply a maturation process, but requires stimulation through challenge and support. The equilibrium model [4] suggests that students progress from one stage to another, until maturation, at different rates and may recycle through some stages.

Several of the core competencies were highlighted for the students being mandatory. Four main units under Student Affairs are assigned the ownership of the leadership program known as the Student Development Program (SDP) which are: the Career Development Office (CDO), the Independent Learning Center (ILC), the Center for Communication and Rhetoric (CCR) and Student Life (SL). These units focus on developing the core competencies of the Student Development Program collaboratively. Table 1 below shows these core competencies.

Table 1. Effat Co-Extra-Curricular Program: High-Stake Leadership Core Competencies

Unit	**ILC**	**CCR**	**CDO**	**Student Life**
Core Competencies	Mechanical Skills Survival Skills in College Study Skills Numeracy Skills Personal Development Research Skills	Communication Skills Interpersonal Skills Intrapersonal Skills Presentation Skills Building Confidence Seminar and Debate Skills Social & Intercultural Skills Interfaith, Tolerance, Respect for others	Personal Organization Skills Time Management Skills Professional Career Preparation Emotional Intelligence Work Ethics Practical Job Preparation Leadership in the workplace Graduate Study & Research Preparation Life after College	Appropriate Behavior & Decorum Rights & Responsibilities Leadership in College Social and Civic Responsibilities Safety, Security & Basic Health

Co-curricular activities are defined as the ones that enhance the professional, academic and personal skills of the students that necessarily have an impact on the student's career. Extra-curricular activities, on the other hand, relate to recreational ones where students find the freedom of expression and come nearest to a liberal arts approach to learning. Both streams are merged to form one program, SDP (Student Development Program). The grading of the core values among the levels pre-college + 4 college levels follows a constructivist approach to learning, escalating from simple to more complex.

Furthermore, the system gives flexibility for the students to develop themselves in the areas of their choice; either in those specified in the core competencies or in others. This is suggested to students through encouraging them to seek further professional qualification in areas that interest them.

Like ambassadors who hold red passports, the Effat student holds one for SDP; starting with a light red passport, which deepens as the student progresses from one level to the next until she gets the dark red passport. The passport notion relates to the ambassadorial vision of Queen Effat[1]. The passport involves each student in an active

[1] Queen Effat is the wife of King Faical ibn Abdul Aziz Al Saud, King of Saudi Arabia from 1964 to 1975. First woman in the Kingdom who introduced formal education to girls.

errand of learning and self development through the course of study. Furthermore, it ties meta-cognitive with cognitive skills. For example, the student refers to Web Banner[2] System in order to check her level and GPA. She has to find out about the bylaws, the schedule of her workshops, and activities required through Blackboard[3]. She has to plan for attending them, and keep a record of these activities. This process enhances organization, facilitates orientation, and raises awareness of all policies and procedures that are needed to navigate through university life until she completes her graduation.

Student passports are divided into five categories: Foundation year (Pre-college year), Freshman (0-36 earned credits), Sophomore (37-72 earned credits), Junior (73-108 earned credits), Senior (109-above earned credits). Each category has a different passport with a prescribed co-curricular program. Students fulfilling the requirements of SDP, receive official transcripts at graduation along with recommendation letters from Student Affairs.

3.2 Assessment

Assessment of SDP is incorporated in the assessment of course work. Both are integrated into one hundred marks per course. This integration helps in providing constant feedback for students to enhance their development. The amount of 5 per cent from each course registered per semester is dedicated to active participation and involvement of the student in her SDP, which translates into 50 points required through participation in various events. Assessment takes three different forms: continuous assessment for students to evaluate students' learning in each workshop/lecture; an overall assessment for students which includes journal writing, interviews and presentations; evaluation by students of SDP and presenters.

Collaboration between student affairs and academics is highly marked through their communication especially during the end of semester to calculate the students' marks together. Indeed, it reaches its peak during their participation in an annual key event marking the selection of Queen Effat Citizenship Award winner. This award is granted to the role model student who is usually as an active candidate on and off campus, with a clear vision and great powers of communication coupled with excellent academic performance. In a nutshell, she is a role model in achieving a balance between her academic performance and her SDP.

SDP activities that are used for developing the core competencies for each level are presented in the form of workshops mainly, by national and international trainers and key figures. Hiring national and international figures is based on student and faculty evaluation.

4 Evaluation and Challenges

The new structure for SDP has various positive outcomes. The passport system helps students to take ownership of their own learning and actually learn by doing. In many ways, the passport works like a manual, agenda and a log.

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[2] Web Banner System is a Student Management System used by Effat University to manage students' records and data.

[3] Blackboard is a Course Management System used by Effat University to Manage courses.

The mandatory workshops by level ensure quality input across the board. The goals and objectives of each program are clearly defined for the students and the administration so it is easy to assess and evaluate the output.

Nevertheless, few drawbacks are identified after evaluating the program by students, staff, and faculty. Several areas that require improvement include the refusal of students to the notion of mandatory workshops and lectures. Students do not have time to attend self-initiated activities. Faculty is unable to conduct extra departmental activities. Student Affairs staff is over-occupied by data entry.

An international consultancy was sought to provide an external evaluation for SDP. Suggested solutions to solve the problems include refraining from calling the activities "mandatory". Instead they should be called "high impact" or "high stake" activities to make it psychologically more appealing to the adolescent.

The second suggestion was to encourage the students to develop important skills independently and use of the E-portfolio which could be monitored by Faculty. Eventually, such practices would develop learning community and team teaching environment.

5 Conclusion

The educational sector requirements which could lead the transformation of the economy from a "Consumer Economy" to a "Knowledge Economy", necessitate a design of an educational system that realizes the full potential of students [16-17]. The proposed Student Development Model emphasizes acquiring meaning through active participation. By relating the student learning with student life activities, the student's learning process is constantly moving. The SDP model succeeded in integrating the co-curricular activities with the students' learning processes in the classroom. Students are aware of the need to develop themselves as individuals along with the field of study. As a result they become more involved in the university activities and thus are more responsible. This shows maturity in their behavior and consequently, their learning experience becomes more profound and meaningful.

Additional studies to confirm the results might include a quantitative analysis of the proposed model among students, staff and faculty.

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Balancing Teacher Quality and Quantity

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Abstract. The world is facing a shortage of trained teachers. According to the 2010 Global Monitoring Report approximately 10.3 million teachers will be needed globally to staff classrooms from Bangkok to Canada. The situation is worse in Sub-Saharan Africa. Estimates suggest that approximately 1.2 million new teachers will be needed in Sub-Saharan Africa alone to achieve universal primary education goals by 2015. Increases in primary school enrollments, drought, and HIV-AIDS have exacerbated the need for well trained teachers. Despite the need, the focus is on balancing quality with quantity. An effective teacher is deemed a critical element, although not the only one, in a student's success in the classroom. This paper focuses on the dilemma of meeting universal primary education goals in Sub-Saharan Africa, while maintaining teacher quality in fragile contexts.

Keywords: Sub-Saharan Africa, teacher quality, EFA, UNESCO, primary education.

1 Introduction

The acute shortage of well trained teachers has threatened to derail progress toward meeting Education for All (EFA) goals by 2015 [12]. One key EFA goal is provide all children with basic primary education. Other goals include gender parity, teacher development, and reducing the out-of-school population [11]. To reach these goals more than 10 million teachers will be needed to staff classrooms worldwide. The situation is even worse in Sub-Saharan Africa. While substantial progress has been made in reducing the numbers of children not attending school in Sub-Saharan Africa by 13 million, one fourth of all Sub-Saharan Africa's children in 2007 were still not in school [12]. The 2010 Global Monitoring Report estimates that Sub-Saharan Africa alone will need approximately 1.2 million new teachers to achieve universal primary education (UPE) by 2015 [12]. Increases in primary school enrollments, drought and HIV-AIDS throughout Sub-Saharan Africa have exacerbated the need for well trained teachers [13]. Ensuing conflicts and wars create an unstable environment that makes it difficult to recruit and retain teachers. Progress toward EFA goals are monitored and reported through Global Monitoring Reports that analyze trends on the state of education throughout the world.

Despite the need for teachers, the focus is on balancing quality with quantity. Research has clearly shown that an effective teacher is the critical element, although not

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the only one, in a student's success in the classroom. A report on international best practices concerning teacher polices and practices emphasized the importance of teacher quality by concluding that "Teaching is arguably the strongest school-level determinant of student achievement" [8].

The question then becomes one of quality assurance in teacher preparation. How does developing nations struggling to meet EFA goals assure the quantity of teachers without sacrificing quality? Developed nations have policies in place regarding licensure, preparation, testing, and standards. Teachers in Australia are licensed through a process called registration [8]. Some schoolteachers in France must pass the *Ceritificat de aptitude au professorat de l'ensiegnement to* obtain a teaching license. Among other requirements, Germany requires the completion of an internship that follows the completion of a degree at the university and successful passage of a state exam. In South Africa, the government instituted the National Qualifications Frameworks to ensure the quality of teachers [8].

Are these appropriate models for developing countries where the need for teachers is often so great that quality is sacrificed for quantity? Some developing countries in Sub-Saharan Africa have no formal system of licensing, tracking or testing teachers. Isolated rural areas often resort to the use of poorly trained emergency and contract teachers to staff classrooms. A report published by the International Institute of Educational Planning describes the challenges of teacher management as a departure from implementing a uniform teacher policy that views teachers in a monolithic fashion and treats them as one homogeneous group [3].

This chapter focuses on the dilemma that many developing countries in Sub-Saharan Africa are facing as they struggle to meet EFA goals. The challenges include stretching already thin budgets to meet the needs of growing populations of children in need of education with fewer resources including well trained teachers. Due to the global financial crisis Sub-Saharan Africa stands to loose 4.6 billion dollars in education financing [11]. How will developing countries like those in Sub-Saharan Africa assure both quality and quantity of teachers as they struggle to provide universal primary education? What regulatory policies can and should be developed? What best practices and promising trends in teacher preparation work best for the African context?

2 Background

There was a pledge made at the World Education Forum in Dakar Senegal in 2000. This pledge was made by governments throughout the world who promised to commit time, resources, and energy toward achieving universal education for all by 2015. This pledge has become known as the Education for All (EFA) and has set into motion a worldwide effort to develop sustainable mechanisms to provide a quality education to all as emphasized in the Millennium Development Goals (MDGs). Even prior to the Dakar Forum, plans, policies, and meetings were in the making to improve the quality and quantity of education [8]. The nations of the world assembled at Jomtien, Thailand, in 1990 under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO) developed in 1945 to create conditions for international cooperation. The participants at the Jomtien conference stressed the centrality of education to development and its importance to building a knowledge society. The sustainable development of any nation is partially dependent upon its ability to become a knowledge society [6]. The Jomtien conference also characterized education as a human right. This affirms article six of the Universal Declaration of Human Rights ratified in 1948 and the many subsequent conventions and instruments stressing basic education as both a right and a responsibility.

Focusing on an expanded vision of educational commitment, the Jomtien participants agreed upon a framework for addressing basic learning needs that governments might use to craft their own EFA agenda. Particular emphasis was placed on the learning environment and the critical role that teachers play in the learning process [9]. These affirmations and guidelines from the Jomtien conference became known as the *World Declaration for Education For All* developed by the 155 governments and 150 affiliate organizations that assembled in Jomtien for the historic event [9]. The International Consultative Forum on EFA was developed as an oversight committee responsible for convening meetings and monitoring progress in relation to achieving universal primary education by 2015. Wadi Haddad, the Executive Secretary of the World Conference on EFA sealed the pledge with his statement that the theme of the conference was "above all about people, the most valuable resource" [4].

The theme of human potential continued as the focus of the follow-up conference on quality education held in Amman Jordan in 1996. By the time ministries of education and delegates of organizations met in the capital city of Jordan, there was much progress to report. Primary school enrollments in all but 20 % of the world's developing nations had steadily risen since the Jomtien conference in 1990 [10]. Rising school enrollments conversely required trained teachers that were in short supply in many developing nations, and some more industrialized nations [11]. From 1990 and 1995, approximately 50 million pupils were attending schools in all developing countries. Sub-Saharan Africa and South Asia had enrolled the most students [11]. However, in his opening speech, Director General of UNESCO, Federico Mayor reminded attendees that despite progress, there was much work to be done. The Director General was referring to the 39.3 million children ages 6 to 11 years old that spent their days idling at home or in the streets, and not learning in school [13]. Many of out of school children are girls in rural or remote regions of poor countries [12], [13].

The Amman conference focused on stock taking and progress reporting. The 250 representatives from over 70 nations emphasized girl's education and the expanding role of teachers. Provisions for providing education amid conflict and emergencies were also cited. The *Amman Affirmation* summed up these recommendations in its final report. The *Amman Affirmation* particularly noted the tendency of authorities to view basic education in a vacuum [10]. Influences such as the impact of war and disease on both teachers and students are often under appreciated. While efforts were aimed at providing the world's children with basic education, the need for more teachers and improved teacher training are often overlooked. The report specifically noted that "Apart from the individual learner, probably no other person is as important to the learning achievement as the t e a c h e r" [9].

Recommendations were made to improve teacher quality at the Amman mid-decade conference on EFA. The recommendations specifically focused on increasing teacher salaries, creating positive working conditions, providing professional development, and improving morale. Other important recommendations included mechanisms for teachers to be competent in their content areas and protected by teacher organizations. Others focused on enhancing girl's education by recruiting more female teachers and enhancing teacher quality by developing a system of teacher registration and or certification.

3 Teaching in Fragile Contexts

Fragile contexts are defined as environments impacted by conflict, war, famine, disease, drought, or any situation that renders an emergency state [14]. Increased emphasis is being placed on the contexts in which teaching and learning takes place. The environment in which students live and learn and which teachers teach is critical to the success of the learning process. Shortages of well trained teachers are often a factor of fragile contexts [17]. Teachers and students need heightened security in conflict zones to foster a safe and secure learning environment. In a report on children and armed conflict prepared by the General Assembly of the Security Council of the United Nations noted that the planned and preempted attacks on innocent schoolchildren, teachers, and school facilities were escalating in certain conflict zones like Sudan, Iraq, a and the Central African Republic. The General Assembly decided that this unnecessary violence warranted increased scrutiny and international attention [15].

An insufficient number of qualified teachers also contribute to the fragility of the environment by increasing pupil to teacher ratios [11], [12], [13]. High pupil to teacher ratios significantly impact learning and reflects the difficulties of recruiting and retaining teachers in conflict zones. The ratio of male to female teachers in rural and urban areas is also impacted by the fragility of the environment. Teaching assignments in urban areas are often more preferably than more rural and remote areas where security is tenuous and amenities are few [2]. There are more female teachers in primary schools in urban areas in Uganda and Zambia than there are in more rural and remote schools [12]. The lack of sufficient numbers of female teachers is seen as a contributing factor to the low enrollment of girls in rural areas [10], [13] [14]. Delivering instruction in mother tongue languages in primary grades may help balance or even reduce the corrosive impact of fragility factors. Fragility factors are like risk factors. It is their cumulative effect that can be overwhelming. Conflict, disease, and few female or qualified teachers are fragility factors that mutually reinforce other fragility factors [16].

Uganda is a good example of the difficulty in recruiting teachers in fragile contexts. Uganda is a landlocked country in East Africa that has been ravaged by war, disease, and instability. The Lord's Resistance Army formed in 1987 destabilized the region by displacing some 1.4 million people to bordering refugee camps during the last decade [14]. The situation was exacerbated by cattle rustling, rapid population growth, and political and economic instability, especially in the northern regions of Uganda [14]. As a result Uganda has trouble recruiting teachers. Despite almost 10 million people living below the poverty line in 2003, the town of Kitgum located 452 kilometres from the capital of Kampala only received 180 applications for an advertised 500 teacher positions [14]. It is not surprising that the pupil to teacher ratio in northern Uganda is 90:1. An optimal pupil to teacher ratio is 40:1 [8]. Northern Uganda's pupil to teacher ratio rate is twice the national average of the country, but it is not alone. Pupil to teacher ratios widen when you compare the actual number of trained teachers to the number of pupils. Mozambique, Bangladesh, Madagascar, and Sierra Leone all have high pupil to trained teacher ratios of 80:1 or more. The rate falls to 40:1 when you measure pupils to untrained teachers.

The low turnout for the 500 teacher positions advertised in Kitgum is evidence of a series of inter-related and mutually reinforcing factors. The insecurity of war and conflict is a factor. The low educational levels of the people sometimes referred to as education poverty is a factor that may have resulted in a less qualified pool of applicants. In several northern districts such as Kotido, Nakapiripirit, and Moroto over 80 % of the population of 17-22 year olds has less than two years of education [14]. The lack of interest in the teaching profession may also result from the low status and pay accorded to teachers. Prospective applicants may view teaching as the profession of last resort.

Adequate compensation for teachers is a problem in all but a few countries around the world. According to a Teacher Education Policy Forum report teacher compensation in Sub-Saharan Africa has steadily decreased from 1975 to 2004 [16]. Declining teacher salaries in Francophone Africa and the increasing use of short-term contract teachers in West Africa were cited as possible contributors [3]. Inadequate teacher management policies and cultural practices were also cited.

One source of particular concern was the use of contact teachers or other emergency personnel. Contract teachers are often used when qualified teachers are unavailable. Contract teachers are often minimally qualified, paid less, and given limited duration contracts that may be terminated after a certain period [3]. Contract teachers have been used in Europe, the United States, China, India, Sub-Saharan Africa, as well other countries with some success in increasing access to education in rural and remote areas [3]. However there is a cautionary tale to the use of unqualified emergency, provisional, and other means to staff classrooms. A report examining the use of contract teachers found that while it is important to have flexible pathways to increase access and opportunity in rural and remote schools, relying too heavily on contract teachers undermines the entire system and ethic of quality education [3].

4 Quality versus Quantity

The issue of quality versus quantity of teachers is commented upon in guiding documents on teacher and school personnel. The key standard setting document for international best practice regarding the work of teachers is outlined in the 1966 International Labour Organization (ILO) / UNESCO Recommendation Concerning the Status of Teachers [5]. The ILO is a United Nations affiliate that works with ministries of education, employers, workers and other stakeholders throughout the world advocating for the rights and responsibilities of workers (ILO/UNESCO, 1966). The ILO works in concert with the Committee of Experts on the Application of the Recommendation concerning the Status of Teachers (CEART). CEART monitors and evaluates the progress of the ILO recommendations in the same way that the Global Monitoring Report monitors the progress of EFA. This standard bearer document recommends that states should not be satisfied with the mere number of teachers, but should also insist on the quality of their teaching force. The issue is not quality versus quantity, but quality and quantity of effective teachers.

While the recommendations set forth in this document are not legally binding, they are intended to be persuasive. The 13 provisions set within 146 paragraphs are to be used by policy makers, program planners, and others whose work impacts the lives and working conditions of teachers. The Member States of ILO and UNESCO have been encouraged to use these recommendations as a tool to develop local, national, and even international policies that affect the work of teachers [5].

5 Teacher Policymaking

Several international organizations and governing bodies have been created to establish a coherent set of international guidelines around teacher management. One such body is the Teacher Education Policy Forum for Sub-Saharan Africa. The purpose of this Forum is to provide international dialogue around teacher policy. The key concern is the recruitment and retention of highly qualified teachers needed to achieve EFA goals and provide children with a quality education. The Forum met in 2007 and developed a Teacher Development Policy Toolkit to aid policymakers in crafting more effective legislation regarding teachers [10].

The Teacher Education Policy Forum for Sub-Saharan Africa is a part of the larger Teacher Training Initiative for Sub-Saharan Africa (TTISSA). Organized by UNESCO in 2006, TISSA initiated a ten-year drive to increase the quality and quantity teachers for sub-Saharan Africa. TISSA is composed of education stakeholders and policymakers that recognize the multiple interrelated factors involved in successful teacher management and policymaking. These fragility factors span the social, cultural, financial, and political domains of society. They are often interconnected and mutually reinforcing. TISSA specifically focuses on teacher preparation and considers teacher development as a process of continued learning, growth, and development.

A report on global perspectives of teacher education suggested that policymakers and school administrators should recognize the relevancy of the entire spectrum of teacher learning and experience when making policy decisions [8]. This spectrum is referred to as the continuum of teacher learning. This means that teacher preparation is considered a process of continued learning, growth, and development [8]. The continuum of teacher learning begins as early as primary and secondary school where future teachers are exposed to role models that shape their conception of good and bad teaching. This is called the apprentice of observation [8]. The continuum continues through teacher induction, professional development, and spans the cycle of a teacher's career [7]. The 2009 evaluation of TISSA's goals and objectives in relation to teacher quality found them to be aligned with international best practices. This focus on teacher quality was also deemed vital to the success of EFA efforts [11].

6 Conclusion

The pledge made at Dakar has not come easily and without costs. Balancing the need to increase enrollments have increased the demand for teachers and especially well trained teachers. EFA efforts have strained the budgets of many developing countries, during a time of reduced aid and global financial hardships. Tight budgets need to cover the costs of building schools, textbooks, administrative costs, as well as training, recruiting, and compensating teachers properly. The 2010 EFA Global Monitoring Report identified financing gaps in poor countries ability to cover the associated costs with providing universal primary education. These financing gaps were identified as a significant challenge to reaching EFA targets. Poor countries need approximately 16 billion dollars for basic education initiatives alone. Providing lower secondary education opportunities increased the gap to $25 billion. This represents a significant slice of developing countries operating budgets. Some estimates even suggest that more children may be out of school than previously thought [12]. These discrepancies mask hidden costs in terms of teachers and capacity. For example a review of school enrollment in Senegal revealed that the overall rate of children ages 5 to 11 is much higher than the actual attendance of children in this age group [12].

There are some success stories. Several countries in Sub-Saharan Africa have successfully managed teacher supply and demand resulting in optimal learning environments for students. Burkina Faso, Burundi, Niger, and Senegal all have pupil to teacher ratios within the acceptable limits of 40:1. The education sector in Burkina Faso is noted for implementing novel models of professional development, such as its partnering in distance education initiatives in conjunction with the African Network for Education at a Distance. The Ministry of Education in Burkina Faso cooperated with France and other partners to fund the program. The purpose of the inservice was to increase the knowledge and skills of its headteachers in order to maximize capacity and retention. The program utilized printed modules developed by the participants along with workshops to facilitate the course. Participants varied in their education and expertise. Some headteachers had university training, while others possessed only primary and secondary education [1]. The 2010 EFA Global Monitoring Report framed the dilemma of balancing quality and quality as a non-dilemma. The best of learning materials and school facilities could not negate the effects of a bad teacher. The authors argued that quality was the heart of the whole matter [12].

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An Automatic Indicator of the Reusability of Learning Objects Based on Metadata That Satisfies Completeness Criteria

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Abstract. The search for learning objects in open repositories is currently a tedious task, owing to the vast amount of resources available and the fact that most of them do not have associated ratings to help users make a choice. In order to tackle this problem, we propose a reusability indicator, which can be calculated automatically using the metadata that describes the objects, allowing us to select those materials most likely to be reused. In order for this reusability indicator to be applied, metadata records must reach a certain amount of completeness, guaranteeing that the material is adequately described. This reusability indicator is tested in two studies on the Merlot and eLera repositories, and results obtained offer evidence to support their effectiveness.

Keywords: learning object, reusability, metadata completeness.

1 Introduction

As Downes [5] reminds us, the widely touted concept of the learning object was driven, at least in part, by the hope that sharable and reusable learning resources would reduce the cost needed to produce them. It seems clear the most attractive feature of learning objects is their reusability, meaning the effective use of a learning object by different users, in different technological environments and in different educational contexts [15].

However, in spite of these expectations, the current rate of reuse is not as high as might be expected [13]. One of the main factors that conditions the reusability of learning objects is the likelihood of them being located by users. An algorithm should be developed to automatically order the resources returned by a search for learning objects, otherwise searches in repositories might return a huge number of resources, complicating the selection of the most suitable resource and therefore lowering the rate of reuse [2].

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In order to tackle this problem and help to locate learning objects, most repositories have developed user and expert rating initiatives. However, as Kelty et al. [10] point out, recommending learning objects based only on expert reviews is not practical due to the high cost of carrying out this task manually. This situation can be found in repositories such as Merlot, where only a small proportion of the materials are graded. At the same time, user reviews - like the comments section in Merlot - have major limitations, for various reasons such as lack of user training or possible subjectivity according to taste. In addition, only a small number of users carry out these assessments, so their evaluations might not be representative of what users on the whole feel [9]. One weakness common to both expert and user evaluations is their manual nature. However, for a measure of the quality of learning objects to be useful, it must be possible to calculate it automatically [12].

One of the proposed solutions to this lack of an automatically calculated indicator is Ochoa and Duval's [14] relevance measures, which use values from the search carried out by the user, from the metadata of learning objects, from object usage records and from context information. However this proposal has still not been sufficiently tested. One solution that has already been implemented consists of using the usage data to recommend educational materials, as in the Connexions repository.

In contrast with the proposed solutions listed above, in this article we suggest an indicator to order the learning objects according to their reusability. This indicator is based only on metadata and can be calculated simply and automatically. For the indicator to work correctly, the metadata records will need to comply with a certain degree of completeness in terms of metadata, to ensure that they are adequately described. Metadata completeness is measured according to a fine-grained metric system, which takes into account the effect of multiple values of multi-valued fields and can be fully customized to reflect the needs and preferences of its users [11].

The rest of this paper is structured as follows. Section 2 explores factors affecting the reusability of learning objects, and Section 3 proposes the reusability indicator. In Section 4 completeness of metadata is analyzed. Section 5 then reports findings from a study concerning the reusability indicator and completeness of metadata for learning objects, using two samples of resources found in the Merlot and eLera repositories. Finally, conclusions and future lines of research are provided in Section 6.

2 Reusability Factors

The factors that determine the reusability of a learning object can be classified as structural, technological or educational [4], [8], [15].

From a ***structural*** viewpoint, reusable learning objects must be:

Self-contained: A learning object should make sense in isolation. References to other resources will decrease reusability, and the more prerequisites attached, the less likely it is to apply to other contexts. There is a consensus over the fact that a learning object must be designed with reusability in mind, and therefore be self-contained [6].

Modular: a learning object must be combinable with other objects to form composite structures such as lessons and courses.

Properly grained: proper grain size and a proper learning objective will facilitate reuse of a learning object. A learning object should have a single clear learning aim [16].

From a contextual viewpoint, the more context-dependent and context-specific a learning object is, the more limited its reusability will be. We can deal with contextual factors in the technological and educational dimensions.

The ***technological*** dimension of context includes platform dependencies and software needed to run the learning object, as well as representation issues (reusable learning objects should separate content from format issues). In addition a learning object should be traceable, easily identifiable via the correct metadata, which leads us to the need for completeness of the metadata.

Educational contexts should have the following characteristics: learning objects must be generic, i.e. subject- or discipline-independent; they must be usable at different levels of education and assessment; they must be pedagogically neutral, i.e. not involve a specific pedagogical method. When shifting educational level, we can accommodate vertical and horizontal reusability [3]. Vertical reusability means a learning object can be reused at different educational levels; in contrast, horizontal reusability determines the extent to which the object has interdisciplinary validity.

Designers tend to produce objects with multiple dependencies to enrich the learning process, rather than independent self-contained objects which may contribute less significant knowledge. Designing self-contained, properly grained objects containing both structural and contextual aspects that do not jeopardize reusability is a challenge [1].

3 Reusability Indicator

The above identified factors, which affect reusability, are related with metadata that have information to quantify them, from the application profiles in Merlot (http://www.merlot.org) and eLera (http://www.elera.net), as shown in Table 1.

The following formula (1) describes the calculation for the reusability of a learning object *o*, incorporating each of the factors that contribute to it.

Table 1. Mapping between reusability factors and eLera and Merlot metadata elements

Reusability factors		**eLera**	**Merlot (Material Detail)**
Structural	Self-contained Modular Properly grained	Resource type	Material type
Educational	Generic Different educational levels Different academic disciplines	Educational context Language Subject	Primary audience Language Categories
Technological	Hardware dependencies Software dependencies Format dependencies		Technical requirements Technical format

$$Reusability(o) = \alpha\,Structural\ (o) + \beta\,Educational\ (o) + \gamma Technological\ (o) \tag{1}$$

Where α , β , γ represent the weighting of the different reusability factors and where all factors will take values ranging from [0-5]. Whenever one of the required pieces of data is absent, the weightings are adjusted in order to not penalize its absence in the reusability calculation, always ensuring that $\alpha + \beta + \gamma = 1$.

4 Completeness of Metadata

Completeness of metadata refers to their sufficiency to fully describe a resource covering all its possible aspects. Theoretically, a sufficient description exists when all metadata elements of a metadata schema are populated with values. However, the measurement of completeness is not just a process of marking the presence or absence of a value in a metadata element.

In order to measure completeness of metadata and ensure that the learning objects to be tested for the reusability indicator will be adequately described, we used the fine-grained metric system for metadata completeness, which is introduced and analyzed in detail in [11]. This metric system defines completeness at the element level – instead of the record level. A metadata element is a container bearing a variable amount of information, according to its position in the hierarchy of the metadata schema, its multiple values (in case its cardinality is greater than 1), its relative degree of importance for a given user and its value's multiple representation forms that could potentially be present in the element instance. These factors, which influence the calculation of completeness in the respective mathematical formula, are adjusted by the user setting relevant parameters, according to his/her requirements.

In the case of Merlot and eLera application profiles, the metadata elements used are all at the same level, since they follow a flat structure. Furthermore, there is no datatype for the values of the elements, expressing different representation forms of a value. Thus, completeness metrics is customized according to the user's requirements, only by setting the relative weights of importance of each element and the minimum number of values of the multi-valued elements in order to consider them complete.

For Merlot, we assigned a weight of importance for each one of the Merlot Material Detail elements of Table 1 (ensuring that the sum of the weights is equal to 1) and a minimum expected number of values for the multi-valued elements Categories, Primary Audience and Language that would make them complete. Likewise, a weight of importance was assigned to the eLera elements of Table 1 and a minimum number of values for the multi-valued elements Subject and Educational context. Having set the parameter values, metadata completeness was ready to be calculated according to the respective mathematical formula found in [11].

5 Results

To carry out our research a set of learning objects were selected from Merlot and eLera. In our case study of eLera, all objects with at least one rating were selected, giving 95 objects. In the Merlot case study, only those objects added to the repository between 2005 and 2008 which had peer review ratings and comments were selected, allowing us to analyze a final sample of 91 objects.

5.1 eLera Case Study

We set 0.6 as the completeness threshold for the metadata, and found that only 83 objects met this requirement. The 0.6 threshold ruled out records lacking essential information, as missing values, of the heavily weighted multi-valued elements Subject and Educational Context or the single-valued Resource Type element.

Once we obtained the set of objects adequately described by their metadata, we proceeded to make a quantitative estimate of the factors that contribute to their reusability. For the *Structural* factor we have the Resource Type metadata item. This field takes different values that indicate a higher or lower level of reusability, for example materials labeled Reference Material will be more reusable than those flagged as Narrative Text. In terms of the *Educational* factor we have the Educational Context, Language and Subject metadata items. The greater the number of grade levels present in Educational Context, academic disciplines included in Subject and languages the materials are available in, the greater the reusability. In this application profile we find no metadata to calculate the Technological factor, so it is not considered in our final reusability calculations.

We calculated the reusability indicator and compared it with the Reusability rating from user evaluations in the eLera repository. In order to measure the efficiency of the indicator we analyzed the quality of prediction.

$$pred(l) = {}^{i}\!/_{n} \tag{2}$$

Where l is the chosen maximum relative error size, i is the number of data items where the relative error is less than or equal to l, and n is the number of data items in the sample [7]. The results obtained show that $pred(0.3) = 70\%$, indicating that for 70% of the learning objects studied the reusability indicator calculated has a difference less than or equal to 0.3 compared with the Reusability rating made in eLera.

5.2 Merlot Case Study

Of the 91 objects selected from Merlot, 83 have a completeness measure greater than or equal to 0.6. Records that did not pass this threshold were mainly records with missing values in the Categories, Primary Audience, Technical Format and Technical Requirements elements.

For these 83 objects we calculated the three reusability factors - *Structural*, using the metadata item Material Type, *Educational* using the metadata items Primary Audience, Language and Categories, and *Technological* using the metadata items Technical Requirements and Technical Format. To calculate the *Structural* and *Educational* factors we followed a process identical to that explained for the eLera repository. For the *Technological* factor we considered the most reusable objects those that had more common formats and requirements that were easier to fulfill.

In this repository no specific Reusability rating is available to check the validity of the reusability indicator. However usage data is available, such as that provided by

Personal Collections, indicating the number of times that an object has been stored in users' favorites lists. What we actually studied is the extent of the correlation between the calculated reusability indicator and the number of Personal Collections in which an object appears. Since an older object may have had more opportunities to be chosen, we standardized the value of Personal Collections dividing by the number of months the material has been available. We then used Spearman's Rho, obtaining a correlation of 0.243, significant at the 0.05 level (two-tailed).

6 Conclusions and Future Work

The results obtained support the idea that we can obtain a measure that allows us to automatically estimate reusability. This aprioristic indicator can be obtained for those learning objects that meet reasonable standards of completeness of their metadata records, since otherwise it is impossible to ensure that we have the information necessary to make a recommendation. The fine-grained metric system for the completeness of metadata that we used served this purpose. It is worthwhile to note that if we had followed a traditional approach for the measurement of completeness (not taking into account the multiple values of the multi-valued elements and the weights of importance of all the elements), the 0.6 threshold that we set would have been passed by all selected learning objects. Instead, the approach we followed produces a quite bigger number of different values for the completeness measures of the set of learning objects tested, thus offering the advantage of a more flexible selection of the completeness threshold (the dispersion of the completeness values is much larger).

The main advantage of this reusability measure over current systems of recommendation is that it could be calculated automatically, improving the current situation where manual evaluations by experts only cover a small proportion of the learning objects available in the repositories.

Future studies will examine the possibility of developing an application that can access the repositories and allow us to calculate the completeness of metadata records and automatically calculate the reusability indicator.

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Recognizing the "Transformational" in Preservice Digital Literacy Assignments

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Abstract. The authors review and evaluate a Teaching Methods course in Language and Literacy, one which focuses on multiple literacies, including digital literacy and critical literacy. The course is offered in a laptop-based university program. In this article, the authors outline the context of the multiple literacies course, its resources and assignments as well as their instructional goals. Their qualitative data sources include student-created digital artifacts such as digital literacy stories and digital book talks. The researchers draw from cross-program data based on hundreds of student reflections and one-on-one interviews. The authors conclude that there are indications from their data analysis that suggest that digital literacy supports the development of "transformative elements" that can extend beyond the teacher training program.

Keywords: digital literacy, multiple literacies, techno-centric, teacher preparation, educational technology.

1 Introduction

This article describes experiences over the past three years in a teacher preparation Language and Literacy teaching methods course which focuses on multiple literacies including digital and critical literacy. In the first section of the paper, we outline the context of the course, our instructional goals, and the theoretical framework underpinning our instruction. Next, we describe our investigation to determine to what degree and how digital technology has enhanced our students' ability to grasp and teach key constructs. Our "students" are teacher candidates in a one-year teacher preparation program in a laptop university. Because we believe that helping new teachers become change agents for their digital world is a worthy instructional goal, we analyze their reflections and their practice teaching for "transformative" elements. We conclude with a discussion of the implications of our findings.

We are preparing teacher candidates to teach in a digital age; accordingly, our language and literacy course goes beyond the traditional print text. We know that teacher candidates engage with new digital media regularly in their out-of-school lives and we want them to be familiar with the out-of-school digital practices of their future students. We work from an "asset model" that assumes that using new technologies can work as a benefit to literacy instead of as a deficit (Mackey. 2002). We realize

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also that multimedia technologies require new teacher skills and competencies if education is to remain relevant (Kellner & Share, 2007). Because we consider that technology has transformative possibilities – it has the potential to help students make positive changes in their world, our language arts methods course begins with a focus on social justice as well as digital media and multiple literacies. We maintain this explicit multiple focus throughout the duration of the course.

We begin our Literacy Methods course by immersing teacher candidates in the complexity of multiple literacies (Bearne, 2003; Cope & Kalantzis, 2000; Kress, 2003, Lankshear & McLaren, 1993; Mayer 2008). Here we include media literacy, critical literacy, computer literacy and digital literacy. Immersing them in complexity is a deliberative design (New London Group, 1996) and we see ourselves as designers of intentionally-complex learning processes. We ask our teacher candidates at the outset to engage with multiple literacies within the social constructions of experience, culture and education.

2 A Multiliteracies Pedagogical Framework

The New London Group (1996) proposes a theory of multiliteracies pedagogy in which they identify that learning's fundamental purpose is to ensure that, "students benefit from learning in ways that allow them to participate fully in public, community and economic life." (p. 60) They propose four underlying pedagogical components: situated practice, overt instruction, critical framing and transformed practice. Embedded within these four components is a socio-cultural, socio-constructivist approach to literacy which we infuse into our methods course.

The first course assignment is the creation of a digital story that presents the significant literacy events in their lives, positioning our students as both producers and consumers of media. Garrety and Schmidt (2008) outline emergent and distinct genres of digital storytelling and see that each genre addresses a different function and purpose. They identify *reflective practice* digital stories as a genre that encourages teacher candidates to apply higher-order thinking such as metacognition in order to grasp and synthesize more difficult educational concepts.

Significantly, we invite but do not require them to share their digital stories with their peers. We ask them to reflect and seek deeper meaning from both the production and the viewing, considering how literacies develop within a global context of education and society's constructed realities of advantage and difference. We position them to examine and to reflect on the mosaic that is offered to them by viewing, hearing and experiencing the literacy and life experiences of their peers. Through this process, we encourage them to seek deeper meanings - not just about literacies, but about how these media representations of education and experience can help us to examine our notions of advantage, disadvantage, social difference and the complex routes through which learners come to "know."

We support their learning in a deliberate way; readings and resources are carefully selected to build their capacity to look beyond the literal meaning of texts and embrace complexity. When we read a story or model instruction based on a commercial resource, we ask them to observe what/who is present or missing; to evaluate the text's complete meaning and the author's intent; and to focus on issues of fairness, equity, and social justice. Our teaching goal is to immerse our teacher candidates deeply in conversations about issues of privilege; difference; representation; assumptions of neutrality; and marginalization. In doing so, we model the social justice strategies that are detailed in the course readings.

Their second assignment focuses on social justice. We ask them to frame their pedagogy within an understanding of the social, political, cultural and ideological systems at work in education and society (New London Group, 1996). We introduce them to a framework of critical literacy practice that has four dimensions: a) disrupting the commonplace; b) interrogating multiple viewpoints; c) focusing on sociopolitical issues; and d) taking action and promoting social justice (Lewison, Flint & Sluys 2002). The teacher candidates select a book that has a clear social justice, diversity or equity issue or message and prepare a "digital book talk" explaining how they would use this book in their future classrooms.

The final assignment is to create a critical media literacy lesson to use in future classrooms with their students. We discuss the ubiquitous presence of media and the dangers of a compliant and uncritical public. We emphasize that media teaches values, beliefs and behaviour that we often absorb unconsciously and uncritically. Our teacher candidates are the first generation to learn the skills of media construction and deconstruction and they are building media literacy skills alongside their future students. Our critical media literacy approach includes discussions about the societal realities of culture, gender, race, social class, abilities and sexuality - geared toward a goal of teaching an understanding of larger notions of power and control, privilege, and hegemonic norms.

Our central research question became to determine if and how our deliberative strategies for their learning impacted our teacher candidates. As researchers of our own practice, we next identified elements that would indicate that their learning in this methods course had resulted in transformative elements that could be made visible in data collection.

3 Methodology

We are fortunate that our program affords us almost unlimited data sources to review in our efforts to analyze and weigh evidence of progress toward our stated goal of transformative teaching. We have the digital stories, digital book talks, media literacy lessons, and reflections from three years of teacher candidates. Following the course, we invite them to participate in interviews and to send us examples of how they have used the digital assignments in their practice teaching in schools. We analyzed our students' output data from the perspective of whether or not the work they produced had transformative elements. We looked to determine if our teacher candidates were taking their new knowledge and skills and replicating them or using them in new ways. We looked for evidence that they were introducing elements of critical pedagogy (such as questioning voices, silences and representations) into their own teaching practice. In the section that follows, we have organized our key findings.

4 Findings

We discovered that many took the digital story assignment and repurposed the concept in their own practice teaching sessions in a multiple ways: to consolidate student learning on a topic; to present stories to engage the class; to engage their own students in guided and shared writing; to feature the students' own voices in presentations for parents or for assemblies; and to introduce critical media studies. Others used the software to introduce themselves to the class or to say goodbye when their practice teaching ended. One teacher candidate used the digital story to help students understand the level of preparation that goes into a presentation. Through this project our teacher candidates in general said that they had "discovered" the importance of allowing students to use a variety of modes of expression. The digital story assignment helped them develop a conceptualization of the teaching of narrative, one that encourages lifting the story from the printed page. In general while we found ample evidence of repurposing the digital story, there was less evidence of repurposing the digital story for critical purposes.

As we anticipated, some teacher candidates reflected that initially they found the instant immersion into a digital multiple literacy assignment somewhat intimidating while others found that it presented a unique and engaging challenge. What emerged from our research was the finding that the feelings of anxiety and pressure were short-lived and quickly replaced with increased feelings of confidence and expertise. No teacher candidates indicated that the digital medium was restrictive- rather, they consistently indicated that it created more spaces within which to present their ideas. They saw the digital elements of the assignment as powerful and enabling. A common comment was that the digital story opened up more spaces for expression than pre-digital storytelling.

A significant finding was that many teacher candidates commented that the real power of the digital story assignment was in the viewing of their peer's digital stories. When discussing the viewing of others' stories, one student wrote, "I believe that it gave me a look into their souls." They learned from their peers' successes and struggles with literacy that their future students will come to the classroom with varied experiences and abilities. Through the digital stories, they "saw" the need for differentiated instruction.

The "Make a Difference" book talks provided ample evidence for us that our teacher candidates were able to plan learning activities that would include social justice elements. In their lesson descriptions, teacher candidates included many transformative comments such as this one,

> Since many cultural stereotypes are ingrained in our society, our social justice teaching should focus on eliminating these perceptions with early intervention in our schools. In fact, we have an ethical obligation to expand our children's horizons, to socialize them into the global culture which represents our new reality.

Another teacher candidate wrote that she learned from the exercise that introducing social justice topics was much easier than she had expected. She described her insights about including a book that gives "a gentle" introduction into the concept of families that includes gay families. She stated her intent to include the book "One Dad, Two

Dads" (Valentine,1994) as part of a larger unit that looks at family. She concludes that books about gay families are not about being gay but they are about the things that many families do, such as raising children, caring for pets and family celebrations. This is evidence of her repurposing the technique from her language arts class, and applying critical analysis and reflection about the teacher she wants to become.

One of the findings related to the students' media literacy lesson plans was that teacher candidates used technology to teach about media literacy and uses of technology were wide-ranging. A second key finding was that most of the teacher candidates were able to address media literacy in a critical sense with varying degrees of depth of understanding. Most of the teacher candidates used video and YouTube and similar innovations in their media literacy lesson plans. For example, one teacher candidate wrote a lesson on product placement in movies and used movie clips to teach the concept of overt and implied messages in media. Another collected media clips of commercials depicting competing political candidates. In her lesson students were encouraged to deconstruct how each of the candidates "positioned" himself or herself in their commercials. She introduced the concepts of bias and position to her students. She encouraged the class to consider how the message has been constructed and why different students receive the messages of the commercials differently. While we were not able to measure the learning of the students of our teacher candidates, we were able to analyze whether or not the teacher candidate understood the concept with sufficient depth to plan a media literacy lesson.

5 Discussion

Harste (2003) argues that "the redesign of curriculum begins with reflexivity; the self-reflective interrogation and critique of what it is we have been doing" (p. 11). Our research leads us to reflect on our practice and make important decisions about how we model critical digital pedagogy. Our findings afford us a heightened appreciation of the important elements of a multi-literacies pedagogy. We are reminded by our teacher candidates' comments that our role as teacher educators is to model compassion and the creation of safe places for our teacher candidates to learn to absorb the complexities and often unsettling viewpoints that will become evident when the spaces are opened for a counter-cultural discourse. It has become increasingly clearer as we immerse ourselves in the study of this program, that literacy teaching in a digital age needs to be "reimagined" and that we must "reconsider taken-for-granted assumptions, goals, and practices" (Selber, 2004, p. 23). Perhaps our experience offers a suggestive model of how to use new media in a preservice language arts teacher preparation program and will encourage others to explore the transformative potential of digital storytelling in teacher education programs.

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Getting Ready for the "School of the Future": Key Questions and Tentative Answers

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Abstract. This paper explores some key aspects of "today's school", as opposed to those that have characterized "yesterday's school", with the final aim of shedding light on "tomorrow's school". In this direction, the paper puts forward tentative answers to some key questions related to the new characteristics and roles of teachers and students (main actors of the learning process) and the new features/ potentialities of contemporary educational tools which, in turn, require the enactment of innovative pedagogical approaches and educational methods. The emerging picture of the present learning landscape helps in figuring out a future situation where learning possibilities are substantially increased.

Keywords: Formal Education, Learning Innovation, Educational Approaches, School Systems, Technology Enhanced Learning.

1 Introduction

Education is a key issue in the 21st century Knowledge Society. In Europe, following the 2000 Lisbon Agenda, the relevance of education and training has been further highlighted in a number of recent declarations by both the European Council and the Commission[1,2].

This paper looks at educational systems in the light of the wide amount of novelties brought about by both the fact that education is increasingly felt as a particularly prominent aspect of today's Knowledge Society (Lytras and Sicilia, 2005) and by the current widespread adoption of ICT (Information and Communication Technologies) for educational purposes.

At present the fact that ICT tools may provide education with a significant added value is almost unquestioned, but still there is a lack of shared vision about the role ICT should play in education (Twining, 2007). Thus considerable research efforts are directed at making the most of the potentialities offered by these new tools to education and training, also by acknowledging that - as suggested by Ferrari et al. (2009)

[1] Available at: http://www.nqai.ie/docs/international/Lisbon_Report.pdf (Accessed January 2010).

[2] Available at: http://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/ec/89013.pdf (Accessed January 2010).

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- "*the upsurge of new media and technologies that learners use in their everyday lives can be exploited in creative and innovative ways and contribute to formal and informal learning*". As a matter of fact, a "new learning generation" is around. The "new" students, who are actually "digital native" (Prensky, 2001), make wide use of ICT in their everyday lives for both leisure and communication/social interaction purposes. This emerging situation affects learners' choices and attitudes, as well as their expectations and needs (Punie & Carneiro, 2009); an entirely new learning landscape is emerging, where the instructional use of digital devices, applications and services is becoming more and more widespread and where, as a consequence, new educational approaches are envisaged.

Fig.1 briefly summarizes an all-round view of this "new" learning landscape where "new learners" are at the core and the whole learning process is seen as the result of the interactions among "new tools", "new teachers" and "new pedagogies" (i.e. the new pedagogical paradigms/choices adopted by new teachers by taking into account the new/augmented functionalities of new tools).

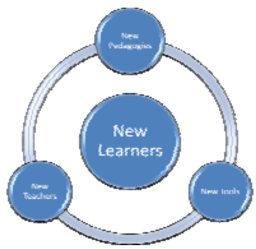

Fig. 1. Key elements in the new learning panorama

In the following, we look at the educational landscape sketched above bearing in mind that living in the Knowledge Society (and working to exploit its potential) actually implies an adaptation to the current "*social, cultural, economical, political and institutional transformation*" and that it also requires one to "*assume a more pluralistic and developmental perspective*" (Khan, 2003). This paper doesn't directly tackle the ambitious issue of discussing how to make the most of the potential of ICT applications to build up the "school of the future": it rather aims at exploring the present educational situation and some key aspects that make it genuinely "new". In doing so, starting from the consideration that a number of potentially effective new educational tools are available, it puts forward some tentative answers to a number of the key questions involving students, teachers and educational methods.

2 "New" Learners: Who Are They?

The feeling that today's learners are to be considered as "new", has led to the creation of a wholly new term to identify them: the "new millennium learners"[3]. Who are,

[3] OECD definition. Available at:
http://www.oecd.org/document/10/0,3343,en_2649_35845581_38358154_1_1_1_1,00.html
(Accessed January 2010).

then, these new millennium learners? Unfortunately, drawing an exact picture of the "typical millennium learner" is not easy and would require taking into account many different perspectives: what is universally acknowledged, as said above, is that they are "digital native" (Prensky, 2001) and have strong familiarity with ICT. Midoro (2010) casts a glance at the new learners and focuses on those radical educational changes brought about by the need to suit their needs, thus also arguing that there is an evident need to globally rethink the educational processes to be enacted. In order to explain his idea of the "new school", he also provides the pictures of two different classrooms (the first picture-Fig.2 left side- was taken at the end of the 1950s while the second one- Fig.2 right side- is contemporary).

Fig. 2. A primary school class: left side year 1958, right side year 2009

In addition to a number of significant considerations emerging from the comparative analysis of the two classes, the author points out that the second picture instantiates one of the key aspects to be carefully taken into account: the new millennium learners are certainly a multifaceted group of individuals, whose individual and cultural differences must be considered and valued to the greater possible extent. In this view, the entire group of the new millennium learners should not be represented (as in the past) as a homogeneous set of individuals (Fig.3 left side) but as a multifaceted and complex community (Fig. 3 right side), where differences should be carefully considered and regarded as a value.

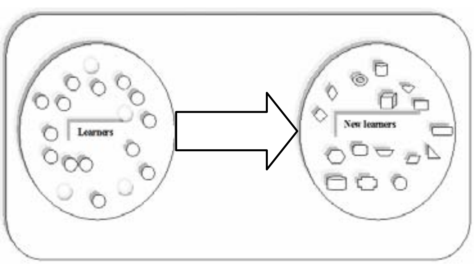

Fig. 3. New learners as a group of different individuals

3 Teachers: Should They Be "New"?

Teachers need to adapt to the new, emerging learning panorama and to take into account on the one hand the new goals to be attained in the knowledge-based and knowledge-oriented society and, on the other, the new characteristics, attitudes and tastes of the "new millennium learners". Besides, managing technology for a teacher may take a great deal of time and intellectual energy: teachers should certainly possess new skills and capacities in the technological field, as they actually need to be aware of the possibilities offered by the technological tools and the way they function. To them it may be demanding, both to select appropriate tools and resources in accordance with specific learning objectives and with the learners' needs, and to know and adopt new methods to effectively incorporate the chosen educational resources into mainstream educational activities. It is also required that they have the willingness and the capacity to assist learners while they use technological tools. The traditional techniques of class instruction and scheduling are brought into question, the type of activities to be done may change, changing the ways in which the teacher facilitates learning, and also changing the ways in which learners tackle educational tasks. Basically, the teacher's function in the new classroom incorporates mediation, modelling, and coaching, and this requires a high degree of adaptivity to new learning/teaching schemes, models and tools. As a matter of fact, the teacher's primary role shifts from that of information giver, to that of facilitator and guide (Lytras, 2007).

4 Teachers – Students Relationships: What "New" Dynamics?

As a facilitator, the teacher is required to become personally engaged in public and private dialogue with students, in order to assist them (face-to-face and online) throughout the whole learning process. S/he should also think of how to promote and orchestrate collaborative study, and often needs to become a co-learner and co-investigator together with her/his students.

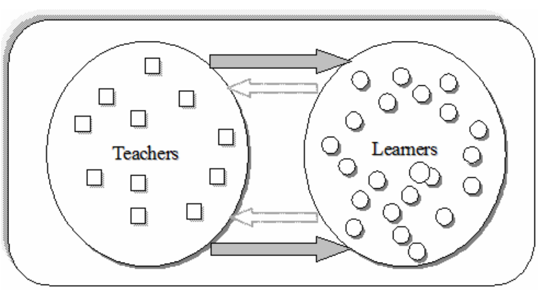

Fig. 4. Traditional relationships between learners and teachers

Fig. 4 recalls the traditional, now obsolete, situation where teachers mainly acted as the information providers and students were mainly considered "recipients" to be "filled" (the grey arrows show the prevailing direction of the interactions between the two groups). The two groups are represented as separate and the members of each group (teachers /learners) are depicted as similar (teachers-squares; students-circles) as their specificities are not considered very important.

Fig. 5 represents, instead, the new learning situation where learners, who are represented by different shapes to stress the value of their individual differences, assume the central position and are linked (work together, cooperate, network) with pairs and have reciprocal, frequent interactions with teachers, who also work in a team and not in isolation (and are therefore represented as connected, although multiple, individualities).

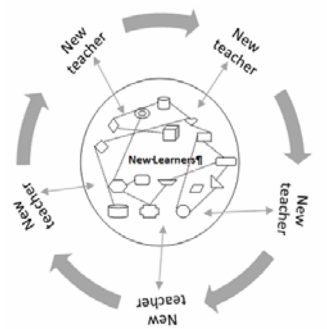

Fig. 5. The new learning community

In this last view, teachers and learners who actively interact and work together, form a new learning-community, which foresees a multiplicity of interactions among the actors (learners –learners/ teachers/ learners/ teachers-teachers).

5 What "Novelties" in the Educational Approaches?

Even in such a new learning community, the relevance of a teacher-driven pedagogy cannot be questioned, and there is evidence that the pedagogical choices made by teachers and the overall pedagogical approach adopted by them represent a concrete value to broaden students' learning opportunities and foster learning: new tools and new pedagogies are strictly intertwined and ideally connected. Among the wide variety of possible pedagogical choices a teacher may take as a consequence of the availability of the new tools, we broadly distinguish among: active learning, personalization of learning activities, collaborative learning.

Active learning happens when the learning process leads students to "building and reshaping understanding as a natural consequence of their experiences and interactions within learning environments that authentically reflect the world around them" (Grabinger et al. 1997). As underlined by Dufresne et al. (1996) emerging technologies (including communication systems) offer promising tools to help instructors creating a more interactive, student-centred classroom, where the learner plays an active role in constructing knowledge. A wide variety of examples of ICT-based active learning environments are reported in the literature and the effectiveness of this approach on the learning outcomes are underlined (Eysink et al., 2009). Coming to the second approach, we recognize that one of the most interesting new possibilities offered by new technologies is the personalization of educational activities, which meet the individual needs of a wide range of learners. As to the latter possibility, we are witnessing that students are dedicating an increasing amount of their leisure time to the use of online communication tools (such as instant messaging, chat, VOIP tools, forums, mailing lists, blogs, wikis etc...). With the increased availability of such technologies, including those for “mobile learning” (Diamantini & Pieri, 2008), there is greater scope for educational applications aiming at constructing knowledge by means of cooperative learning (Sigala, 2007, Augar, et al., 2004).

6 Conclusive Remarks

In this paper we have briefly depicted the contemporary learning landscape, paying specific attention to what we consider the main emerging novelties and their most significant functional implications: starting from the widely acknowledged assumption that “new” technological tools have a high potential to foster and increase learning possibilities, we have underlined that in almost all the formal educational contexts, ICT tools do not make the difference *per se*, simply by being used: rather, what is likely to produce significant improvements on the effectiveness of the whole educational process, are the pedagogical ideas and the educational approaches underpinning the learning activities to be enacted. Innovation cannot cross the school’s threshold without teachers’ deep and convinced involvement and the effectiveness of the very majority of educational actions mainly depends on the choices they make (as far as both the tools and the educational methods to be adopted).

By acknowledging this, Midoro (2010) also underlines that radical and not slight changes are required to the educational systems to pave the way to the “school of the future”. Not only should the school system be able to offer continuous and qualified training to teachers, but also it should provide support to the teacher who adopts new tools and approaches in his/her practice, by proving the suitable equipment and infrastructure, and also by affording a constant technical support. The new teacher’s role and students’ attitudes should also find a counterpart in the curriculum and the overall evaluation method, that should demonstrate a certain flexibility, so as to allow the teacher to feel free to adopt innovative tools and methods, without being limited by “bureaucratic” constraints. As a matter of fact, in order to make the most of the adoption of the “new” tools, radical changes and modifications in educational contents, dynamics, approaches and structures are required: educational change is an on-going, long-lasting process that needs to be pursued with determination, despite the significant challenges it poses.

Unfortunately, if we look at contemporary school systems in the majority of European countries, what we see is not really a setting ready and open to encompass and treasure the announced novelties. Our school systems are often old and not flexible enough in infrastructure and organization to welcome either new students, new teachers, new tools, or approaches. Following UNESCO (2005) observations, we can probably say that an overall “open” and “forward –looking” vision of what the future of education will/could be, is still lacking and that genuinely new perspectives in education will be opened only if also those fields and aspects of education “*that are not* *central or even non-yet-existing in the traditional school, but vitally important for modern society*" are considered and valued.

Coming back to the picture of a new learning landscape proposed in the introduction, and considering the issues raised in this paper, it seems that Fig. 1 may well turn into Fig. 6 (right side), which represents the same elements at play, but within an "open circle", so to indicate that each of us can think and imagine that further elements will hopefully contribute to build up an increasingly effective "school of the future".

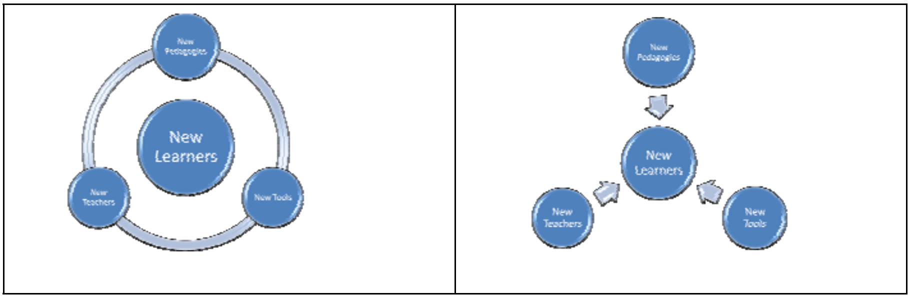

Fig. 6. A new vision for an "open school of the future"

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Modeling Project Management Competences: An Ontology-Based Solution for Competency-Based Learning

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Abstract. Due to growing requirements for skilled workers, the education should value the outcome and address students' real performance in life. A learning process turns out to be good when the degree of transformation made possible through that process is high or the degree of competences increases. Current paper indicates e-learning as a suitable activity for competences development. The authors also argue that a proper competences modeling solution would increase the efficiency of competence-based learning. Consequently, an ontology based solution is presented for project management domain.

Keywords: project management, competency-based learning, e-learning, educational ontology, competence catalog.

1 Introduction

In the current complex economic environment, knowledge is seen by countries and by business organizations as a key factor for competitiveness. Taking into account the globalization phenomenon, the information technology revolution and the world economic crisis, people need to evolve quickly, for achieving sustainable growth. This can be achieved only if every individual has the necessary competences to live and work in this new society [1].

A common way for workers from knowledge society to develop their competences is through learning. The importance of learning is also proven by the variety of trainings held in firms and organizations and by various tools meant to develop employees' skills [2] or to fill knowledge gaps [3]. Selection for suitable learning activities for competences development has, without a doubt, a tremendous impact on firm well being and, as well, on individuals' well being.

Current paper indicates e-assessment as a suitable activity for competences development. The authors also argue that a proper competences modeling solution would increase the efficiency of e-assessment in competency-based learning. Such a solution is presented for project management domain.

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2 Challenges in Competency-Based Learning

A learning process turns out to be good when the degree of transformation made possible through that process is high or the degree of competences increases. Researchers have emphasized the importance of an education which really creates competences needed for productivity or job performance [4]. This type of education, which values the outcomes and addresses students' real performance in life, is named competency-based learning [4].

Competency can be defined as the combination between knowledge and ability to apply that knowledge. As competency is strongly related to a work environment, competency-based learning is applicable especially to adults learning. Nevertheless, researchers argue about straightening also the high school and university education towards a competency based approach [4]. They try to link the educational content to the outcome, this aspect being the real challenge in competency-based learning.

Among core concepts related to professional competency, there is also the competency assessment ("evaluating performance for the effective application of knowledge and skill in a work setting") [5]. As the information systems are more and more used in work environments, e-assessment applications became a common tool for knowledge checking [3]. In enterprise environments, assessment is seen by managers as a decision tool [7]. But e-assessment is also used as a method of increasing the already acquired knowledge [8] or for transforming the tacit knowledge into explicit knowledge.

Many researchers named various attributes of e-assessment quality [7], [9], but we consider standardization as a global requirement for qualitative e-assessment. Current paper argues that an ontological approach, based on metadata, for managing competences in e-assessment is a solution for increasing personalization, resource accessibility, manageability or compliance with other learning systems [8].

3 An Ontological Model for Competences E-Assessment in Project Management

Projects, which are the most spread organizational structure in knowledge society, join this request for competence development: 'in project management, competence development is one of the critical success factors' [6]. The current study develops an ontological model for project management competences, named PMCatalog and indicates it as a solution for quality increase in e-assessment. The model is based on a professional standard, IPMA Competence Baseline (ICB), developed by the International Project Management Association (IPMA) [10], using the Protégé editor.

3.1 The Structure of the Competence Ontological Model

The PMCatalog ontology structure resembles with a tree with nodes and hyper-connections. It has one metaclass, MyMetaClas and 15 classes, as shown in Fig. 1. The PMCatalog has four abstract classes and 11 concrete classes. The abstract classes are set in a taxonomic hierarchy: the class Catalog from Fig. 1 is the super-class for the

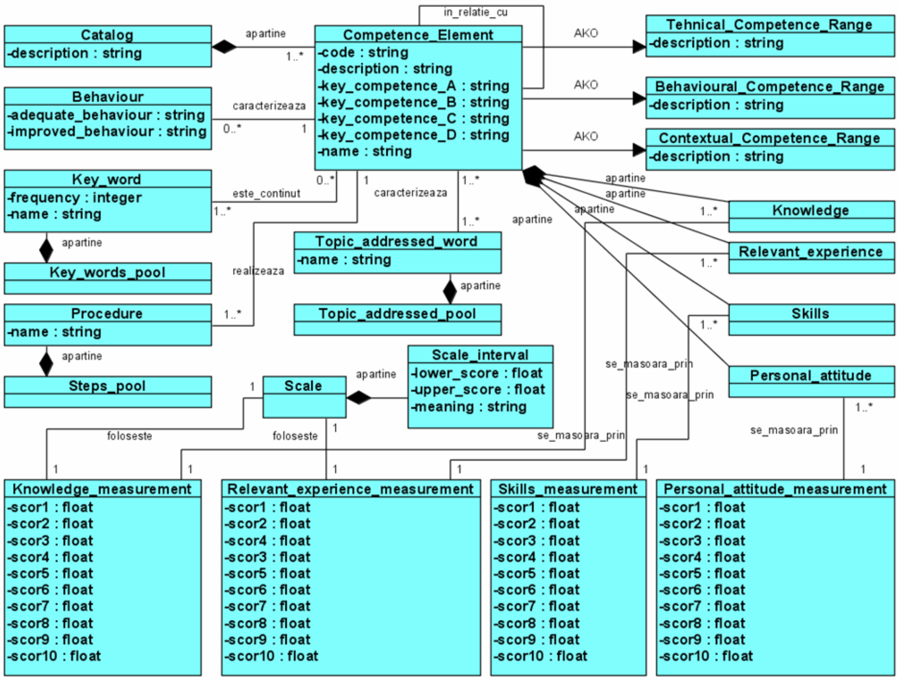

Fig. 1. Class Diagram for PMCatalog Ontology

other three classes – Technical_Competence_Range, Behavioural_Competence_Range and Contextual_Competence_Range. The sub-classes correspond to the three groups of competences from ICB [10]: 20 technical competences for project management, 15 behavioural competences for project personnel and 11 contextual competences of projects, programmes and portofolios.

The slot named “description” is an extrinsic property, which contains a primitive value (a string). Slots are defined at the top level in Protégé, meaning that there is only one slot named description in the knowledge base. It is attached to several classes: besides the Catalog class, another important class which has a description is the Competence class. This class is a concrete sub-class of Technical_Competence_Range, Behavioural_Competence_Range and Contextual_Competence_Range. It has 46 instances, corresponding to the 46 elements of competence of the ICB [10]. This class has the following 16 attributes: *code, description, key_competence_element_A, key_competence_element_B, key_competence_element_C, key_competence_element _D* and *name* (as string attributes), *behavioural_pattern, knowledge_component, personal_attitude_component, procedure, relation_with, relevant_experience_component, skills_component, structured_description* and *topic_addressed* (as instance attributes).

The big number of attributes proves that *Competence* class is the core of the proposed ontology. The other connected classes of the *PMCatalog* reflect the structure of the ICB: each competence element has a title (*name* in our ontology), a general description (*description* slot), list of possible process steps (*procedure* slot), a list of addressed topics (*topic_adressed* slot), key competence for each of the four levels (*key_competence_element_A, key_competence_element_B, key_competence_element _C, key_competence_element_D*) and main relations to other competences from the ICB standard (*structured_description* slot). The procedures have guidance value: they have the role to make the candidates and the assessors understand how the competence elements can be applied. In ontological language, procedures are instances of the *Steps_pool* class. Topics addressed indicate further reading and internet searching and are instances of *Topic_addressed_pool* class. The logic behind the ontology classes resembles to the one standing behind relational databases. The *structured_description* slot is an instance of *Key_words_pool* class. The key words are indicated at the end of ICB and are meant for comprehensive reading. They should also be reflected in *relation_with* slot, which links competences and helps the candidates to build a cognitive map of ICB elements.

For each competence element, the knowledge, experience, necessary skills and personal attitude are taken into consideration. The classes reflecting these four factors are sub-classes of *Competence* class. The knowledge and experience are measured using a scale where values from 0 (no competence) through 10 (absolute maximum) are used. Knowledge does not mean just correctly reproducing facts, but also understanding relationships, knowing how to apply project management in practical situations and interpreting methods. The individual has the required level of knowledge that is normally provided by answering questions. The project manager doesn't gain much experience from doing the same type of project for many years. He should apply the knowledge in real and different situations (e.g. projects of different sizes, different kinds of projects, different organizations, branches of the organization and/or cultures). The connection between the *Competence* and *Scale* is made through *Knowledge_measurement* and *Relevant_experience_measurement.* The *Scale* has a property which indicates the correspondent scale interval. The cardinality greater than 1 of the slot *Scale component* means that this slot can have multiple values. For example, the average score expected of a candidate at each IPMA level is different. The fact that the score is an average means that the values can be situated in intervals.

The assessment of the project management competence elements requires a mix of methods [7], [8]. Project management knowledge and experience can be assessed using training portfolio, written exam, the 360-degree feedback or the workshop, the project report, the references and the interview itself. The written exams are replaced by e-assessment exams, in many national associations which are affiliated to IPMA. The replacement stays in the benefits brought by the information systems. The above ontology can be easily integrated or exploited by such an e-assessment application. The proposed ontology model permits extraction of relevant information to achieve optimal knowledge assessment. For example, a tutor can select which competences should be assessed in a test session.

3.2 How to Use the Ontology Model for E-Learning

The PM Competence Catalog is connected with an educational ontology (Fig. 2). The educational ontology is part of the content management system of an e-learning platform, named SinPers [11].

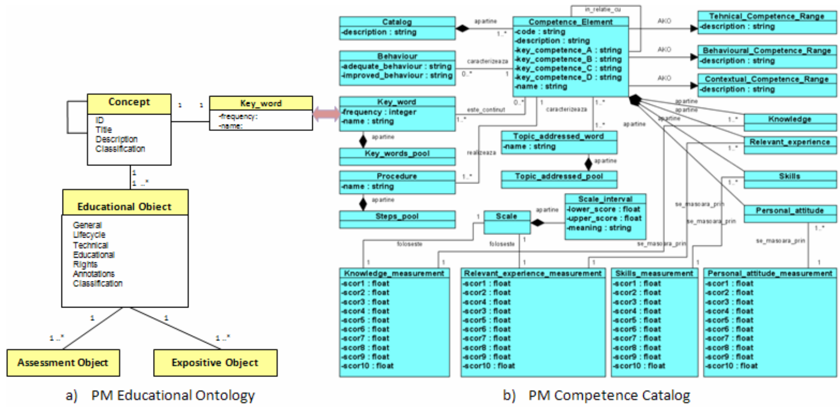

Fig. 2. The connection between an educational ontology (a) and the Competence Catalog (b)

In SinPers e-learning platform, the educational content is structured as a collection of distinct educational objects (EOs). There are the following two types of educational objects: expositive objects (the pieces of lesson with different structures and interactivity levels) and assessment objects (the pieces of tests or questions).

Each EO has metadata, describing the object type (text, slide, simulation, questionnaire etc.), the required educational level (high school, university etc.), language, interactivity level etc. The *educational ontology* (Fig. 3) is defined based on EOs (concepts to be learned) and relationships between concepts. The main relationship type are the following: *Has_part* and *Requires* dictating the hierarchical relationships between concepts as well as the constrains defining the mandatory learning order of the concepts; the relation *Suggested_Order* can be added optionally. The link between the concepts and the learning objects, depending on its type (expositive object or assessment), is stated by the relation *Explained_by* or *Assessed_by*.

The educational ontology of the project management course contains 200 concepts, 366 learning objects**,** 61 tests and all types of relationships mentioned above. The *accessibility* holds the most important information needed to perform the personalization of the unit of learning, respectively learner preferences regarding: teaching *language*, educational objects *format*, the *technological support* used (operating system, browser), *difficulty level*, as well as the *learning style* (active/reflexive, sensorial/intuitive, visual/verbal, inductive/deductive) declared or established through testing. The learner model is set up progressively, starting with the data entered at user's enrolment and continuing with the specification of the objectives and preferences, the assessment of the initial cognitive status, learning styles and results tracing.

Within a teaching-learning defined process, a personalized unit of learning is composed by a learning path offered to the learner. These objects are selected from a digital content warehouse by comparing EO metadata with the characteristics and preferences of the learner and set up in a sequence according to the relations between concepts and the activity flow previously defined. Test is a distinctive class of learning objects designed to the learning evaluation in different stages of the teaching-learning process, in order to prove the achievement of the learning objective or to obtain a knowledge set specific for a given concept.

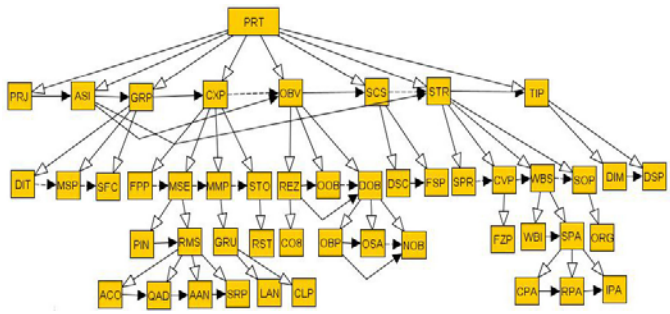

Fig. 3. Fragment of educational ontology (the part 1 - "Project")

For each concept of the ontology, one or more tests can be defined, having different characteristics (metadata). According to the IMS recommendation [12], as each learning object, the assessment tests are composed from a content file and the attached metadata, regarding the following aspects:

- *General:* groups information describing learning object as a whole (e.g. *title, catalog entry, language, description, keyword, structure*),
- *Lifecycle:* history and current state of resource (e.g. *version, status*),
- *Technical*: technical features of the learning object (e.g. *format, size, location*),
- *Educational:* educational or pedagogic features of the learning object (e.g. *type of resource, description, interactivity type, difficulty, context, learning time*),
- *Rights:* conditions of use of the resource (e.g. *cost, copyright*),
- *Relations:* features of the resource in relationship to other learning objects,
- *Annotations:* comments on the educational use of the learning object,
- *Classification:* description of a characteristic of the resource by entries in classifications.

An assessment test contains all of the necessary instructions to enable the sequencing of the items and the calculation of the outcome values. So the assessment objects' metadata contain g*rading* (qualification level and the necessary credit for the qualification) and *weight* of the elementary test grade from a composed test. In the SinPers system, the tests are created and edited in the same time with the expositive learning objects and are stored in content files; the metadata are connected to the content by the selection of the file from its location.

4 Conclusions

The paper provides a study of competency-based learning, in the framework of lifelong learning and adults' education. It also addresses the issue of e-assessment, as a valuable tool in competency-based learning and quality related aspects of e-assessment. The authors argue that using ontological approaches for competences mapping would increase the efficiency of competences e-assessment. The *PMCatalog* ontology is a proof for this statement. The benefits of using such ontology to companies' performance are also underlined.

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Measuring the Quality of the u-Learning Service Using the Zone of Tolerance SERVQUAL

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Abstract. The purpose of this study is to analyze diverse factors that affect service quality of Digital textbook service. The ZOT(Zone of Tolerance) SERVQUAL has been applied to develop the research model. Users of the Digital textbook service were selected as subjects for the sample frame. A total of 115 surveys from over 112 schools were collected and used as data for analysis. Results of the survey by SPSS Win Ver. 12.0 showed that the perceived level of service quality in terms of reliability is particularly low, and is quite different from adequate quality. This paper suggests useful guidelines to education providers for improving their public u-Learning environment.

Keywords: Measuring the Service Quality, u-Learning Service, Digital Textbook, Public Education, ICT based Learning.

1 Introduction

The ongoing development of Internet technology and the dispersion of ICT devices using Internet technology are changing the paradigm of education. Notably, traditional teaching and learning methods centered on the use of textbooks in a limited classroom environment have expanded to include e-Learning, which utilizes the development of the Internet and various application technologies as well as information terminals [1]. However, e-Learning that has been provided in the form of CBE (Computer-Based Education), web-based education, and e-Books has limitations of time and space, and has hitherto been used as little more than an auxiliary educational tool in the public education area. The MEST (Ministry of Education, Science and Technology) in Korea is developing a new concept of public educational environment based on the u-Learning environment, by recognizing the limitations of traditional textbooks and e-Learning materials that were provided to learners only. Since 2007, the MEST has been developing and providing Digital textbook, a new type of textbook that combines the traditional textbook with ubiquitous technology. ICT utilization in this educational environment enables students to be more active, enhances their motivation, and improves their understanding, as well as cultivating their ability to retain information longer and enjoy classes more [2]. It also shifts the paradigm from a teacher-centered delivery approach to that of a learner-centered environment [3]. In this paper, we will review the status of Digital textbook, which are provided in

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Korea as an exemplary service in the field of public education, and the strengths and shortcomings of the Digital textbook service, as well as the implications for the successful introduction of the u-Learning environment into the public educational environment. Korean experiences in this field may serve as an important lesson for those countries or service providers that are trying to introduce Digital textbook classes to public education.

2 Literature Review

2.1 Characteristics of Digital Textbook

Digital textbook encompasses a wide range of media, but involves a different concept from existing educational content, educational software, and e-Books. Digital textbook is a medium that converges analog with digital in the teaching and learning field in schools, and possesses the advantages of both online and offline media. In addition, Digital textbook is being developed as teaching materials that can configure and create the knowledge of the individual learner and the community, and support and manage the teaching and learning of the teacher and learner, respectively. Accordingly, Jeong (2008) defined Digital textbook as an open-type textbook that has a support and management function, presents the learning content and promotes teaching and learning, and generates and expends new knowledge with the voluntary participation of learners [4]. The effectiveness of Digital textbook was mainly performed by research schools and by specialized researchers on several occasions. These studies analyzed the factors that influence the learning effect in various respects in association with the use of Digital textbook. Byeon et al. (2006) found that Digital textbook doesn¡¯t have any primary effect on learners, but show significant effects with regard to the level of learning achievement of learners[5]. Song et al. (2008) compared the degree of learning achievement among groups that used Digital textbooks and traditional textbooks, and found that Digital textbook has a more positive effect on learning outcomes.[6]

2.2 SERVQUAL and Zone of Tolerance

SERVQUAL is widely used methods applied to measure the service quality and to evaluate user's satisfaction. Parasuraman et al. (1988) defined SERVQUAL's five dimensions as tangibles, reliability, responsiveness, assurance, and empathy [7]. Pitt et al. (1995) proposed that the service quality in the field of information system should be measured by the classification developed by Parasuraman et al. (1988) [8]. Subsequently, DeLone and McLean (2003) accepted the SERVQUAL concept proposed by Pitt et al. (1995), and came to announce the modified DeLone and McLean IS model, which adds service quality to the system and information component [9]. Previously, SERVQUAL was mainly studied in the area of marketing fields, but these days it is applied and utilized in various organizational contexts [10]. However, there are some issues in using SERVQUAL. First, it is difficult to clearly identify the difference between the expected service level and the perceived level. The use of this gap was deemed to be a factor that deteriorates the reliability of the measurement tool and the convergent validity. Second, each researcher defines the five SERVQUAL levels differently. Jiang et al. (2002), Kettinger and Lee (1997), and Pitt et al. (1995) determined by analysis that the five levels of Parasuraman (1988) do not have discriminant validity in the context of the information system, and adopted a skeptical view regarding application of SERVQUAL in the context of the information system [11]-[12]. Several alternatives have been presented, as many subsequent researchers have raised the issue related to SERVQUAL. For example, Liljander (1994) proposed measurement of the perceived service only, unlike the expectancy disconfirmation model, by which the expected level is deducted from the perceived service [13]. On the other hand, Parasuraman et al., (1994) proposed to measure the level desired by consumers and the tolerance level separately, as the level expected by consumers can be interpreted in various ways [14]. They named this segment the ZOT (Zone of Tolerance). They came to the conclusion that consumers could not be satisfied in this zone. Kettinger and Lee (1995) applied the ZOT and studied it via a comparison with the degree of the consumer's actual experience.

3 Data Collection and Analysis

For this study, the questionnaire was designed using ZOT SERVQUAL, which introduces the concept of the ZOT, the difference between the user's expected level from a service and the minimal service level acceptable to the user, in order to measure the quality of Digital textbook service that is operated in the public educational environment in Korea. The questionnaire was distributed to teachers working at 112 exemplary Digital textbook schools. A total of 115 sets of answers were collected. The respondents were composed of as follows: 5th grade teachers accounted for 54% of the users of Digital textbook, whereas 56% use the Digital textbook for less than one year, and a similar number of research schools were running the Digital textbook with two operating systems, compared with the entire proportion (Windows 75%, Linux 25%). The questionnaire was designed with 7 score scale for three areas (desired quality – maximum level expected from the service; adequate quality –minimum acceptable level of the service; and perceived quality – perception of level of the current service) regarding the level of service quality (Reliability, Assurance, Responsiveness, Empathy, Tangibles) experienced by users of the Digital textbook service. The collected answers to the questionnaire were processed using factory analysis, reliability verification, and regression analysis, using SPSS Win v12.0.

3.1 Construct Validity

In this study, exploratory factor analysis was conducted three times by separating the quality of the Digital textbook service according to the proposition of the ZOT. The results of the factor analysis identified the following factors regarding the perceived service quality. In terms of reliability, 3 factors were grouped, whereas 4, 3, 2, and 4 factors were grouped for responsiveness, assurance, empathy, and tangibility respectively. Also, 4 factors were grouped for service satisfaction. As a result, 5 SERVQUAL levels and 1 service satisfaction level were grouped as intended.

Table 1. Rotated Component Matrix

	Reliability	Responsiveness	Assurance	Empathy	Tangibility	Satisfaction
ZOT_Sat3	0.19278	0.13718	0.12611	0.12539	0.05159	0.84295
ZOT_Sat4	0.09001	0.16397	0.21713	0.23220	0.13904	0.71822
ZOT_Sat2	0.03879	0.16571	0.28132	0.04034	0.33695	0.68449
ZOT_Sat1	0.21919	0.29126	-0.04129	-0.05499	0.30321	0.67121
ZOT_Tan2	0.06999	-0.04614	0.14137	0.07007	0.73576	0.28668
ZOT_Tan1	-0.00638	0.25235	0.41639	-0.00236	0.66701	-0.05685
ZOT_Tan4	0.11441	-0.10994	-0.20640	-0.04507	0.59275	0.42028
ZOT_Tan3	0.12915	-0.01759	0.25833	0.12203	0.52734	0.41372
ZOT_Emp2	0.17818	0.23310	0.14769	0.10620	0.52472	0.16131
ZOT_Ass1	-0.09379	0.10505	0.75163	0.01522	0.12828	0.09693
ZOT_Ass2	0.28391	0.02488	0.72669	0.10215	0.08847	0.14272
ZOT_Ass3	0.21781	0.12077	0.60834	0.38225	0.22519	0.29116
ZOT_Res2	0.32611	0.79582	0.07968	0.07844	0.05557	0.05287
ZOT_Res4	-0.02856	0.68981	-0.12036	0.01532	0.04249	0.42102
ZOT_Res3	0.10422	0.66500	0.35836	0.16275	0.07087	0.03814
ZOT_Res1	0.25133	0.54127	0.07950	0.22003	0.08432	0.23700
ZOT_Rel2	0.78521	0.12793	-0.06994	0.27205	0.11551	0.05971
ZOT_Rel3	0.65601	0.19800	0.07223	-0.08906	0.04287	0.18707
ZOT_Rel1	0.53114	0.17723	0.30005	0.08900	0.17660	0.13754
ZOT_Emp4	0.35177	0.03945	0.24630	0.18738	0.30841	0.30711
ZOT_Ass4	0.07429	0.08439	0.09145	0.72739	-0.21587	0.07814
ZOT_Emp1	0.09026	0.09474	-0.01735	0.62226	0.45954	0.10898
ZOT_Emp3	-0.00363	0.22035	0.28526	0.57805	0.31965	0.23456
ZOT_Rel4	0.24329	0.12014	0.06829	0.44629	0.41736	-0.06111

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 8 iterations.

Table 2. Results of factor analysis by area

	Perceived Quality	Adequate Quality	Desired Quality	Common Factor
Reliability	2,3	1,2,3	1,2,3,4	2,3
Responsiveness	2,3	1,2,3,4	2,3	2,3
Assurance	1,2,3	1,2,3	1,2,4	1,2
Empathy	1,3,4	1,3	1,3,4	1,3
Tangibility	2,3,4	1,2,3,4	1,2,3,4	2,3,4

Factor analysis was also conducted for adequate and desired service quality, and common items in each level were extracted for three areas.

3.2 Reliability Analysis and Model Verification

In this study, internal consistency was checked using Cronbach's α coefficient of the questionnaire items, which were finally found to be valid in common. Cronbach's α value at the adequate service quality and the desired service quality level was 0.840 and 0.886 respectively, which is over 0.7 - claimed by Nunnally (1978) as reliable. On the other hand, that of the perceived quality was 0.652, which is the acceptable level of reliability [15]. When regression analysis of the perceived service quality area

Table 3. Model summary of the perceived service quality

Model	R	R^2	Modified R^2	Standard deviation of estimate	Statistical variance				
					R^2 variance	F variance	Deg. of freedom 1	Deg. of freedom 2	Significance probability F variance
Adequate Quality	.800 (a)	**0.64**	0.622	0.51239	0.64	35.558	5	100	0.000
Desired Quality	.872 (a)	**0.76**	0.749	0.45753	0.76	69.068	5	109	0.000
Perceived Quality	.681 (a)	**0.464**	0.439	0.71572	0.464	18.868	5	109	0.000

was performed taking satisfaction as a dependent variable, the model was found to be significant ($F = 18.868$, $p < 0.01$), whereas R^2 was 0.464, which implies that it explains 46.4% of the distribution at the service level. Judging from the significance level 0.05, only responsiveness and tangibility have a significant effect among all independent variables.

3.3 Results of Analysis

The result of analysis implies that, generally speaking, the current quality of Digital textbook service doesn't meet the user's expectations. Analysis of each level indicates that the perceived level of service quality in terms of reliability is particularly low, and is quite different from adequate service quality. Therefore, it seems that improvement in this level is most urgently required.

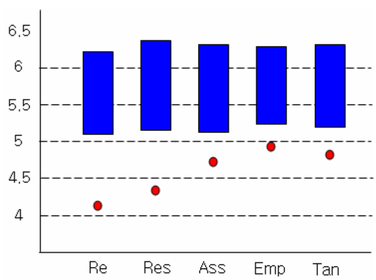

Fig. 1. ZOT of Digital textbooks

Digital textbook service in Korea was developed and initially provided on the Windows platform in 2008, and open source-based Digital textbooks using Linux were developed in the second half of 2008. Currently, the service is provided to 265 classes (197 Windows-based classes and 68 Linux-based classes). When the average is calculated using the operating system used by the questionnaire respondents and the ZOT is analyzed, the following difference can be identified. First, in a comparison of the two systems, the quality perceived by teachers who use the open source-based system was found to be lower than that of the Windows-based system. However, when analyzed in detail, the Windows-based system showed higher satisfaction in all service levels in terms of adequate service quality and perceived service quality, but the open source-based system showed a higher level in terms of desired service quality. Accordingly, the open source-based system has a wider range of expected service (desired service quality – adequate service quality) for each service level than the Windows-based system. It may be inferred that the teachers (respondents) were unable to make a clear decision because only a small number of teachers have had experience of Linux, rather than that they expect more from the open source-based system. Next, when the perceived service quality was compared, the difference between reliability and empathy was found to be relatively large. In particular, it seems that the reliability of the open source-based system should be improved as quickly as possible, because it was found to be the least reliable.

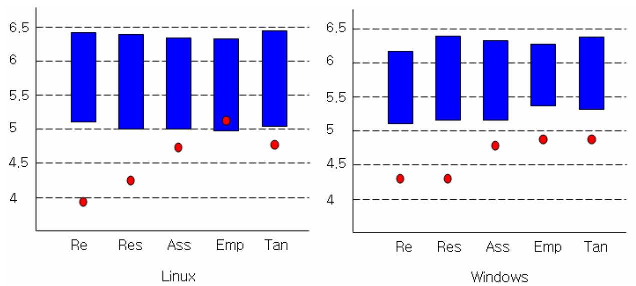

Fig. 2. ZOT by operating system

4 Conclusion

This study is intended to identify and improve the current problems with the u-Learning (Digital textbook) service, which is provided as an exemplary service in Korea, by measuring its quality. The level of quality as currently perceived by users was subjected to empirical analysis of the adequate service quality, desired service quality, and perceived service quality, using the ZOT SERVQUAL, which supplements the shortcomings of SERVQAUL. This study extracted 11 questions in common in order to measure three service areas. According to the ZOT analysis, reliability is the lowest one among currently perceived levels of service quality, and is quite different from the adequate service quality (minimum expectation level). Therefore, it seems that improvement in this area is the most urgent requirement. In addition, the quality of the open source-based Digital textbook service is lower than that of the Windows operating system in the perceived service quality area. As a result, improvement in this area is deemed necessary. The limitation of this study is that only teachers were given the questionnaire, and only half of the teachers who currently use the service returned their answers, which may be the reason for the shortage of descriptive power. In addition, it was difficult to find out the reliable question item when actually analyzing the questionnaire, as the item for each service is not sufficiently included. Future study should include development and measures of the quality measurement questionnaire for primary school students who use Digital textbooks in the field, and a quality level comparison of Digital textbook service between learners and teacher will be necessary, based on the developed questionnaire. Various analyses could make a contribution to improving Digital textbook service.

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The Social Network Classroom

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Abstract. Online social networking is an important part in the everyday life of college students. Despite the increasing popularity of online social networking among students and faculty members, its educational benefits are largely untested. This paper presents our experience in using social networking applications and video content distribution websites as a complement of traditional classroom education. In particular, the solution has been based on effective adaptation, extension and integration of Facebook, Twitter, Blogger YouTube and iTunes services for delivering educational material to students on mobile platforms like iPods and 3rd generation mobile phones. The goals of the proposed educational platform, described in this paper, are to make the learning experience more engaging, to encourage collaborative work and knowledge sharing among students, and to provide an interactive platform for the educators to reach students and deliver lecture material in a totally new way.

Keywords: Social networking, blogging, Facebook, Twitter, YouTube.

1 Introduction

Teens and college students, ages 12 to 28 years, have quickly embraced online technologies that enable social, communicative and creative uses. They are more likely than other age categories to send and receive email messages, play online games, create blogs, download music, search for school information online or simply spending time online. They are used that information is delivered in this way. Traditional classroom education simply does not fulfill anymore the expectation of students. Use of media and modern means of interaction has literally rewired the way that our students think and process information.

According to a December 2008 survey performed by Lenhart 2009 [5] for the PEW Internet and American Life Project the share of the adult users who have a profile on an online social network has grown from 8% in 2005 to 35% in December 2008. It is worth noticing that the social network users are equally likely to be men and women, and also more likely to be young: 75% of adults between 18 and 24 have an online profile as do 57% of adults between 25 and 35, according to the same study. Moreover 68% of full time students and 71% of part-time students have a social network profile.

It is even more interesting to take a look in the kind of activities those young people are engaging themselves when they are online. Table 1 depicts the generational differences in online activities according to another study performed by Jones and

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Fox 2009 [4] for PEW Internet and American Life Project. It can be noticed that a large proportion of the people with ages between 18-28 years (the typical age of college students) are using the internet for watching videos online (72%), send instant messages (59%), reading blogs (43%) or use social networking sites (67%). The survey from Table 1 shows that teens and younger people ages 18-32 are significantly more likely than older users to send and receive instant messages, playing online games, create blogs or download videos.

Table 1. Generational differences in online activities according to Jones and Fox 2009 [4]

	Online Teens (12-17)	Gen Y (18-32)	Gen X (33-44)	Younger Boomers (45-54)	Older Boomers (55-63)	Silent Generation (64-72)	G.I Generation (73+)	All Online Adults
Go online	**93%**	**87%**	**82%**	**79%**	**70%**	**56%**	**31%**	**74%**
Play games online	78	**50**	38	26	28	25	18	**35**
Watch videos online	57	**72**	57	49	30	24	14	**52**
Get info about a job	30	**64**	55	43	36	11	10	**47**
Send instant messages	68	**59**	38	28	23	25	18	**38**
Use social networking sites	65	**67**	36	20	9	11	4	**35**
Download music	59	**58**	46	22	21	16	5	**37**
Create SNS profile	55	**60**	29	16	9	5	4	**29**
Read blogs	49	**43**	34	27	25	23	15	**32**
Create a blog	28	**20**	10	6	7	6	6	**11**
Visit a virtual world	10	**2**	3	1	1	1	0	**2**

The goal of the pedagogical study presented in this paper was to leverage and use for educational purposes the new online technologies that the students are already using in their every day work or in their free time. It this way, we have tried to make the learning experience of the students more effective and engaging. We propose the use and integration of social networking sites, podcasting technologies and applications developed for mobile devices into a collaborative online educational platform called *eSocialClasroom*. Our expectation was that the *eSocialClasroom* should encourage collaborative work and knowledge sharing among students and function as a platform for the educators to reach the students and deliver lecture material in a totally new way.

The rest of the paper is organized as follows: Section 2 presents the technical architecture of the *eSocialClasroom* platform. In Section 3 we present some of the preliminary results of our teaching experiment and the social and educational benefits of the project that we have observed during the duration of this experiment. Finally, Section 4 presents our conclusions and future work.

2 Technical Architecture of the *eSocialClasroom*

Traditionally class material is delivered to the student in a printed form during the lecture or electronically via the course webpage. However the delivered electronic content via the webpage, in most of the cases, is in the form of a pdf file of the lecture slides and can be only visualized on a computer. From the teacher point of view this is a very convenient way of delivering the classroom material: it can be done very quickly and requires little technical knowledge about web technologies. From the students point of view this will require some discipline like checking regularly the course web page for updates and for new material. It is a safe communication channel between the teacher and the students. However there are several disadvantages with this approach: Firstly, the material available on the course webpage is available only for computers and cannot be visualized on mobile devices. Moreover the material is seldom interactive or exploits the available multimedia technologies. Secondly, the students enrolled in a course hardly know their classmates or have course related interaction. Their interaction is limited to the breaks between the lecture hours or during the laboratory sessions.

To overcome some of these problems, we propose an educational platform called *eSocialClasrrom* (see Fig. 1 below) that combines Web 2.0 technology, social networking and mobile application for delivering educational material to the student in a new and innovative way.

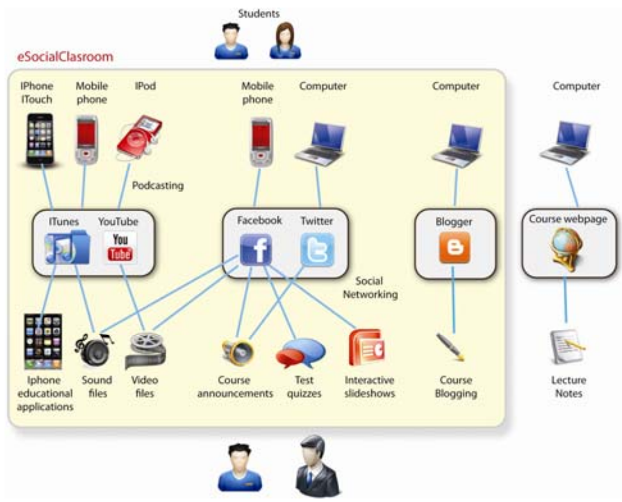

Fig. 1. The architecture of the proposed *eSocialClasroom* platform

The *eSocialClasroom* Platform was built on Web 2.0 and mobile technologies and experimentally deployed for a one semester Computer Science class (Design Patterns) at Linköping University, Sweden. The experiment has been performed during a three months period. In addition to the normal course web page the following components have been used:

- iTunes and YouTube for podcasting course related multimedia content to the students. Audio files and classroom related video content like recoded lecture sessions combined with slideshow presentations have been automatically podcasted to students. The classroom material podcasted by the teacher is automatically downloaded to the student's mobile device (IPhones, Ipods or mobile phones), so the students receive an up to date material. During this project we have also developed interactive mobile teaching applications for IPhone and ITouch devices.

- Use of social networking sites such as Facebook and Twitter for distribution of course announcements, course related link, interactive slide shows and quizzes. In this way students can have access to additional course material is a new and innovative way while they can also know each other better and interact during the course. A special Facebook group was created for the students enrolled in the Design Patterns course. 71% of all the students enrolled in the Design Pattern Class have also joined the Facebook group. The Facebook group enrolment was optional.
- Blogger for a forum on which students can express themselves on issues related to the course that they are following, can propose new ideas or present their original view and which requires a deeper presentation of subject under discussion. In this way the dialog among students and between students and teachers have been extended well beyond the classroom environment.

3 Project Benefits

The student's participation and usage of the *eSocialClasroom* components was optional and was considered as an extracurricular course activity. During the one semester deployment of the *eSocialClasroom* platform the following benefits have been observed:

3.1 Social Benefits

The study performed by Ellison et al. 2007 [1] indicates a clear association between the use of a social network site like Facebook and three types of social capital: *bonding* social capital, *bridging* social capital and *maintained* social capital, as defined by Putnam 2007 [7]. Social capital, in this context refers to the resources accumulated through the relationships among people. Bonding is the strongest form of social capital and it is usually manifested among individuals that are belonging to a homogenous category like family, very close friends or even criminal gangs. Bridging is usually manifested among individuals with the same goals or similar interests like a sport team, classmates or neighbors. The third form of social capital called maintained refers to relationships that are kept despite the fact that a significant change has happened in the social networks of the individuals. As an example, a social relationship with former high school classmate that is located now in a different geographic location and has different interest compared to ours can be considered to be a maintained relations.

A high social capital is generally considered to be closely related to positive outcomes for the society in general and a better psychological "*wellbeing*" of the individuals that is part of the high social capital group. For individuals and for the students in particular the accumulated social capital allows them to benefit from the "*social network wisdom*" in form of useful information, personal relationships that will directly affect their academic life with future extension to their professional life. Social networks like Facebook, LinkedIn and MySpace are actually designed to exploit bridging and maintained social capital (people who kind of know but you wouldn't chat with). According to the Stanford sociologist Mark Granovetter 1973 [2] weak ties are more likely than strong ties to provide new information and opportunities like a new job or new career path. The resources of the bonding social capital are probably very similar while the weak ties will provide a much larger diversity.

All the three types of social capitals were visible in the developed relationships inside the Facebook group that we have created for the course. The accumulation of bonding and bridging social capital was very evident among the members. The students very quickly developed a "course identity" extending to personal social relationships despite the fact of the cultural diversity of the class members. The bridging capital was not only limited to the students enrolled in the course. Several other external members with interest in computer science have also joined the group together with other academic people interested in educational aspects of the social networks. An unexpected aspect was that we have also observed several instances of maintained relationships in which former students from previous years have joined the course social network site and interacted with students or the teacher.

3.2 Educational Benefits for the Students

The following scenario illustrates a typical usage of the proposed *eSocialClasroom* platform. The scenario is based on the interviews performed on three students at the end of the course. The names used in the following use case scenario are fictitious and any resemblance to real persons is purely coincidental.

Anna Svenson, a student of University of Linköping, Sweden, is enrolled in the Computer Science program in her last study year. Soon is time for Anna to choose a final master project. Anna lives 50 km (31 miles) from the university in a city called Norrkoping and every day she takes the campus buss to Linköping to attend her lectures. In our scenario we can see her waiting for the bus at the central station. She has arrived a little bit earlier to the station and while waiting for the buss she flips open her mobile phone and start writing an SMS message to her friend. After finishing sending the message she decides to check what her friends are doing on Facebook. She connects to Facebook using the mobile phone and she can immediately see that Angelica her classmate has posted some pictures from the last week party. A smile on her face immediately appears while looking at the pictures. There is also a friendship request from a former classmate David. David was an exchange student from Australia, that Anna met two years ago, but after 6 month spent at Linköping University, David went back home. She did not hear from David since then. Anna accepts his invitation and immediately access David's profile. Now she can see that David become a graduate student at Carnegie Melon University in USA. "*This is great*" thinks Anna, because she would like to enroll for a graduate program at a university in USA after her graduation. "*Now I can ask David how this can be done, he surely went through this already and he might be able to help me*". She quickly writes a message to David then she is navigating back to the Facebook home page to see what else happened with her friends. Then she notices that there are some new postings from the Facebook group of the Design Patterns course (see Fig 2) in which she is enrolled this term. The teacher just posted a small video from YouTube in which Alan Kay a famous computer scientist explains the functionality of an early computer graphics system developed at MIT in the late 60s. Anna remembers that her professor mentioned something about that computer system during the last lecture. She watches the four minutes short movie and indeed now she clearly sees the connection between the computer science notions that her teacher presented and the computer graphics system developed at MIT.

Fig. 2. The Design Pattern Course Facebook page accessed from a mobile phone

She decides to check further the messages on Facebook but the bus has arrived. Now it is time for a quite boring 50 min trip to Linköping. She close the mobile phone, shows the ticket to the bus driver than she takes a sit in the bus. "*What a boring trip*" – says Anna trying to figure out what to do during this trip that she need to make it every day. She searches her pockets and finds the ITouch in the internal pocket of the jacket. "*This trip it will not be so boring after all if I listen to some music*" – thinks Anna and carefully removes the protective cover of the ITouch. While searching for her favorite song she notices that the animated slideshows of the latest Design Patterns Lecture together with the sound recording of the lecture have been automatically downloaded to her iPod via the a podcasting service. "*Oh, Great*" – Anna says "*Now actually I can check what the professor said during the lecture about the MIT computer graphics system*". She opens the video file and the she find the sequence where the professors explain the MIT systems. She listens to the explanations while watching the animated slide show (see Fig 3). "*Now everything is much clear*" – thinks Anna and she continue to watch the lecture movie for five more minutes. Then she remembers that she had some difficulties with the latest laboratory work for that course. She was simply not able to compile the latest program on her machine. She decides to check the course discussion forum on the course Facebook. Maybe some of her colleagues have already solved that problem. Anna opens again her mobile phone then and check the forum. Unfortunately nobody posted a solution to her problem. She decides to post a question to her problem on the Facebook group discussion forum. She starts writing the question and after finishing she push the publish button. "*Maybe somebody will help me*" – hopes Anna. She notices a flashing banner in the right corner "*Amy Eriksson took an object-oriented programming skills quiz. Her score is 85. Could you beat her score*? "*I'm sure that I can beat her score*" – thinks Anna very confidently. The quiz was made by the teacher of the design pattern course and consists of 15 programming questions similar to those that will be given during the exam. Anna starts working on the quiz. It is actually harder than she thought at the beginning. She finishes the quiz

Fig. 3. Recording of a Design Course lecture running on an Apple ITouch

after 15 min with the final score of 82. Well, she did not beat Amy but she can see that 42 other colleagues have taken the quiz and she has a score that it is in the top 10 of her class. "*It is not bad*" - she thinks. While she is contemplating the quiz statistics there are two incoming messages that inform her that two answers were posted to the discussion thread that she opened 15 min ago. Two classmates, Mark and Spencer have both posted a solution to Anna's problem. "*Ohh it was so easy to solve it. How could I miss that compilation directive?*"

The buss finally arrived at the campus and Anna takes the shortest way to the C Building where her lecture that she intends to attend will start in 10 min. Plenty of time left to "*tweet*" a message to her friends: "*I feel :-) today despite the rainy weather in Linköping.*"

4 Conclusions

The proposed *eSocialClasroom* platform was adapted very quickly by the students despite the fact that students expect social networks to be social and not necessarily educational. At the end of this experiment we could clearly see the potential of social networks as an educational tool for extending the traditional classroom education. However the educational benefits of social networks are largely untested. Much of the existing academic research on social networks and in particular on Facebook has focused on the social benefits aspects (Ellison et al. 2007 [1], Valenzuela et al. 2009 [8], Zywica and James 2008 [9]) including studies on differences among users and non-users of social networks (Hargittai 2008 [3]) or privacy, identity and security aspects (Lewis et al. 2008 [6]). We are not aware of any detailed studies that address effects of the social networking sites in the relationship between professors and students or between students in classroom settings despite the fact that many faculty members have already a social network based classroom presence.

We intend to repeat the experiment and the deployment of the eSocialClasroom platform again during the fall term 2010. The student satisfaction and learning improvement will be systematically measured by conducting interviews with the students and systematic evaluation of the impact that the proposed framework has on the learning process. The didactical success of the system can be defined by the student satisfaction and the degree of how much the *eSocialClasroom* boosts collaboration of students that would otherwise work on their own. Before extending the project at other courses we need however to answer several questions:

- Is there sufficient proof of educational value to consider the proposed platform as an alternative/complement and as a non conventional way to classical information distribution (printed lecture notes and course web page)?
- What would be the effect of such an information distribution and how much will involve the students?
- Will it improve learning or it will distract the students from their usual course work?
- How teacher would embrace this new technology and way of teaching and how will impact our traditional way of preparing teaching materials?

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A Process-Oriented Model for Technology-Enhanced Learning

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Abstract. A process-oriented model is developed to underpin the initiatives in technology-enhanced learning currently introduced in the Faculty of Education, University of Malta. The need for such initiatives is highlighted considering the educational, economical and social needs of the country. These needs demand a technology-intensive, flexible, learner-oriented approach to education and training. More important they need to be based on an innovative methodology that focuses on learning processes and interactions rather than subject content only. Based on recommendations from different fields of research a process-oriented approach is proposed that considers dimensions and levels of interactions. Interactions are categorized along the domain, technology and community dimensions and across three pedagogical levels – novice, competent and expert learners each having characteristic learning needs. The model is used to develop a programme in TEL integrating epistemology, pedagogy, design principles with use of digital tools.

Keywords: Technology-enhanced learning, Pedagogical models, Process-oriented methodologies, Post-graduate studies, Course design, course evaluation.

1 Introduction

This paper introduces the theoretical framework and the process-oriented model underpinning the initiatives in Technology-Enhanced Learning (TEL) being implemented at the Faculty of Education (FoE), University of Malta. Other papers by the same author will discuss in detail these initiatives and the mechanism adopted to evaluate technology-enhanced learning.

Between 2000–2008, the FoE had a programme to train students and Faculty members in ICT skills and the development of educational resources, as part of the undergraduate Bachelor in Education course (B.Ed. Hons). The emphasis of this programme was to develop competences in using different teaching-related applications mainly presentation, desktop publishing and production tools. With the introduction of ECDL as compulsory entry requirement for the B.Ed (Hons) course, this programme became irrelevant to student needs. Also, the development in TEL on an international and local level, triggered reflection about the need for a programme that

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meets the educational needs of the Faculty and local educational system in the knowledge (or better in a post-knowledge) age.

Several factors have driven this process. The widespread use of learning technologies amongst students, teachers and academics made more urgent the need for the formal integration of these technologies within academic programmes and classroom practice. This has been fuelled by the National eLearning strategy which provides the necessary theoretical frameworks, policies and resources to transform the teaching-learning process in all stages of the formal educational process.

Also the Faculty has to respond to realities of a knowledge society. The introduction of learning technologies has triggered experimentation and reflection by practitioners world wide. Different categories of learning technologies are extending and transforming the learning experience beyond the traditional transmissionist approaches integrating more constructivist and constructionist epistemologies. TEL is emerging as the major life-long and life-wide learning mode that complements the initial formal learning process which has also been radically transformed by these emerging technologies.

Learning spaces are evolving into multipurpose, flexible, technology-intensive environments. At the same time learning management systems are integrating course/content management, with on-line administrative tools, social networking and ePortfolios. These developments are creating an urgent need to redefine our pedagogical frameworks so that pedagogy drives technology and not the other way round [1]. Content oriented pedagogical models are becoming increasingly deficient in capturing the totality of the learning experience that blends acquisition with participatory and contributory modes of learning [2, 3). New forward looking pedagogies are needed that promote 'curriculum innovations, including support for collaborative and cross-curricular learning and develop in 'next-generation teachers skills in exploiting technology for creativity and social networking' [4].

'Learning by designing' is increasingly becoming an integral component of any pedagogy. Besides preparing young citizens to develop knowledge acquisition skills, an important role of the formal educational process in a knowledge society is to develop knowledge building skills. Knowledge jobs are mostly technology-mediated involving interactions with conceptual artefacts [5] mostly in the form of software applications. Technology-mediated creativity, research and innovation, together with team skills that enhance participation and contribution to the development of new solutions, should form part of the personal portfolio of learners. From the early stages of formal education, besides technology-enhanced instructional approaches, the curriculum should also include technology-based design projects to develop these creative and collaborative skills. Thus besides transforming 'designed curricular approaches, through innovative technology-mediated approach, learners are becoming participants in and co-creators of learning: Technology enhances opportunities to engage learners in designing and creating their own learning,' [4].

Within the international scenario, the University of Malta (UoM) is continually facing challenges from traditional and virtual universities. This compels the institution to diversify university-level education and to increase study choice opportunities in Malta and possibly in the Mediterranean region by utilising available information networks and advanced learning technologies. To remain competitive in a globalised environment institutions of higher education must become more internationalised, digitised, customised, embed programmes in a framework of Life-Long and Life-Wide Learning and base their policies on empirical developmental research. Thus the main objective of the proposed programme in TEL is to develop these dimensions within the UoM and also contributes to the development of the concept of 'Technology-Enhanced Learning' within the local and Mediterranean contexts.

To be relevant in a knowledge society the FoE must continually being propose innovative initiatives in 'teacher education'. Increasing numbers of learners prefer to follow flexible, technology-intensive courses. This demands that future teachers should be equipped with knowledge and skills for designing, managing and evaluating TEL and integrate them in flexible learning approaches. Teachers, having training and experience in technology-intensive flexible learning systems, are the complement required by the Faculty of Education to meet its future mission in providing a 'balanced education' (traditional and technology-intensive) to all.

The FoE must also address the training needs arising from the country's socio-economic reality. Unfortunately Malta has one of lowest percentage of graduates in its working force when compared to other European Countries. At the same time the country's economy is being oriented to specialised services and high tech niches. This creates an urgent need for initiatives that promote flexible approaches for educating adult learners and training our work force, while minimizing constrains that impede or discourage people from furthering their education and develop job-related competencies. Blended approaches, that merge technological resourcefulness and efficiency with formal learning and training environments, are the most feasible approaches for innovative, efficient educational and training initiatives.

Within this context, educational models that provide 'balanced' education have to be promoted. Blended learning and training approaches that combine traditional face-to-face and technology-intensive forms of learning are becoming more in demand and will be the major future methodology. From a pedagogical perspective 'balanced education' implies equal emphasis on content and process intelligence, employing both acquisition and contribution forms of learning. It also demands the adoption of process-oriented models to complement the ubiquitous transmissionist ones. For this purpose the proposed programme promotes innovative initiatives in TEL both as pedagogical extension involving mainly technology-enhanced instructional approaches, and as pedagogical re-engineering [3] where more autonomous technology-enhanced learning scenarios are created.

2 The Programme in Technology-Enhanced Learning

In 2009 the 'Programme in Technology-Enhanced Learning' (PTEL)' was launched within the FoE, University of Malta with the specific aim of integrating epistemology, pedagogy, technology and innovation management within a coherent experience in TEL. Constructivist, constructionist and connectionist epistemologies and findings from contemporary research in various fields provide the necessary guiding principles and vision for developing an innovative process-oriented methodology. The design and evaluation of TEL should be guided by process-oriented models rather than content-oriented ones. Such models are better suited to capture the complexity of TEL involving various levels and dimensions of interactions.

Bereiter [5] discusses a Connectionist epistemology pointing to the shift from an objectivist conception of knowledge and transmissionist methodologies, based on the 'mind as container' metaphor, to one promoting the 'rhizome or internet' metaphor of the mind. Thus learning is considered as the development of an extensive and deep relationship with a particular domain and related 'community of practice'. The direct implication is that TEL should be considered from a process-oriented perspective integrating different dimensions and levels of interaction. Bereiter elaborates on Popper's [6] three world model and the Constructionist Epistemology promoted by MIT scholars, mainly Seymour Papert, Mitchell Resnick and Yasmine Kafai.

Bereiter considers learning and knowledge building as a process of interaction with the physical world, with the world of ideas and conceptual artefacts, together with the interactions of these two worlds with the intra-individual reality of the learner.

Consequently education in the knowledge society is characterised as a process of enculturation into the world of conceptual artefacts, besides its complementary traditional role comprising interactions between the physical world and the world of ideas and conceptual artefacts.

Evolving from this connectionist frame-of-mind, the proposed programme acknowledges the intimate interaction between epistemology, pedagogy and technology and how these determine the modality of interaction with the inner and outer world of individuals using particular digital technologies. It also recognizes the role of a constructionist approach based on Learning by Design, Learning in Communities and Learning about systems.

'Learning by designing' promotes inquiry-based learning and knowledge construction through the use of physical and conceptual artefacts. 'Learning in Communities' involves three levels of interactions. Learning *From* others involves the acquisition of knowledge and skills through apprenticeship. Learning *With* promotes intra-individual change in cognition and skill repertoire through participation in the social process of knowledge construction. 'Mediating' others' learning is the highest level of learning within a community of practice involving the use of specialised tools and development of expertise. The influence of individual propensities in communication and learning arising from personality factors (approach or withdrawal tendencies) and information processing (verbal versus visual) are considered in relation to solitary and collaborative aspects of TEL. 'Learning about systems' demands reflection on how to organise and impart domain knowledge and skills through a systems approach. At a deeper level this is concerned with the use of digital technologies as 'tool' systems for knowledge generation, elaboration, storage and dissemination. These systems should be adaptive to learner's cognitive and affective needs capable of generating interactive patterns based on evolving user-tool interaction.

Research from other fields of knowledge also point to the adoption of a process-oriented approach to TEL. Describing human behaviour from an interactions perspective is being considered as the major programme of research in Cognitive Neuroscience for the 21st century, [7]. Cognitive Neuroscience claims that one of the major functions of the human brain is to enable people to be as skilful in social interactions as they are in their interactions with the physical world. During social interactions, the brain employs concurrently different areas that deal with separate mental processes so that it differentiates monitors and controls the external environment. This activity manifests itself in task-relevant and (non-task) person-oriented social interactions.

The focus of contemporary research in education is shifting from the intra-individual dimension, characteristic of content-oriented approaches, to the qualitative and quantitative measurement of inter-individual interactions. Salomon & Perkins [2] emphasised that:

> *"A focus on the individual learning in social and cultural solitude is increasingly seen as conceptually unsatisfying and ecologically deficient. As Bronfenbrenner* [8] *has pointed out, "in ecological research, the principal main effects are likely to be interactions", and these interactions are, to a large extent, between an individual, his or her social surrounds, and the artefacts culture provides."*

While in earlier individual-oriented models of assessment learning outcomes were considered as end products of interactions with a particular domain of knowledge, such approaches are very limited in developing assessment instruments to capture learning in collective entities. A different set of conditions exists in TEL where the main pedagogical emphasis is not acquisition of facts and information but knowledge and skills that promote participation and contribution to the learning community. This surely demands a paradigm shift in considering interactions themselves as learning outcomes. The type, frequency and directionality of interactions that are stimulated in learning environments can be used as indicators of potential learning dimensions and as a means of assessment. Identification of patterns of interactions along organising dimensions can lead to the development of learning profiles that may be very beneficial pedagogically, especially for designing TEL.

Such context cannot be adequately investigated solely through analytic, componential, individual oriented approaches. Collaboration and distributed cognition demand systematic approaches rather than analytic ones. Distributed cognition cannot be considered as the sum of individual information processors, where the context of social interaction is considered more as a background for individual activity than as a focus of research in itself. Thus a process-oriented model is being proposed to be used for qualitative or quantitative analysis of interactions in TEL. To capture, analyse and possibly manipulate 'emergent, socially constructed, properties of the interaction and the dynamic contribution of different sources of interactions' [9] an integrative, taxonomic model is needed. Its objective will be to capture interactions along identified domain dimensions, levels of expertise, and different typologies of social activity. The proposed model attempts to operationalise such process-oriented approach. The model organises interactions, both in solitary or collaborative contexts of TEL, along three dimensions – Domain, Technology and Community – and across three pedagogical levels that progress in emphasis from 'Acquisition', through 'Participation' to 'Contribution' modes of learning. The domain/content dimension involves interactions leading to the acquisition of knowledge and skills in a particular domain. The social dimension captures the socio-emotional climate and interpersonal interactions manifesting underlying bonds, relationships and roles. Through interactions with different forms of technology, participants acquire knowledge and skills that make them increasingly competent in the use of digital tools.

3 A Process-Oriented Model

The proposed process-oriented approach to TEL is summarised in the table below. The columns in the model represent the different dimensions, while the rows represent the various pedagogical levels that corresponding to the path taken by *novice* learner to become '*experienced*' and then *expert* learners along the domain, technology and community dimensions [10].

	Domain	**Technology**	**Community**
Acquisition Novice (competence)	Knowledge and skills	Knowledge & skills in use of tools	Interactional skills
Participation Experienced (affiliation)	In Affinity spaces and CoPs	Learning with others in use of tools for communication, group management and sharing	Experiencing different roles in contiguous & virtual communities
Contribution Expert (Self-actualisation)	Creating, designing & evaluating	Developing / using tools for mediation & knowledge building	Managing, leading, facilitating, evaluating contiguous & virtual communities

The first row integrates interactions arising from experiences within the physical world characterised by acquisition learning (Learning *From* others), mostly through imitation of psychomotor, cognitive and social skills during apprenticeship. This addresses the need for competence along the three proposed dimensions. Along the domain dimension learners acquire domain-related declarative, procedural and conditional knowledge in relation to a wide range of topics. Typical interactions at this level will include learner initiated actions such as imitations, asking for task-related help to understand initial conceptualisations or procedures and asking for clarifications while consolidating concepts and skills through practice. The corresponding metacognitive activity (intra-individual interactions) involves monitoring and organisational interactions while systemizing knowledge around domain core themes in the process of identifying a domain model and related skills regime. It also involves developing an awareness of natural propensities in information processing and controlling for domain-related personal beliefs.

Acquisition along the technology dimension includes developing a working competence based on knowledge and skills related to the use of different tools. Typical interactions will include identifying tool options, testing tool features and imitating use of tool. Metacognition involves rationalising belief system about the digital tools, controlling attitude to digital technologies and developing affective strategies to manage anxiety. Competence along the community dimension means acquiring interpersonal skills leading to affiliation and adoption of particular roles within the learning community. The main metacognitive activity within this dimension involves rationalisation and control of individual propensities related to perception, beliefs and reactions to technology-enhanced social interactions counteracting natural inhibiting propensities.

The middle row represents the ‘experienced’ level that includes interactions with the physical environment and with conceptual artefacts. This level is characterised mainly by participatory learning (Learning *With* others) and thus addresses the need for relatedness, affiliation and intimacy with the contiguous group and any domain-related ‘Communities of Practice’ or tool-related affinity spaces. Participation in learning and knowledge building, involving negotiation and argumentation, widens the ‘zone of proximal development’ [11] along the domain and technology dimensions that leads to the joint construction of distributed knowledge and skills through task and person-oriented interactions. The group serves as a forum for negotiation and argumentation along all dimensions. Participants assess and refine their knowledge and skills through further imitation, guided practice and deliberations. The group also provides apprenticeship in developing advanced forms of competence and understanding the deep structure of the particular digital tool for technology-enhanced communication and sharing. Along community dimension negotiation and argumentation manifests themselves in sharing impressions about use of tool with other participants, sharing domain and biography in relation to digital tools and artefacts, negotiating roles, suggesting goals and promoting interpersonal communication.

At this level of competence metacognition would involve monitoring interactions in the process of developing distributed knowledge and skills along the three dimensions. The domain model is further elaborated through discussion and negotiation, while the deep structure of digital tools is further understood through the categorisation of tool features. Along the community dimension, through mentalising (mind reading), group monitoring skills are identified and practiced. This mainly involves challenging individuating impressions and evaluating the goals and beliefs of other colleagues by comparing incoming impressions with social scripts.

The third row represents the expert level, including mainly interactions with the world of ideas and artefacts. This interaction is characterised by contributory and mediation forms of learning and knowledge building (*Mediating* others’ learning) that addresses the need for self-actualisation. Domain or tool experts communicate their highly refined knowledge and skills or mediate the learning of less competent learners through discourse enhanced by digital conceptual artefacts. Mentoring, modelling and evaluating domain models and skilful use of digital technologies are all expressions of leadership that satisfies the need for self-actualisation and power. Thus more competent participants show a higher level of interactions related to evaluation and modification of domain and TEL models, together with negotiation in mediating them through mentoring and modelling.

Along the community dimension contribution in TEL implies monitoring and managing group interactions by challenging behaviours, impressions and beliefs, evaluating group goals and suggesting alternative roles. Metacognition involves developing insight into domain models and the structure of the digital artefact with the necessary skills for using these models as conceptual artefacts. Insight into community functioning is shown by interactions to nurture group affinity, ability to anticipate others' behaviour and proposing alternative relationship models for the group.

4 Conclusion

With this framework as back drop, the content and methodology for the Program in TEL was developed. The programme includes modules related to epistemology, pedagogy, use of digital artefacts and design aspects for TEL. The introductory module focuses on epistemology and technology in a knowledge society and how this translates into practical actions in relation to classroom practice and autonomous learning according to learner's competence. The ePortfolio framework is introduced as a framework to capture, record and evaluate learner interactions within any specified content domain, with technology and related communities of practice. This also integrates reflection tools about the tasks and tools being used thus making learners more aware of their internal processes during TEL.

The pedagogical component focuses on the learning processes mediated by different categories of learning technologies. It refers to the processes characterising productivity, communication, instructional and knowledge sharing tools used in classrooms. It also elaborates on the pedagogical processes underlying simulation and game-based learning, mobile learning, technology-enhanced creativity support systems that employ a 'learning by designing approach' (such as robotics, interactive story-telling, 3D-modelling), media processes (processes involved in developing picture, audio and video-based documentaries) and interactive TV.

The design component focuses on how efficient and effective TEL can be developed through an interactions approach. The characteristic interactions of each cell of the proposed model are identified and activities to promote these interactions are suggested. For example the first cell is characterised with acquisition learning within a particular domain. Thus interactions in a domain are organised in the form of an online tutorial. Cell 6, where the second pedagogical level (participation) intersects with the community dimension, promotes collaborative learning and more efficient interactions within the community through the adoption of different roles in contiguous and virtual communities. Interactions include imitations (of domain, technology and social skills), communication (including chat, rate and comment) and sharing (including send, upload and publish). Interactions across the third (contributory) pedagogical level include two major categories. Interactions to 'Facilitate' learning and knowledge building including the action words 'recommend, channel, tag, subscribe, filter and mentor'. Interactions at the design/create level involve customize, design, produce, contribute, program, model and evaluate actions.

This model will be used to develop programme descriptions for undergraduate and masters programmes. It will be used at the micro level to develop modules focusing on particular categories of pedagogical interactions. The same theoretical model will be employed to design and develop a centre for TEL that will organize its resources according to the demands of this process-oriented methodology. This interactions-oriented model will also be used to develop design templates and evaluation instruments for assessing the complex pedagogical scenarios that may be encountered in TEL. These will be discussed and elaborated in other papers.

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Extending LMS to Support IRT-Based Assessment Test Calibration

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Abstract. Developing unambiguous and challenging assessment material for measuring educational attainment is a time-consuming, labor-intensive process. As a result Computer Aided Assessment (CAA) tools are becoming widely adopted in academic environments in an effort to improve the assessment quality and deliver reliable results of examinee performance. This paper introduces a methodological and architectural framework which embeds a CAA tool in a Learning Management System (LMS) so as to assist test developers in refining items to constitute assessment tests. An Item Response Theory (IRT) based analysis is applied to a dynamic assessment profile provided by the LMS. Test developers define a set of validity rules for the statistical indices given by the IRT analysis. By applying those rules, the LMS can detect items with various discrepancies which are then flagged for review of their content. Repeatedly executing the aforementioned procedure can improve the overall efficiency of the testing process.

Keywords: e-learning, Assessment Test Calibration, Computer Aided Assessment, Item Analysis, Item Response Theory, Learning Management System.

1 Introduction

With the proliferation of computer and Internet technologies, *Computer Aided Assessment* (*CAA*) tools have become a major trend in academic institutions worldwide. Through these systems, tests composed of various question types can be presented to students in order to assess their knowledge. Yet, there has been considerable criticism of the test quality, with both research and experience showing that many test items (questions) are flawed in some way at the initial stage of their development. Test developers can expect about 50% of their items will fail to perform as intended which may eventually lead to unreliable results of examinee performance [1]. It is therefore imperative to assure that the individual test items are of the highest quality possible since a poor one could have an inordinately large effect on some scores.

There are two major approaches to item evaluation using item response data, and both can be used, sample size permitting. The classical approach focuses on traditional item indices borrowed from *Classical Test Theory* (*CTT*) such as item difficulty, item discrimination, and the distribution of examinee responses across the alternative

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responses. The second approach uses *Item Response Theory* (*IRT*) to estimate the parameters of an item characteristic curve which provides the probability that an item will be answered correctly based on the examinee's ability level as measured by the test.

The natural scale for item difficulty in CTT is the percentage of examinees correctly answering the item. One term of item difficulty is *p-value*, which stands for the proportion of percentage of examinees correctly answering the item. Every item has a natural difficulty based on the performance of all persons undertaking the test; however, this p-value is quite difficult to estimate accurately unless a very representative group of test-takers is being tested. If for example the sample contains well instructed, highly able or highly trained people, then the test and its items will appear very easy. On the other hand, if the sample contains uninstructed, low-ability or untrained people, then the same test will appear very hard. This is one of the main reasons that CTT is often criticized for [2], [3], because the estimation of the p-value is potentially biased by the sample on which the estimate of item difficulty is based.

With IRT the composition of the sample is generally immaterial, and item difficulty can be estimated without bias. The one-, two-, and three-parameter binary-scoring (dichotomous) IRT models typically lead to similar estimates of difficulty, and these estimates are highly correlated to classical estimates of difficulty. Additionally, while classical statistics are relatively simple to compute and understand and do not require sample sizes as large as those required by IRT statistics, they a) are not as likely to be as sensitive to items that discriminate differentially across different levels of ability (or achievement), b) do not work as well when different examinees take different sets of items, and c) are not as effective in identifying items that are statistically biased [4]. As a result, the use of IRT models spread rapidly during the last 20 years and they are now used in the majority of large-scale educational testing programs involving 500 or most test-takers.

IRT analysis yields three estimated parameters for each item, α, b and c respectively. The α parameter is a measure of the discriminating power of the item, the b parameter is an index of item difficulty, and the c is the "guessing" parameter, defined as the probability of a very low-ability test taker getting the item correct. A satisfactory pool of items for testing is one characterized by items with high discrimination ($\alpha > 1$), a rectangular distribution of difficulty (b), and low guessing ($c < 0.2$) parameters [5], [6]. The information provided by the item analysis assists not only in evaluating performance but in improving item quality as well. Test developers can use these results to discriminate whether an item can be reused as is, should be revised before reuse or should be taken out of the active item pool. What makes an item's performance acceptable should be defined in the test specifications within the context of the test purpose and use.

Unfortunately only a few test developers have the statistical background needed to fully understand and utilize the IRT analysis results. Although it is almost impossible to compel them to further their studies, it is possible to provide them with some feedback regarding the quality of the test items. This feedback can then act as a guide to discard defective items or to modify them in order to improve their quality for future use. Based on that notion, the present paper introduces a comprehensible way to present IRT analysis results to test developers without delving into unnecessary details. Instead of memorizing numerous commands and scenarios from technical manuals, test developers can easily detect problematic questions from the familiar user interface of a *Learning Management System* (*LMS*). The latter can automatically calculate the limits and rules for the α, b, and c parameters based on the percentage of questions wanted for revision. The examinee's *proficiency* (θ) is represented on the usual scale (or metric) with values ranging roughly between -3 and 3, but since these scores include negative ability estimates which would undoubtedly confuse many users, they can optionally be normalized to a 0..100 range scale score.

2 Related Works

The use of *Learning Management Systems* (*LMSs*) and CAA tools has increased greatly due to the students' demand for more flexible learning options. However, only a small fraction of these systems supports an assessment quality control process based on the interpretation of item statistic parameters. Popular e-learning platforms such as Blackboard [7], Moodle [8] and Questionmark [9] have plug-ins or separated modules that provide statistics for test items, but apart from that they offer no suggestions to test developers on how to improve the problematic items. Therefore, many researchers have recently endeavored to provide mechanisms for test calibration.

Hsieh et al. introduced a model that presents test statistics and collects students' learning behaviors for generating analysis result and feedback to tutors [10]. Hung et al. proposed an analysis model based on CTT that collects information such as item difficulty and discrimination indices, questionnaire and question style etc. These data are combined with a set of rules in order to detect defective items, which are signaled using traffic lights [11]. Costagliola et al.'s eWorkbook system improved that idea by using fuzzy rules to measure item quality, detect anomalies on the items, and give advice for their improvement [12]. Nevertheless, all of the aforementioned works preferred CTT to IRT for ease of use without taking into consideration its numerous deficiencies.

On the other hand, IRT has been mainly applied in the *Computerized Adaptive Test* (*CAT*) domain for personalized test construction based on individual ability [13], [14], [15], [16], [17]. Despite its high degree of support among theoreticians and some practitioners, IRT's complexity and dependence on unidimensional test data and large samples often relegate its application only to experimental purposes. While a literature review can reveal many different IRT estimation algorithms, they all involve heavy mathematics and are unsuitable for implementation in a scripting language designed for web development (i.e. PHP). As a result, their integration in internet applications such as LMSs is very limited. A way to address this issue is to have a webpage call the open-source analysis tool ICL to carry out the estimation process and then import its results for display. The present paper showcases a framework that follows the aforementioned method in order to extend an LMS with IRT analysis services at no extra programming cost.

3 Open-Source IRT Analysis Tool ICL

Several computer programs that provide estimates of IRT parameters are currently available for a variety of computer environments [18], [19]. These include Rascal [20], Ascal [21], WINSTEPS [22], BILOG-MG [23], MULTILOG [24], PARSCALE [25], [26], RUMM [27] and WINMIRA [28] to name a few that are easily obtainable. Despite being the de facto standard for dichotomous IRT model estimation, BILOG is a commercial product and limited in other ways. Hanson provided an alternative stand-alone software for estimating the parameters of IRT models called *IRT Command Language* (*ICL*) [29]. A recent comparison between BILOG-MG and ICL [30] showed that both programs are equally precise and reliable in their estimations. However, ICL is a free, open-source licensed in a way that allows it to be modified and extended. In fact, ICL is actually IRT estimation functions (ETIRM) [31] embedded into a fully-featured programming language called *TCL* ("tickle") [32] and thus allowing relatively complex operations. Additionally, ICL's command line nature enables it to run in the background and produce analysis results in the form of text files. Since the proposed framework uses only a three-parameter binary-scoring IRT model (*3PL*), ICL proves more than sufficient for our purpose and was therefore selected to complement the LMS for assessment test calibration.

4 Integrating IRT Analysis in Dokeos LMS

Dokeos is an open-source LMS accompanied by Free Software Foundation's [33] [34] General Public License [35]. It is implemented in PHP and requires Apache acting as a web server and mySQL as a Database Management System. Dokeos has been serving the needs of two academic courses at the University of Macedonia for over four years, receiving satisfactory feedback from both instructors and students. In order to extend its functionality with IRT analysis and assessment test calibration functions, we had to modify the source code so as to support the following features:

1. After completing a test session, the LMS stores in its database the examinee's response to each test item instead of keeping only a final score by default.
2. Test developers define the acceptable limits for the following IRT analysis parameters: a) item discrimination, b) item difficulty, and c) guessing. The LMS stores these values as validity rules for each assessment. There is an additional choice of having these limits set automatically by the system in order to rule out a specific percentage of questions (Fig. 1.1).
3. Every time the LMS is asked to perform an IRT analysis, it displays a page with the estimated difficulty, discrimination and guessing parameters for each assessment item. If the latter violates any of the validity rules already defined in the assessment profile, it is flagged for review of its content (Fig. 1.2). Once item responses are evaluated, test developers can discard, revise or retain items for future use.
4. In addition to a total score, the assessment report screen displays the proficiency θ per examinee as derived from the IRT analysis (Fig. 1.3).

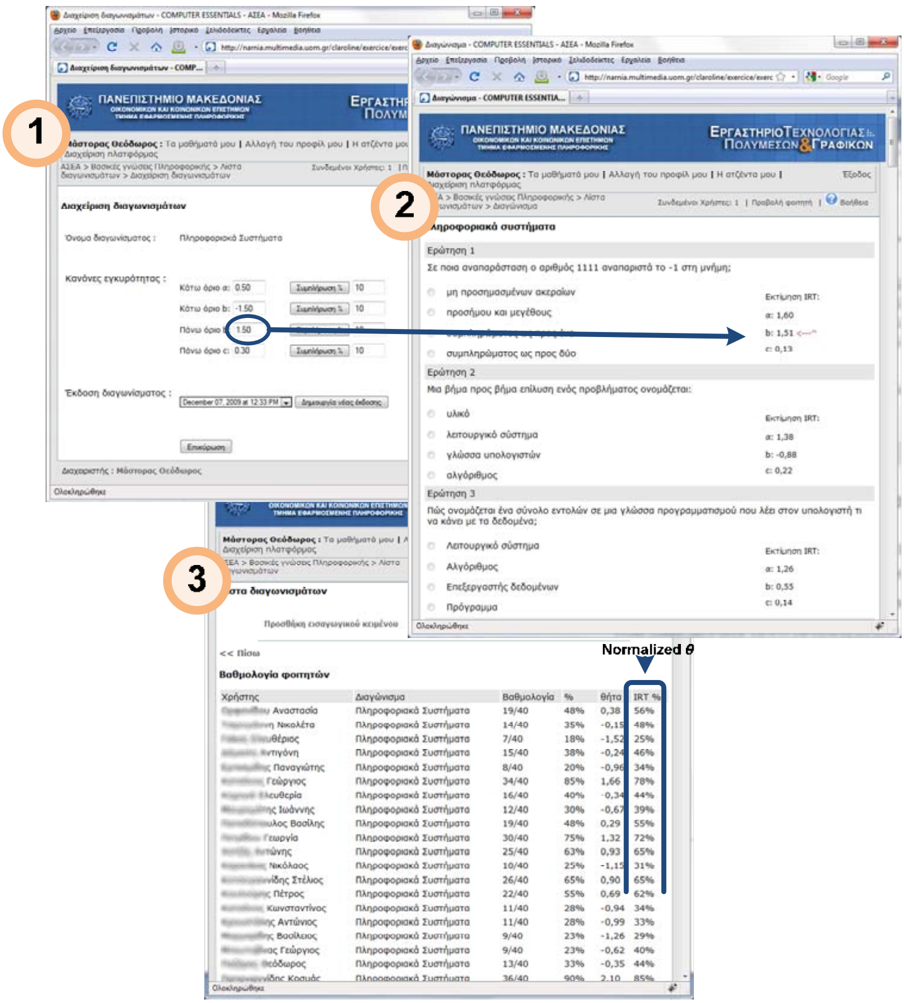

Fig. 1. Functionality features supported in extended Dokeos LMS

5 The Proposed Item Analysis Methodology

The proposed methodology consists of four steps, with each one of them being an action performed by the LMS. Although we used Dokeos as our LMS of choice, the proposed item analysis methodology can be applied to other e-learning tools, too. Once an update of the IRT results is called for, the LMS exports the proper data files and TCL scripts (Fig. 3). The LMS then performs a number of calls to the ICL using PHP (Fig. 4 and 5) and after parsing the analysis results, it imports them to its database. A system following this approach is illustrated in Fig. 2.

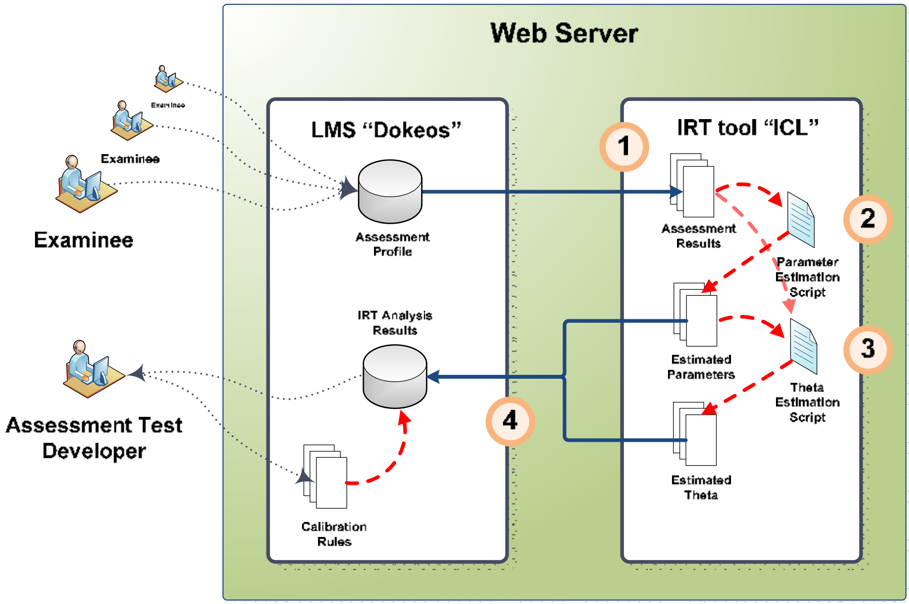

Fig. 2. System architecture

The proposed methodology consists of the following steps:

1. The LMS exports the assessment results to a data file and generates a TCL script to process them (parameter estimation script). The bold parts in the script change after each execution, depending on the number of the test items and the assessment name (e.g. *40* and *test0140* respectively). The rest of the script is about the algorithm performed by the ICL ("EM" algorithm), the type of IRT analysis (dichotomous) and the maximum number of iterations (200).
2. The LMS then calls up ICL with the parameter estimation script passed as a parameter in order to create a data file containing the α, b, and c values for each test item. At the same time it prepares a second TCL script to process these IRT parameters (θ estimation script).
3. The LMS calls up ICL with the θ estimation script passed as a parameter so as to make a data file with the examinees' θ values.
4. Finally, the LMS imports the two ICL-produced data files (*.par and *.theta) to its database for further processing in the context of the aimed assessment test calibration.

Once an initial item pool has been calibrated, examinees can then be tested routinely. As time goes on, it would almost surely become desirable to retire items that are flawed, have become obsolete, or have been used many times, and to replace them with new items. Having these problematic items already been detected by the LMS, test developers can take any necessary course of action to improve the quality of tests. Additionally, since the limits for the IRT analysis parameters are not hard-coded, test developers can modify them at will in order to tune the sensitivity of the system.

```
0101001000100111111001010101100000100111
0101000100010001100000111001100000100110
0000000000000011000000110001000010001000
0001010000110010100000111101110010000100
0100010000000001100000000001001010000100
0111011101110111111101111111111101111111
1111001001110000000000011101010000101100
0110000000010011101000110000001000000110
.
.
.
……… one row per examinee ………
```

```
output -no_print
allocate_items_dist 40
read_examinees test0140.dat 40i1
starting_values_dichotomous
EM_steps -max_iter 200
print -item_param
release_items_dist
```

Fig. 3. (a) Assessment results (test0140.dat file). (b) Parameter Estimation Script (test0140.tcl file).

```
1  1,597597  1,506728   0,128515
2  1,377810  -0,876164  0,223903
3  1,258461  0,549362   0,140593
4  1,031856  0,495642   0,079279
5  1,077831  1,004437   0,136324
6  0,479151  1,544218   0,218270
7  1,439241  1,279352   0,082382
8  0,898259  1,310215   0,129570
9  1,837514  1,349520   0,032675
10 0,467694  0,934207   0,206085
11 0,607603  0,265524   0,181212
12 0,240009  1,054301   0,245737
13 0,945631  1,451464   0,050895
.
.
.
……… one row per item ………
```

```
output -no_print
allocate_items_dist 40
read_examinees test0140.dat 40i1
read_item_param test0140.par
set estep [new_estep]
estep_compute $estep 1 1
delete_estep $estep
set eapfile [open test0140.theta w]
for {set i 1} {$i <=
[num_examinees]} {incr i} {
.
.
.
}
close $eapfile
release_items_dist
```

Fig. 4. (a) Estimated parameters (test0140.par file). (b) θ estimation script (test0140t.tcl file).

```
0,378453     0,434304      19
-0,149162    -0,096175     14
-1,523733    -5,999491     7
-0,238032    -0,172708     15
-0,964941    -1,001566     8
1,658672     1,737581      34
-0,343387    -0,312642     16
-0,665486    -0,666954     12
.
.
.
……… one row per examinee ………
```

Fig. 5. Estimated theta (test0140.theta file)

6 Conclusion

The present paper introduced a methodological and architectural framework for extending an LMS with IRT–based assessment test calibration. Instead of having web developers implement complex IRT estimation algorithms within the LMS, the proposed methodology uses ICL to obtain reliable IRT analysis results. The latter are then automatically imported to the LMS, thus releasing test developers of this burdensome duty. By applying a set of validity rules, the enhanced LMS is able to detect several defective items which are then reported for review of their content. As a result, the suggested approach is capable of assisting test developers in their continuous effort to improve flaws test items. Moreover, the user-friendly interface allows users with no previous expertise in statistics to comprehend and utilize the IRT analysis results.

According to research focused on IRT sample size effects [36], a great number of examinees are needed to obtain accurate results. For example, Swaminathan and Gifford [37] concluded that about 1,000 examinees are required when using the 3PL model. This would pose a problem for most test developers due to the fact that the number of examinees in academic courses rarely exceeds 150. Nevertheless, less accurate estimates are acceptable when aiming for assessment calibration since the desired goal is to identify test items with the highest and lowest parameter values. The proposed system introduces a feature that addresses the aforementioned issue (Fig. 1.1) and allows test developers to easily pinpoint this particular group of test items for revision.

This initial experiment produced encouraging results, showing that the system can effectively evaluate item performance and therefore increase the overall validity of the testing process. The fact that the proposed methodology is not limited to Dokeos but can be easily adopted by different e-learning environments makes it especially suitable for academic use.

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Family Involvement as a Priority Element for an Educational Action Based on Dialogic Learning

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Abstract. In our society, there is a need for a critical reflection on education and the tasks to be developed by every agent. The family and school are the two main socializing settings of children and adolescents and, therefore, their joint responsibility in their education is a commitment that should be established in an atmosphere of confidence and harmony in order to tend towards a learning community model based on dialogic learning.

Many research works, as those by Pineault ([2001]), Martínez and Álvarez ([2006]) and Garreta ([2008]), back that the parents' participation in school life has beneficial consequences for the family-school dynamics, such as: free-flowing relationships between parents and teachers; more collaborative attitudes of parents concerning the educational centre; positive assessment of teachers; higher self-esteem in children and adolescents; increase in academic performance; and greater commitment towards the environment.

Nevertheless, reality is still far from this model. In this research, the participation of families in state Compulsory Secondary Education schools is analysed, and some elements of reflection and working tools are presented to enhance and promote family involvement.

Data were obtained from a questionnaire, especially designed for this study, which was filled in by 1388 families from the province of Barcelona; and from interviews with 21 chairpersons of parents' associations.

Both quantitative and qualitative analyses were carried out. Finally, from the combination of results, some conclusions were drawn, which resulted in guidelines to improve family participation in Compulsory Secondary Education schools.

Keywords: involvement, family-school relationship, learning community, adolescents, secondary education.

1 Introduction

Educating at present requires different coordinated proposals to meet the new challenges set by society. It also requires a deep and critical reflection on the

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functions and tasks to be taken on by every agent, bearing in mind that education is built on the basis of recognising every person's specific responsibilities.

Furthermore, in this information society, learning does not only depend on what takes place in the classroom, but also on the relationship between what happens in the classroom and what happens outside, in the social and cultural environment. If we want this relationship to be fruitful, we have to tend towards a learning community model based on dialogic learning, which implies reorganizing the classroom and the educational centre, and open them to the neighbourhood, town or city. However, to make this model come true, the will of the school is not enough; families have to get involved by participating in different activities and going into the classroom. In this sense, a particular educational and cultural project, mainly based on what Torres ([2001]) calls endogenous, cooperative and joint effort, should be built by all agents in collaboration.

But, to tend towards this community learning model in secondary schools (IES in Spanish), we have to grasp the current situation, which is rather distant from this model, as available information and previous research, such as Pineault ([2001]), Sarramona et al. ([2002]), Seginer, R. and Vermulst, A. ([2002]), Martínez and Álvarez ([2006]), and Garreta ([2008]), confirm a decrease in family participation in activities organized by the educational centre when children change from primary to secondary education, mainly in state schools.

Nevertheless, there is a general positive predisposition towards a closer relationship between family and school, although the time and specific actions to solve this gap situation have not been met yet.

2 Study Objectives

In accordance with the purpose of this research, the general objectives of this study are as follows:

- To analyze, from the point of view of parents or legal tutors, the relationship between the families and the secondary school (four years of Compulsory Secondary Education —ESO in Spanish, with students aged 12 to 16 years) concerning tutorial time, class group meetings, and openness to the environment, with the aim of setting the basis for joint cooperation.
- To prepare specific proposals from the research results that offer elements of reflection and working tools to enhance and promote family participation in the IES and eventually in the community life.

3 Population and Sample

The participants in this research were families of ESO students from 21 IES in the province of Barcelona. Due to the characteristics and objectives of this study, two samples were selected, with different instruments being applied, as shown in Table 1:

Table 1. Sample and instruments

Sample	Sample Composition	No. of sample elements	Instruments used
Sample "A"	Families of different students that study ESO at the 21 IES selected, who were administered a questionnaire	1,388	Questionnaire
Sample "B"	Experts in school life and family participation (that is, parents or tutors with participation responsibilities in state schools). These people were chosen according to the IES in sample A, so that there was one expert per school	21	Semi-structured interview

4 Instruments and Variables

Two instruments especially devised for this research were used: a questionnaire addressed at families of students in four ESO years (Sample A); and a semi-structured interview for different people from Parents' Associations committees (Sample B).

Questionnaire. The questionnaire —submitted to focus group validation– about family participation in the IES is descriptive. The questionnaire is structured in tree main categories

Interview. The instrument applied to sample B was a semi-structured interview. The provisional list of categories was submitted to an interjudge validation, with three professionals that know the family-school relationship.

5 Summary and Discussion of Results

In this section, some results of this research work will be presented, grouped into categories.

5.1 Category 1: "Assessment of Personal Interviews with the Child's Tutor"

To the question *How many interviews with the tutor or with another IES professional did you attend last year?*, respondents' main answers fell into the "one or two meetings per year" groups, particularly one with 41.6 %. Nevertheless, 80.5 % of families stated that they attended all the interviews called to talk about their child, but still 13.1 % of them said they did not attend any.

These dada show that, in quite a high percentage, there is no follow-up of students throughout the academic year, as the "three or more interviews" group only has 19.4 % of answers. As for the person that attends interviews, it is the same one filling in the questionnaire in 98.1 % of cases.

Table 2. Assessment of number of interviews between family and IES tutor

	Assessment of number of interviews		
No. of interviews	Insufficient	Sufficient	There should be more collaboration between family and IES tutor
0	50.70 %	31.69 %	17.61 %
1	25.63 %	54.30 %	20.07 %
2	16.81 %	63.53 %	19.66 %
3	5.84 %	77.92 %	16.23 %
More than 3	5.66 %	76.42 %	17.92 %

If we study the number of interviews per ESO years, we can see that for all the years the highest percentage corresponds to "one interview", particularly in 1^{st} and 4^{th}, followed by "two interviews" that, despite having a high percentage in 2^{nd}, is very similar in the four ESO years.

Contrasting the number of interviews and the parents' answers concerning whether it is sufficient or not, results show, as presented in Table 2, that most parents (more than 50 %) think that the number of interviews is sufficient in the case of one interview or more. Only in the case of no interview is this percentage lower.

We also have to point out that 31.69 % of families consider having no interview at all throughout the academic year as sufficient.

The statistic ($\chi = 129.128, p < 0.0001$) shows that there is an association between the number of interviews and the assessment of sufficiency for this number.

From the causes for the personal interview, "to assess the academic/emotional situation" in general, both if the student's academic performance was good or not, has the highest percentage, 65.72 %, followed by the same reason but when academic performance is low, 14.81 %.

The statistic ($\chi = 15.128, p = 0.442$) shows independence between the causes for the interviews and the student's ESO year.

The statistic ($\chi = 64.655, p < 0.0001$) shows association between the number of interviews and the degree of satisfaction with them.

The statistic ($\chi = 16.895, p = 0.154$) shows independence between ESO year and the degree of satisfaction with the personal interviews.

5.2 Category 2: "Assessment of Meetings with the Child's Class Group"

The class group meetings are another element of communication between family and the tutor. These meetings can be informative in the classroom to talk about the objectives of the year. But they can also be meetings with the teachers or tutors and the parents of the group, to give information, some training, professional guidance or of a more informal nature, with particular aims and to share educational criteria.

Other interesting meetings are those with students and their tutor to explain their term assignments to their families.

In these meetings, an atmosphere of confidence and communication has to be created, and relational aspects have to be considered.

When asked *"How many class group meetings did you attend last year?,"* most parents, 60 %, reported that they had only attended one. In the second place, there is a considerable group, 20 %, with no class group meeting with teachers or tutors, and only the other 20 % attended two or more meetings.

These data show another aspect in the family-school relationship to be improved, as free-flowing communication cannot be achieved in only one meeting, which is mainly informative, and obviously less so with no meeting at all.

As for main reasons to call class group meetings, as shown in Fig. 1, we can observe that in 56.72 % it was to inform about class functioning, which can relate to the previously mentioned fact that very often there is only one meeting. The second reason is a meeting to talk about the organization of external activities, such as outings or trips.

In the assessment of these results, we think it is important to highlight the need for training meetings or term meetings to follow up the class functioning and the work carried out by students.

Among the reasons for meetings, there is no mention to active participation in their child's academic learning, and only 8.5 % of respondents reported that they would like to be involved in this kind of activity.

The degree of interest of these class group meetings is considered by parents as "acceptable" in 57 % of cases, and "high" in 29 %. Only 9 % are dissatisfied with the content and management of such meetings.

The statistic ($\chi = 14.251, p = 0.285$) confirms the independence between ESO year and degree of interest of class group meetings.

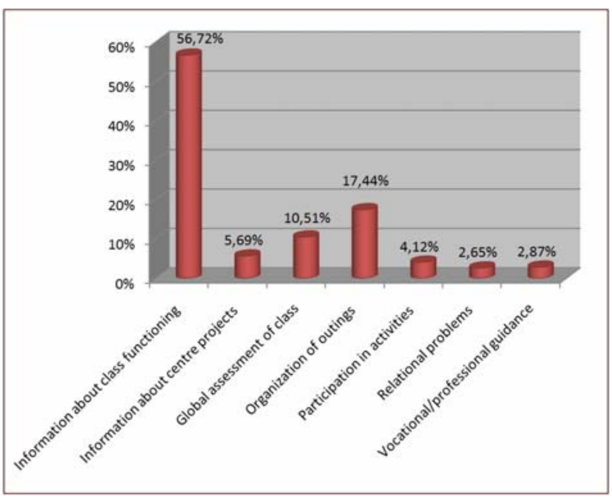

Fig. 1. Reasons for class group meetings

5.3 Category 3: "Attribution of Responsibilities and Concept of Secondary School"

95.5 % of families reported the need to work together, families and teachers, in the case of conflict or low academic performance. This percentage shows a clear stance of parents in relation to a joint working action with IES professionals in order to improve their child's academic and social education.

Nevertheless, the concept of IES not only as a closed teaching centre but also as an educational setting open to the neighbourhood and working online with other centres with common objectives is far from what parents think, as only 3.89 % define the school this way.

Taking into account this low percentage, we decided to find out whether this concept of IES had something to do with the respondent's level of studies, and we found that the percentage of families that consider the school only as the educational centre where their child studies decreases when the level of studies is higher; it is similar for those who consider it to be an educational institution that, together with the family, watches over their child's education; and the percentage of families that think that the school should be a reference for their community life increases progressively with the respondents' level of studies.

6 Conclusions

Interviews have the purpose to find an interpersonal relationship, and they are one of the easiest and most efficient educational actions available.

Therefore, if some actions to improve the family-IES relationship have to be undertaken in an educational community, it is essential to ensure the tutorial action, which has a more direct repercussion on the student and promotes knowledge between parents and tutor.

It would be important to promote meetings to design performance criteria, common objectives to move on together from the beginning of the academic year. Parents and tutors have to jointly develop an educational action plan, because we have to consider that the criteria at the basis of education have to be unified, as different or opposing opinions may lead the adolescent to grow in the middle of serious doubts as a result of receiving contradictory educational influences.

The IES-family cooperation has to be part of the basic and daily organizing elements of the educational centre, with two clear objectives: mutual promotion and joint decision-making, a basic element to set a learning community up, as indicated by Castells ([2001]).

All the members of the educational have to collaborate to identify educational issues, define objectives, elaborate policies, and develop and assess activities, to help students achieve optimal results. As Coll ([2004]) observed, in a community that learns objectives, content, educational methods, settings, and educational aims are subject to revision.

Our society needs a new integrated educational model, where both adolescents and adults can take advantage of the educational elements provided by the social network.

This integrated educational model implies being aware that education is not just a prerogative of the school, but has to be the result of a network project, including contributions from the school, families, associations, cultural associations, educational companies, trade unions, working world, mass media, and so on.

Cooperative work has to adapt to local realities to meet the needs and demands of every place. For this, it is important for the IES to be an element that promotes this work, as it is a training space for future citizens. And joint work gathers efforts and allows us to be more powerful to achieve objectives.

Common interests with other IES in the area can be found, or learning projects can be developed with IES from more distant places, by communicating through audiovisual means. In both cases, the point is to collaborate in order to produce ideas that enrich all the participants. In some towns, platforms or associations have been set up to enhance joint work of different institutions in the educational field, and they also allow participants to deal with problems affecting different centres.

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A Threats Blocking Plug-in for Open Source Learning Management Systems

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Abstract. Web-based Learning Management Systems, as in the nature of web-applications, are subject to attacks delivered through Internet, mainly aiming at accessing restricted data for illegal use. Protection from these kinds of threats is studied in the area of web applications and has been steadily improving in the last years. Nonetheless, especially in the area of very popular and easy-to-install web applications, such as Content Managements Systems, Blogs, and open source Learning Management Systems, the usual way to protect an installed system is to wait that weaknesses in the system software are discovered, and "patches" or new system releases are made available for installation. And this can be necessary also in cases in which no new threat technique has been discovered, while just another part of the system software has been detected as "weak" to that type of attack. Here we give an account of the most usual "exploit" techniques, known to be available, and describe a prototype methodology to equip certain Learning Management Systems (namely the open source ones, in particular those based on PHP engines) with a more stable protection, making it unnecessary to patch, or reinstall, a system in a hurry, after that minor weaknesses have been unveiled. The plug-in for a system is supposed to filter the input, sent by the user through a browser, and to avoid execution of server activities on suspect data. We test the methodology on Moodle, by producing a suitable plug-in, and verifying its success at system run-time.

1 Introduction

A Learning Management System (LMS) supports the management and delivery of e-learning courses, from administration and enrolment in programmes, through presentation and distribution of learning material, to tracing and analysis of learners' activity; other features are available, such as chat and forum, and those dedicated to authoring and storing of learning material.

Here we deal in particular with web-based e-learning, and with the "identity" of LMSs as web applications, able to let users (teachers and learners, basically) to interact via Internet. An LMS, as any other web application, is subject to

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several threats coming from malicious Internet users, able to “exploit” security weaknesses of the network application, and determine leaks of (possibly sensible) information [1,2,3].

The development of rich and user friendly LMSs has increased a big deal in recent years, together with an increase of the availability of network connections, and also with the steady deflation of the skills needed to install and make available through network LMSs. This has determined a great diffusion of LMS installations.

In such evolution the aspects of user friendliness and easiness of use, together with the augmenting of the useful features, have been taken care of in particular. The modular expandability of an LMS (namely Open Source ones) has been quite growing: in these cases, the contribution from users is not any more limited to the mere error discovery in features, yet it is expanded to the possible development of new features, (quite) simply integrable as modules into the system, to cover the developer needs and those of others.

No comparable revolution appears to be in act, though, with respect to the *security issues* of the “LMS as a web application”. Installers of such systems, usually, have to behave like installers and maintainers of any other web-application: they wait that a new weakness of the system software has been discovered, usually after it has been exploited for some attacks; and then wait for the system developers to issue a “patch” or directly a new release of the system to install. Then finally they get the new software and install it.

In the field of Open Source systems, as opposite to the one of proprietary software, the availability of several user fora, where participants can collaboratively raise discovered weaknesses and spread solutions, is remarkable: it can grant some greater speed in the correction of system software weaknesses. (On the other hand, such a quick diffusion of weaknesses description can maximize, too, the damage for unprotected systems).

However, there is a latency between weakness discovery and application of the issued protection. During this span of time, the system is unprotected and subject to well documented and easily attemptable attacks. Moreover, although new malicious techniques to deliver threats are constantly developed [4], much more frequently the exploits are applications of well-known techniques over newly unveiled segments of the system software: the news in the attack is in the localization of a new weakness in the software, rather than in the technique to bring a threat. So, quite often one has to actually reinstall a whole system, just to correct a local problem in some script of the system. The availability of filters in the system, able to counter all those attacks that are performed through certain known techniques, could highly enhance the system protection, and make it more stable and less dependent on constantly pursued system update.

In the general area of web-applications, the design and implementation of system protections, capable to act against whole families of technically homogeneous exploits, is already endeavoured and successful. *Intrusion Detection Systems*, such as ModSecurity ([5]) and `php-ids` ([6]), work at the level of the web-server. This is done either basing on lists of known weaknesses and vulnerabilities, or filtering interactions, through monitors watching on anomalies, unusual behaviour, and common web application attack techniques.

LMSs are basically web applications. On the other hand, there are some particular aspects in LMSs that make them somewhat different than plain web applications. In the case of LMSs we should consider that their increasing diffusion, in particular that of the free and open-source systems, makes it likely that several of such systems are operated and maintained by teachers directly, with possibly not enough assistance by web professionals. (The same probably holds for other popular applications such as Content Management Systems and Blogs, yet we limit our scope to LMSs here).

So, it seemed us reasonable to start trying and devise a dedicated approach, to the above security problems in LMSs: automated integration of the plug-in in the system could be supported, and the end user (that is the LMS manager) would find its use less difficult than having to tamper with higher levels of the web server and needing to use more complicated approaches.

In this paper we present an analysis of some of the most frequently exploited techniques to attack web applications, and so LMSs; we discuss the possibility to define some specific filter to be integrated into certain open source LMSs, in particular those that are developed in PHP ([7]) on a sufficiently modular base. We show a prototype methodology to be applied in such integration activities, and show an application of such methodology to one of the open source LMSs we analysed (Moodle [8]). We also show the final part of the methodology applied to the experimental case, to see how the protection module (Intrusion Block System - IBS) performs on an older (otherwise unprotected) version of the Moodle system.

2 Methodology

The IBS plug-in works by examining data coming from the browser to the PHP application, in order to detect an ongoing attack, and to block the execution of the LMS's pages.

From a "web programming language" perspective, we know that, whenever the web-browser requests a PHP application page, the web-server makes the incoming data available to processing mainly by 4 associative arrays:

– `$_GET`: form/URL data coming through the GET type of action method
– `$_POST`: form data coming through the POST type of action method
– `$_SYSTEM`: header-exchanged information (preferred languages, encoding, content-type etc.)
– `$_COOKIE`: user's cookies available for the current web domain

So, it is enough to examine these 4 arrays, in order to recognize the presence of the most common types of attack.

In the rest of this section we will examine the types of attack that IBS looks for. In the following section, instead, we present an overview of the tests made on the plug-in.

2.1 Types of Attack

The main types of Web application vulnerabilities/attacks can be classified in the following categories:

- **SQL injections:** This attack is possible when (unsafe) data coming from the browser is fed directly to the database back-end without proper verification. In this case it's possible to appropriately craft the incoming data so that the final SQL code sent to the database is modified with new malicious SQL instructions. The resulting SQL query could destroy data or retrieve information from the database. E.g. if the application uses the SQL code
  `SELECT name,surname FROM usertable WHERE id=X`
  and the parameter X is just concatenated from uncontrolled input, an attacker submitting the X string
  `-1 UNION SELECT username,password FROM users WHERE id=1`
  would be able to transform the initial to one that reads the password of any user. In facts, the resulting SQL query would compute the union of a null query (no ID can be negative), with a query that retrieves the username and password of the user with ID=1 (normally, the administrator).
- **Remote File Include (RFI):** This attack is possible if unsafe data is used by the application as the filename parameter of the `include()` function (or the other file inclusion functions), and if the automatic inclusion of remote files is activated in the PHP configuration. To execute the attack a properly-crafted string is passed as parameter to instruct the application to download and include an external page containing malicious php code. The execution of the included code results in modifications of the application behaviour (with complete access to the system).
- **Local File Include (LFI):** This attack is similar to the previous one, and it is used to disclose internal information even if the automatic inclusion of remote files is not activated. To execute the attack an unsafe parameter is crafted to let the application include important configuration/system files in the page, revealing sensitive data. E.g. by including the local `/etc/passwd` file in a page it's possible to read all local usernames in a UNIX system. Moreover, if the web-server is mis-configured and it's running with high privileges, by including the `/etc/shadow` file it would be possible to read all the local passwords (and then later crack them and penetrate the machine).
- **Remote Code Execution (RCE):** This attack exploits mis-configuration of external programs called by the LMS (e.g. the LaTeX system in the case of Moodle), that can be used to execute external scripts or to include and disclose sensitive data in the generated (PDF) pages.
- **Cross Site Scripting (XSS):** This attack uses malicious javascript code that is uploaded and executed in another user's browser, gaining full access to his personal session data. Normally it's used to steal login credentials to be used later.

All these attack types can be characterized through the definition of corresponding signatures, i.e. regular expressions designed to match known string patterns contained in the exchanged data.

2.2 Schema of Interaction

The IBS plug-in is made of three components: a detection and logging module, the signature database, and the administration module, where the administrator adds new signatures and analyses logs.

The IBS plug-in is called by the LMS system at the beginning of all PHP requests coming to the Web server. This is obtained by configuring PHP to pre-pend the inclusion of the IBS plug-in page to all application pages.

IBS, then, checks the data flowing from the Browser to the server before allowing the normal operations of pages.

It scans the above mentioned arrays to match the known signatures, and blocks access to the web application as soon as a match is found.

3 Test Results

The IBS plug-in has been tested in three phases:

- **Functional test:** a test with known general examples of attack on the Moodle LMS (even if they are not known bugs of Moodle), to confirm that IBS detects them and works well;
- **Vulnerable application test:** a test of known vulnerabilities of an older version of the Moodle LMS, to show that Moodle is now protected by IBS;
- **Stress test:** test of Moodle+IBS with a well-known web-application security scanner, (**Wapiti** [9]), to confirm that the IBS' current attack signatures detect and block a good part of known threats.

3.1 Functional Test

We have tested IBS by sending samples of known attacks through all 4 IBS-controlled pathways ($_GET, $_POST, $_SYSTEM, $_COOKIE), obtaining the expected blocking messages (see figure 1 for: an example of SQL injection through a POST form attack).

3.2 Vulnerable Application

In this case we have installed an older version of Moodle, known to be vulnerable to several attacks. We have explored the security advisories present on the most important security sites (`www.packetstormsecurity.org`, `www.exploit-db.com`, `www.securityfocus.com`, `www.secunia.com`) and selected Moodle version 1.8.4, that is vulnerable to an exploit because of several PHP variables that are not properly sanitized before usage in the application.

Once this version has been installed, we have used one of the published exploits (the one available at `http://www.exploit-db.com/download/6356`) and made two tests:

- checked that the exploit actually exposes the vulnerabilities of version 1.8.4 of Moodle.
- checked that IBS traps and blocks all these vulnerabilities.

The test has been successful.

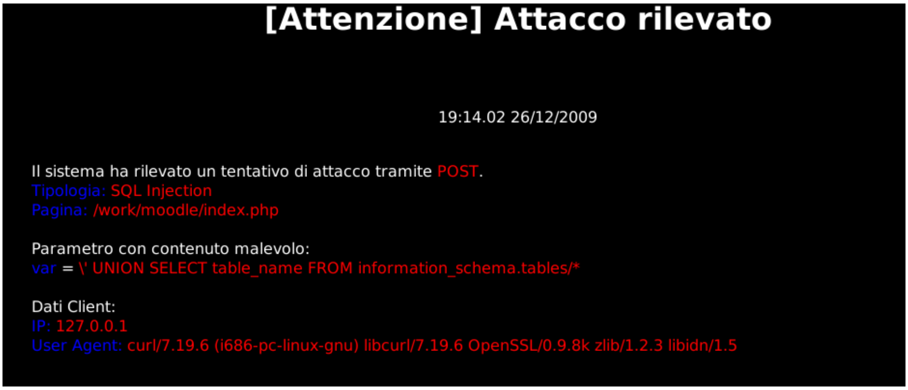

Fig. 1. An SQL injection has been detected in a POST request

3.3 Stress Test

At last, we have downloaded and used the well known **Wapiti** vulnerability scanner against Moodle+IBS to see how many vulnerabilities are discovered and how many are blocked by IBS. **Wapiti** is an open-source vulnerability scanner produced by the Open Web Application Security Project (OWASP). This tool tries several types of attack:

– File Handling Errors (Local and remote include/require, fopen, readfile)
– Database Injection (PHP/JSP/ASP SQL Injections and XPath Injections)
– XSS (Cross Site Scripting) Injection
– LDAP Injection
– Command Execution detection (eval(), system(), passtru())
– CRLF Injection (HTTP Response Splitting, session fixation)

Among the almost 230 attacks done over two of the Moodle pages, 95 attacks have been detected and blocked. The remaining undetected attacks belong all to the SQL injection category. This part of the result was expected, as the SQL injection signatures used by IBS in our test were just a small subset of all SQL injection types. Moreover, while the Wapiti's SQL injection strings are especially crafted to expose the presence of this kind of vulnerabilities, they are not made to produce bad effects in the tested application, but only to discover if a way to do SQL injection exists in the application. Anyway, we are adding the corresponding signatures to the IBS database, in order to detect active vulnerability scans coming from attackers.

4 Conclusions and Future Work

We discussed the design, implementation and test issues of a plug-in methodology to shield LMSs from certain families of security attacks.

One general issue for future work is in the integration and experimentation of IBS in other LMSs (firstly those PHP-based). Moreover, there are some improvements that can be designed and that we plan to work on in future; here some follow.

Application Protection: As we have chosen to ignore the actual application semantic, the IBS plug-in cannot protect from more subtle threats coming from corrupt data submitted to the application. Such attacks cannot be overcome without letting the system to handle a precise definition of the application's data exchanges. So, a first improvement is in making it possible to store in the plug-in a description of the correct application data protocols, and, on that basis, to check for data misuse.

Better Performances: the IBS plug-in runs on top of the LMS application, and it can have some impact on the system response. The efficiency of the plug-in (and its discretion in terms of resources) can be improved by having the threats signatures cached in memory.

Honeypot Traps: *abnormal usage* of the LMS can be exposed also by analyzing the application's output. Many of the threats, in facts, try to steal reserved information. By planting specific information inside the most sensitive data, we can easily detect some data-breaches, through an analysis of the application output, performed before that that data is sent out (to the attacker).

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Design of an Interactive Game for Teaching War Ethics

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Abstract. This work focuses on the use of computer simulations and computer games for the training of prospective and serving Armed Forces officers. A study of the use of computer simulations and games for teaching and training in the context of both the Armed Forces and civilian applications is presented. The study leads to high level specifications for the design of the proposed training game. The functional design of the proposed game is then explained and its rules are listed. The design is shown to offer the flexibility required for the teaching courses it is meant to serve. Further research necessary for the development of optimization algorithms necessary for the design is described.

Keywords: Technology enhanced learning, teaching games, winning strategies, computer simulations, pursuit and evasion, differential games.

1 Introduction

The use of computer simulations has been extensively exploited for enhancing the training of Armed Forces officers in decision making for tactical situations [1]. Teaching of humanities courses like Philosophy or War Ethics still has a lot to benefit from the introduction of e-Learning technologies into the everyday didactic routine [2]. Adopting a technology enhanced learning approach for explaining the theoretical principles involved to students and assessing their understanding, is an intriguing problem. Solutions to this problem require purpose designed systems that address the particular characteristics of specific target student groups. This paper is concerned with the application of technology enhanced learning for the teaching of war ethics to prospective officers of the Armed Forces. More particularly, it is concerned with the technical part of the design of an interactive, on-line war game capable of assessing if students are able of maintaining ethical rules of engagement in conflict while maintaining the required high standards of strategic and tactical efficiency. The use of on-paper war games in teaching Armed Forces cadets is a topic of increasing interest [3]. The problems relating to the assessment of electronic War Games have been

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extensively analyzed in [4] and a multidimensional assessment roadmap has been proposed. In the same study, a very simple sample scenario and preliminary design principles for such a game have been listed.

The aim of this paper is to present a high level functional design of an interactive, on-line, multiplayer game that will be capable of supporting the training prospective officers of the armed forces on the war ethics and maintaining international law governing the rules of armed conflict. The game incorporates tactical and strategic aspects so as to enable students to appreciate the difficulties of abiding by ethical rules while achieving their military goals and devise methods for overcoming such difficulties. The design of the game allows users to compose new crisis scenarios, to determine the rules that are applicable in each case, to assign the importance of the different aspects of the game to the final scoring of the participants and of course to play the game. Algorithms developed in the context of the game can also be used as driving forces for decision support tools.

In Section 2, existing work on the field of games design for teaching and training purposes for both military and civilian contexts is presented. In Section 3, the functional specifications for the present work are explained and the high level functional design for the proposed war game is given. In Section 4, the advantages of the proposed design are outlined. It is hence demonstrated that this design offers significant flexibility for instructors and effectively supports the teaching of the required topics of the curriculum. Finally, a roadmap for the implementation of the game and its assessment in real teaching is given.

2 Interactive Games for Training in Decision Making

The use of games for teaching specialized skills to prospective or serving officers of the armed forces is a well accepted approach ([1], [2], [3], [4], [7], [8], [9]). Officers, as well as many other professionals, need to be able of taking accurate decisions within very strict time limits while taking into account a large amount of possibly uncertain information. This is a very complex task and it is hence difficult to train the personnel simply on a theoretical basis. Such decisions involve subjective evaluation criteria, constraints of a physical or legal nature, assessment of imprecise data and selection from multiple action alternatives. For the case of military operations, the situation the officer has to be trained in is called the “Fog of War” [2], a term that illustrates the fact that the commanding officer always has an impaired view of the complete picture of the field of action.

The use of computer simulations for training (or aiding) personnel to efficiently cope with this kind of situations is always impeded by the fact that both the decision space of such problems, as well as the parameter space upon which these decisions are based are neither finite, nor can they be unambiguously defined [1]. What is proposed in literature therefore is the use of mathematical optimization to follow the situation as it evolves in real time or pseudo-real time ([1], [6], [9], [11]).

Depending on the training required, different types of mathematical modeling may be employed. Pursuit and Evasion situations may be considered as an example of a Differential Game [6]. Pursuit and Evasion games include the “Guarding the target problem, deadline games and patrolling games [6]. Their general aim is to guard a target, which is an area on the plane, from the attacks launched by the evader. Such problems may be formulated in both continuous and discrete versions. A discrete guarding game played by two players based on a directed or undirected graph is an NP hard problem [6]. When considered under restrictions, such as a limited size plane, encompassing an undirected graph, analytical answers as to the optimal strategy that a player should follow may be derived [7]. In its simpler form, a pursuit game is a zero-sum game, in that the goals of the players are conflicting (player A wants to occupy space S, currently occupied by B etc). A less simplistic approach to the design of pursuit games is the non-zero sum case where the goals of the players may not always be conflicting [12].

For a three player discrete game where coalitions are possible, probabilistic analysis, rather than the adoption of an optimal analysis is proposed [8]. Allowing explicit coalitions in games completely alters the theoretical perspective of the game, since the actions of the allied players are independent and may encompass different field information. Defeating a coalition may involve different strategies, such as defeating each ally at different times [8].

A further distinction needs to be made between full information and partial information games. In full information games, all players have full knowledge of all the opponent's forces, as well as all their past moves. In partial information games, players lack knowledge of their opponent's past moves and their opponent's present situation. A player must hence hypothesize about all these parameters and the complexity of the analysis required to derive an optimal solution increases dramatically [9]. Partial information games are better suited to model the fog of war concept.

Continuous modeling of pursuit situations is also possible. In this case pursuers and targets are moving in continuous space and time and the requirements are minimizations of the distances and times subject to the physical constraints of the hardware being used [10]. The scope of the game in this case becomes an optimization of the speed of reaction of the players and deviates from the aim of this work which is targeted to the philosophical aspects of applying the ethics of war rules, subject to the strategic and tactical aims, as well as to the limitations of the fog of war.

Games are an intriguing tool for training personnel on responding to hard to solve problems in real time and this may be verified by the amount of research devoted to this topic [11]. In this section a selection of issues concerning the design of games was presented. This leads to a clearer view on how the design of a game suitable for the teaching of ethics should be approached.

3 Design of the Game

The aim of this work was to design a game that is suitable for teaching ethical rules. Given that this game was targeted for application in the case of prospective Armed Forces officers, it needed to be able to keep the students – players constantly aware of three additional very important aspects of their mission, namely its strategic and its tactical goals as well as the inevitable impairment of the fog of war. It is proposed to be a partial information game of more than two players with the possibility of coalitions.

3.1 The Concept of the Game

More specifically the proposed game is based on a grid, similar in concept with a naval battle game [4] or chess. The main difference from these games is that the proposed war game uses a larger grid with significantly finer resolution. The players of the game belong to one of two groups:

- Tactical army: These are players that represent the armed forces of a state and are hence bound by laws, ethical rules etc.
- Terrorist groups: These players represent forces that are not bound by ethics or rules and their behavior is totally unpredictable. Such players may be human participants or may be automatically handled by the computer program.

In addition to the above, there are two additional categories of players that may be active on the board or be implicitly represented:

- Strategic command: Represent the leaders of tactical armies and set military targets and assessment parameters
- Civilian population: Represent non-fighting individuals that exist on parts of the grid. Despite the fact that they are not active militarily, they may influence the outcome of a battle in various ways, e.g by storing weapons for one player or preventing a player from attacking a specific target.

The two last player categories are typically game parameters set by the instructor (implicit participation) or are active characters that are managed by either the instructor or the computer. Two or more players may belong to an alliance.

Each player possesses a number of pawns that are placed on specific positions on the grid. The grid is a discrete space, i.e. pawns may reside only on the vertices of the grid. Areas on the grid represent different geographical areas (ground, sea, buildings, difficult to access areas). Each pawn represents a specific type of forces (infantry, armored vehicles, ships, planes etc). The pawns may be laid on the grid by either the instructor or the player at the beginning of the game. Civilian pawns are also positioned on the grid by the instructor.

Each player plays on their own computer screen. On their own screen they are capable of seeing their own pawns and the pawns of their allies. Each of the pawns of a player also conveys intelligence information to their headquarters. In practice, this means that a player can also observe on their screen information about their opponents' pawns that their own pawns can see. An infantry unit will hence give its owner visibility over a small area around it, while an airplane will give visibility over a larger area.

3.2 Playing the Game

Each player plays in turn and moves a number of pawns or uses a number of weapons. Each pawn may move a certain distance on the grid according to its type. The number of pawns moved at each turn by each player is a parameter set by the instructor. Each pawn carries a limited number of weapons, depending on its type. Each weapon is effective against specific types of adversary pawns. A player may choose to either destroy or arrest pawns that are in range of their weapons. The use of certain types of weapons may be prohibited or impossible in certain areas. Weapons may be stored in certain positions on the grid. Such weapons are accessible to anybody occupying that part of the grid.

3.3 Pawn Movement Limitations

A player is given an initial amount of credit at the beginning of the game. Each pawn move has a cost that is deducted from their credit. Similarly, each weapon use also has a cost. A player may not move a pawn or use a weapon if they do not have enough credit left for this move. Certain positions on the grid are not allowed for certain types of pawns (e.g. the sea for infantry).

3.4 Definition of the Mission

Players are assigned missions that they need to achieve. A mission may involve occupying an area on the grid, arresting a number of adversary pawns, destroying a number of adversary pawns etc. Pawns that have been arrested and are prisoners of a player, incur a steady cost upon that player.

3.5 Scores and Eviction of Players from the Game

Each part of a mission that is achieved carries a certain number of points towards the final assessment of the player. A player also adds points to their score according to the credit they have left at the end of the game. A player loses points by not having achieved certain parts of their mission at the end of the game, by destroying civilians or allies and by using certain weapons in certain areas. These weapon – area limitations are instructor set parameters.

A player is evicted from the game if certain weapons in certain areas, if they use a weapon on an area with no targets or if they disobey any other instructor set rules. The player is also evicted from the game if a certain percentage of their pawn is destroyed or captured. The game finishes when a player achieves a certain percentage of the goals of their mission or if there is only one player left in the game.

For the case when some players assume the role of terrorists, scoring becomes asymmetrical, i.e. some players may score points for the same actions that cost points to other players.

4 Assessment of the Design and Future Work

The design of the game that was presented in a previous section represents a realistic model for the situations in which the players will have to apply the ethics of war principles that they have been taught. The ethical aspect of the game has been expressed as rules that either cost a player points or cause the "sudden death" of a player, i.e. their immediate expulsion from the game. This way, ethical rules could be measured on the same scale as other objectives of the game such as the completion of the player's mission or the credit points that the player has had to spend in order to pursue their mission. This model represents a real world situation where deviation from the ethical rules incurs costs upon real world players in the form of social pressure, social exclusion as well as legal proceedings.

The proposed design gives extensive liberty to the instructor to implement the game so as to match the priorities of their own classroom teaching, the particular aspects of the theory that they wish to stress or the strengths and weaknesses of a particular group of students. The instructor also has full liberty to participate in the game by assuming unconventional roles, such as that of a terrorist group, groups of civilians or the strategic leader of the players. The design also allows the game to change its scope, from a training exercise to a decision support platform. This is feasible by the use of suitable optimization algorithms that derive feasible, optimal or suboptimal sequences of movements for completing missions, based on mathematical analysis or heuristic rules.

There are still several theoretical issues regarding this work that need to be studied. These have to do with algorithms for producing strategic and tactical paths for dealing with specific situations with which the players may be faced. Algorithms will have to be designed based on both analytical and heuristic approaches. It has been shown in the literature surveyed that optimal solutions will not in general be feasible. The feasibility or infeasibility of seeking an optimal solution will have to be studied. Additionally, the calculation of limits in performance may be sought that can be used to compare the relative merits of heuristic solutions. The calculation of lower bounds that permit the determination of realistic tactical and strategic goals are also of interest to this work. Such a lower bound is derived in [8] for the case of a Cop and Robber game, where it is shown that depending on the distance between the two players, the game may be futile for either the Cop or the Robber.

The final and maybe most important step of this study will be the use of the game in the classroom and the assessment of its impact towards facilitating the teaching and improving the students' understanding of the topic. Additional interest is focused on the effectiveness of the strategies that the optimization algorithms will produce for the players that are automatically controlled (e.g. the terrorist groups).

5 Conclusions

A study on the use of computer games in teaching prospective Armed Forces officers. Existing work relating to the design of war games and training games were presented. The high level design of a training game was presented that is suitable for use in the teaching of war ethics to students. The game was designed to be able to assess the player skills in maintaining ethical rules and international laws on armed conflict while still achieving the strategic and tactical aims of their missions. The broad rules of the game were presented. The design was shown to offer flexibility to the instructors, allowing them to adapt the game to the requirements of their own teaching. Directions for further development of the game were presented, in both theoretical and applied aspects.

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BriteStep: Automation in IT Assessment

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Abstract. This focuses on an assessment system which permits the automated creation of tests and the evaluation of output from IT trainees. The existing prototype differs radically from other approaches in that it does not require any specific software platform to operate. Instead, it integrates seamlessly with standard existing business software such as Microsoft Word, PowerPoint or Excel. To achieve its objectives the system monitors and records user activity and through an intelligent inference engine it either creates test templates or it automatically assesses submitted tests. The present prototype operates on Windows XP and Vista and minimizes the effort of tutors to set and evaluate tests.

1 Introduction

There are several reasons that have prompted attempts for the computerized and automatic assessment of tests in the IT sector. Perhaps the most common reasons given are that computerization will deliver a series of advantages including:

- increased efficiency and lower costs;
- greater flexibility regarding administration (e.g. tests on demand versus tests at fixed and infrequent times);
- instant marking and , in some cases, feedback;
- better targeted items through the use of adaptive testing, leading to more precise and more efficient measurement;
- fewer errors;
- better integration with existing modules in the educational curricula where already Information and Communications Technology (ICT) has a strong hold.

Barriers in the introduction of automatic test assessment systems may include:

- Cost and expected return on investment;
- Establishing the equivalent of pencil and paper ease of use.
- Security;
- Coping with the diversity of ICT environments and cultures
- Software and hardware reliability, robustness and resilience of the system in the face of breakdowns
- Difficulty involved in accomplishing the task in the first place
- Complexity of software and user interface

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It is therefore no surprising that despite several attempts towards automatic software assessment such as [1], [2], [3], [5], most of the existing assessment systems still revolve around on-line multiple choice questions which the students need to answer and submit for evaluation.

Some more advanced systems consist of simulators designed to mimic part of the functionality of business software. Tests set using these systems usually consist of a series of instructions which the students must follow precisely and submit their answers for assessment. Even in these cases, it is not untypical for the assessment process to require a large manual effort owing to the considerable variation that answers may be provided.

There limitations associated with these approaches are numerous:

(i) For Multiple choice tests

- The tests have limited scope even though it is easy to set and assess them.
- It is not possible to test the full set of skills of trainees (particularly true in mathematics or other related subjects).

(ii) For Simulator-based tests

- Considerable effort to produce simulators in the first place
- Only a subset of the actual application will exist in the simulator thus limiting its functionality
- Following instructions in a simulator limits the range of skills that can be tested.
- Substantial effort may still be needed to assess the output

In both case (i) and (ii) the assessment is based on produced final outputs or actions, and there is no information regarding the activities followed to reach these results. This therefore restricts the amount of in-depth information of the trainee's understanding and skills. Once again this has more relevance in subjects related to mathematics or physics.

A more sophisticated system, called 'WP Marker', is described in [4] where IT trainees complete authentic tasks in a realistic environment, using standard business software. Unfortunately the system only partially automates the assessment process and still requires a lot of manual work to be done by the examiners. Another drawback of this approach was hat each examination required its own rule base (on average about 150 rules) in a "language" built by the designers which allowed users to express rules. Thus considerable amount of work was required to built the rules for each exam even though rules could be reusable.

The BriteStep technology addresses several of these issues and provides the basis for defining and creating automated assessments that are totally hands-off and which give the educator the option to evaluate all the actions of the students.

BriteStep integrates seamlessly with standard business software and can be used to test the full range of skills of students. .

The current system operates on a Windows platform (XP or Vista) and consists of three main parts:

a) A component that interacts with the actual legacy software application in real time and captures user actions as they occur;

b) A storage area where these actions could be placed and processed appropriately;
c) A means of comparing the stored information and assessing the actions to evaluate how well trainees meet set objectives.

This paper describes the first two main structures with a brief outline of part (c).

2 Methodology

From inception it was clear that any automated assessment of student progress system, needed to address all of the above issues so as to become a useful training tool and to reduce the amount of effort currently required to set and assess tests.

It was therefore decided that the system should operate on the actual software the trainees are meant to use and not just on contrived limited functionality simulators. In this way, the cost and effort for creating individual simulators could be eliminated, whilst the full range of skills and capability of trainees could be tested – and not just the final output of a preset instruction set. It was also the only way to ensure progressive expansion to include more and more of the functionality of legacy software. Further, it was decided that in order to be able to provide an assessment on the approach, a trainee used to produce a final result (as well as the result itself), a method of recording and assessing actions was needed.

With reference to the main structures of the system given in the Introduction, it was clear that the development should be used in one of the following ways: a) help educators and trainers to generate on line tests, b) record student/trainee actions and submit them for assessment, and c) provide suitable templates for assessing work submitted by students.

To develop the first part of this structure we used existing methods commonly available in Microsoft Windows such as “system hooks” which can be used to capture user actions. System hooks allow developers to insert call-back functions in applications and through them intercept messages which may be mouse or keyboard related. Hooks are generally characterised as local or global – the name relates to their ability to operate on one or on all applications which are active during a given session. Hooks must be designed and used carefully as they tend to slow down applications and can produce inconsistent results. Our approach entailed the loading and unloading of hooks as required, thus minimising the effort needed and retaining maximum possible system performance.

At present the prototype system uses a number of hooks to capture keyboard and mouse activities as users interact with applications with the captured actions stored for processing. It should be noted that in this case the use of hooks does not cause any noticeable slowing down of computer use as the human-computer interactions are almost invariably a lot slower.

For each action performed the following information is retained, as appropriate:

1) The type of action (e.g. mouse or keyboard) and the time it occurs.
2) If a mouse action is recorded, it retains the screen coordinates of the mouse both before and after the action.
3) The resulting action on the application (e.g. menu→ submenu→ action) or, if the action is applied to text or a drawing area directly, it denotes the result such as italicised text, moved diagram, etc.

4) If the action is performed on text or an area designated as a drawing area the position, paragraph and page on which the action applies is retained, or the starting and resulting output if the action relates to a diagram.
5) Naturally, all typed text is also recorded and stored including all control and shift characters as well as lines paragraphs, pages etc.

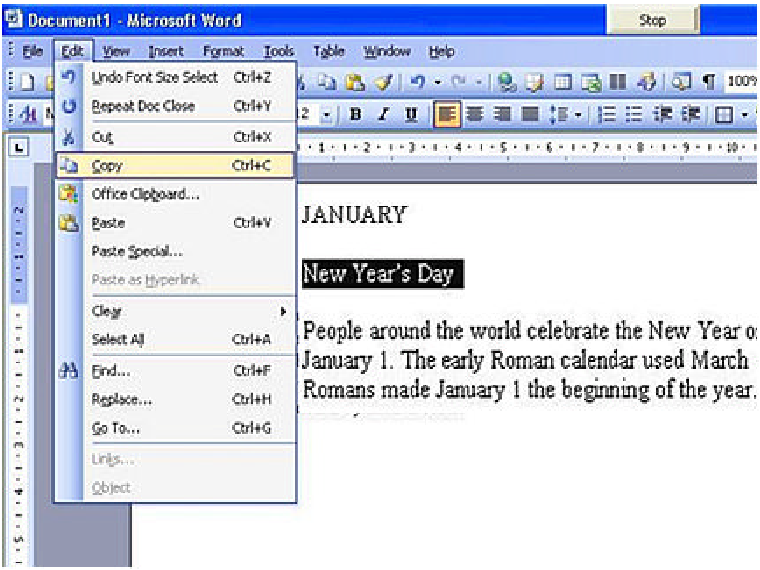

Fig. 1. Recording actions

With reference to Figure 1, the system is able to record the actions performed whilst using the shown application (in this case Word for Windows). Thus the system records that the words “New Year’s Day” have been highlighted and subsequently copied to the clipboard using the Edit Menu of the application. Had a Ctrl+C action been performed using the keyboard instead of “copy”, the system would have interpreted this as an equivalent “copy” statement. The “Stop” button shown on the upper right side of Figure 1 is placed there by our system to allow users to stop the recording. Certain user actions may be ignored if the system considers them incomplete. For example, if a mouse click on a diagram is not followed by any further action such as, for instance, to drag an icon to a different position, or if some text is highlighted without, for example, being italicised, then the system considers the action incomplete and ignores it.

A control icon on the system tray, allows users to start and stop the recording as well as submit tests to be assessed. Files for assessment are normally sent to a database host whose location is known and it could be wither a local machine or another designated server. Additional functionality is available to privileged users only to help edit files and create test templates.

When actions are captured they are normally stored sequentially on the local machine, on which the system executes, as an XML file. Subsequently this file can be ported to a database such as SQL or MySQL.

In this way, a history of all user actions relating to a particular session is retained and can be recalled instantly for comparison purposes and for providing an assessment of trainee actions.

3 Using the System

As it is seen in Figure 5, the prototype development has two main modes: "Test_Creation" and "Assessment". In its "Test_Creation" mode the development assists trainers/tutors to make up tests and create templates for assessing student actions. The operation begins with the tutor creating a new test as depicted in Figure 2. At this stage thesystem will ask for a filename to store the recorded information.

When the recording is stopped the tutor has the opportunity to edit the file so as to merge files, append, replace or delete actions as required. This can be done through the menu shown in Figure 2, by clicking the "Edit Test" part of the menu which brings up a file selection window. Selecting the required file and clicking on the edit command on this window produces an editing interface. After editing the final file can be ported on to a database to serve as a template for the exercise that the tutor just developed.

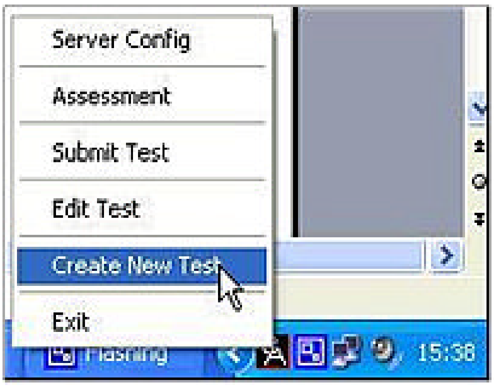

Fig. 2. Starting a new test

In its "Assessment" mode the system is used at test time. In this case the trainees input their name (or user ID) and the filename where their results will be retained prior to starting the test. As the students carry out the set of instructions, the system records all their actions and an XML file is created. At the end of the test, the file is ported to the specified database for comparison against the main template created by the tutor. Once a file has been submitted a process of preparing the file for assessment begins. Firstly the file needs to be processed according to the assessment procedures specified by the tutor. For example actions which cancel each other out may not be taken into consideration when making an assessment and therefore they will be ignored or even removed from the file. Thus if a student has pasted some text and then has removed it, this text will be ignored or not shown at all. In general only actions that have a direct influence on the outcome are retained. Following this, the prototype system begins a comparison of student actions against those in the tutor template, also taking into consideration any marking scheme that the tutor has devised. This approach is rather complex as there could be several alternatives to providing a given output at any point during the test. The system needs to reason about situations as they arise and it does so in a variety of ways. For example, if the tutor has specified that alternative approaches are acceptable (one way of testing the skills of students) the system will cycle through known alternative methods to identify which one matches the one used by the student. When the method is found then the appropriate mark is allocated.

In case a method is not identified but the prototype system concludes that the resulting output following an action is the same as that specified by the tutor, then the events describing that action and leading to the output are stored as a potential new equivalent action and an alert is placed for the tutor's verification and approval. This, in effect, constitutes a self-learning mechanism for the system. Thus, provided the tutor agrees, the new action is stored as equivalent and a mark is associated with this action as specified by the tutor.

The development has several different ways to ensure that insignificant differences which can appear within files do not adversely affect the output results to the disadvantage of students. A fallback position to consult with the tutor is always possible, but it is only used as a last resort when the system is unable to reason about the documents.

4 Conclusions

A prototype methodology has been presented which allows tutors to develop tests and automatically test trainee competence to learn how to use legacy software packages. Contrary to other systems, it operates by "observing" user's actions and recording their activities. If the user is a tutor who sets an exam, then the system creates a template which is subsequently used as the main means to assess trainees. If the user is a student undergoing a test, then the system captures the information, stores it, and compares it to the existing template. The present development integrates with legacy applications, records all user actions and generates editable XML files. The described approach provides the basis for generating a structure far superior to any existing system designed to train personnel the use of IT software and can readily be extended for use with other legacy applications for a variety of training tasks. The presented approach has partially been tested using Microsoft Word for Windows and is being extended to other legacy applications for use mostly in engineering educational packages.

Creating new tests can, after some time, becomes just a case of editing and merging existing test files and creating new templates. Assessing tests is an automated process which depends on an existing marking scheme for each designed action. It also depends on a set of rules set to regulate what needs to be tested and how strict the testing process should be. To further ease the creation and assessment of tests the system has a self-learning mode to identify and use actions which are deemed to be equivalent to those originally set by tutors.

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From Empiricism to Total Quality Management in Greek Education

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Abstract. Nowadays the education system in Greece moves towards democratization and decentralization. School unit is the cell and the base of the education system. Principal's role is highly demanding, multi-dimensional, and a critical determinant of school performance and effectiveness. The paper proposes an effective organizational plan of school units in Primary Education based on basic administration processes and Total Quality Management. Using theory of emotional intelligence and Blake-Mouton's grid it emphasizes the impact of Principal's leadership on democratizing the school unit, on creating a safe and secure environment and positive school climate and motivating teachers committee to participate in the decision making process.

Keywords: TQM, emotional intelligence, Principal, Organization plan, Primary education.

1 Introduction

Greek education system is centralized, by means that the Ministry of National Education and Religion Affairs formulates and implements the educational policy [13, 29]. The education system is also characterized by "intense bureaucratization, strict hierarchical structures, extensive legislation (polynomy) and "formalism"" [26]. After 1981 there is a trend for reformation towards democratization and decentralization [46].

Since the early '90s, in Greece, there is a keen interest in developing management of education. Primary factors in this expression of interest are: The shift from a centralized to a decentralized system of Management of Education and progress, both in theory and practice, of the organizational and management science, which now thoroughly analyses data related to the operation, efficiency and the evolution of educational institutions. In this progress two conditions related to the management are analysed, the "efficiency", namely the maximization of results from Management actions with given resources and the "effectiveness", name Management's ability to fulfill the predefined objectives [1].

The above-mentioned first factor of decentralization refers mainly to the deliberation of challenges a school unit is facing [23] and the emergence of opportunities and

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possibilities that the school has, in order to be organized in such a way so that it can constitute a body of shaping and exercising internal educational policy [30].

School unit is the cell and the base of the education system. In the centralized Greek education system the Principal of the school was selected depending on the years of service and has been the result of a “game” that has powerful political dynamics [2,3]. This fact now outdated and seems gradually to fall under the suffocating pressure of globalization and knowledge society. Based on laws passed by the Parliament the state now seeks to democratize education and applying meritocracy in the selection of administrative staff of education [21]. School unit has to take decisions, while at the same time it is important for the Teachers Committee to take responsibility [38]. The role new role the Principal is both critical and important. Whitaker [50] claimed that a key element of an effective school is an effective principal. And according to Beck and Murphy [6] "Principals were assumed to be more like business executive, using good management and social science research to run schools effectively and efficiently." (p. 2)

The paper aims at presenting an effective organizational plan of school units in primary education based on total quality management. Using theory of emotional intelligence and Blake-Mouton’s grid it emphasizes the impact of Principal’s leadership on democratizing the school unit, on creating a safe and secure environment and positive school climate and motivating teachers committee to participate in the decision making process.

2 The Principal

2.1 Principal’s Role

The Principal that is primarily responsible for the smooth running of the school, coordination of school life, compliance with laws and instructions and implementation of the Teachers’ Association decisions. (Article 11 of Law 1566/85D). Principals serve also as the educational heads of school units. They coordinate and guide teachers at their work and make provision for in-training services. Teacher Councils implement program and curriculum regulations, monitor students attendance and discipline. School committees which include parent and local representatives manage budgets for heating, lighting, maintenance, equipment etc. (Minister Dicision 105657/16-10-2002, Volume 1340, vol B of the Greek Governments Bulletin; Ministry).

Principals role is highly demanding, multi-dimensional, and a critical determinant of school performance and effectiveness [4]. “Today’s principal is expected to simultaneously be an instructional leader, change agent, and manager, while the role continues to expand” [9 p. 64]. The dimensions of principals role can be described as: Leader , Inspector, Teacher, Secretary, Instigator, Assessor, New teachers’ mentor , School’s representative, Receiver of complaints, Craftsman. Within this role he collaborates with corporate bodies such as: Teachers Councils, School Council , School Committee and Parents Union [31,43]. In practice, many of the above roles or bodies are inactive. 87% of school councils are at below capacity because they are cumbersome or have lots of members. 70% of teachers says they are uninformed about the operation of School Committees. As far as the Parents Union is concerned, their presence in the events of the school community is rudimentary and often non-existent [43].

2.2 Principal's Skills

Skill was defined by Hans Renolds in 1928, as 'any combination useful to industry, of mental and physical qualities which require considerable training to acquire [33]. Despite the vast range and variety of activities principals are involved it is possible to identify managerial roles and skills associated with these (Michel et al). For the multidimensional role of the Communicational, Organizational, Innovation and Technical skills are required.

Communicational skills are needed, because he should be a transmitter and a receiver of clear messages and also a decoder of unclear ones. He should also be the one who creates an appropriate mood - ambience and have the perceptual ability to understand the motivation and skills of teachers. "Creating a collaborative environment and open communication has been described as the single most important factor for successful school improvement initiatives" mentioned Halawah [19] The Principal must also have organizational skills because he is a regulator and distributor of workload and at the same time he has to be flexible in decision-making. According to if the principle is an organization leader he/she should helping to alleviate the anxiety created by workload, maintain social integration and normal atmosphere [34]. The innovation skills are needed in high-level leadership which expands beyond the daily organizational program up to the level of innovation and creative administrative imagination.

3 Total Quality Management

Total Quality Management (TQM) can be defined as "a management philosophy that fosters an organizational culture committed to customer satisfaction through continuous improvement" [22]. It is a continual improvement in process and the outcomes of the organizational activity [35]. Psychogios and Priporas [41, p.42] assumed TQM as an "attempt to improve the whole organisation's competitiveness, effectiveness, and structure". According to Silvestre [45] adoption of TQM by the public administration has "the intention of raising the public administration performance, developing the complaint mechanisms in order to make the organizations more responsible and being aware of users' expectations and needs". Total Quality Management nowadays occupies much of modern literature in education. [18, 24, 25 39, 51]. It was Deming [11] who proposed the free market and TQM for public school .

TQM in is the enforcement process of an administrative approach in which each denominator of education (education personnel, students, families, etc) participates actively in the decision process of education and characterizes the increasing customer satisfaction with continuous improvements (http://www.meb.gov.tr /stats/apk2001ing/Section_9/2 NewApproachesin.htm). Pressures from industry for continuous, upgrading of academic standards with changing technology; government schemes with allocation of funds, which encourage research and teaching in the field of quality; increasing competition between various private and government academic institutions are some of the reasons for applying TQM in education [47, 48].

The TQM framework in education is: Leadership and quality culture; continuous improvement and innovation in educational processes; employee participation and development; fast response and management of information; customer-driven quality and partnership development, both internally and externally [40]. This framework implies the central role of the Principal, which is the overall coordinator of this effort.

4 Emotional Intelligence

The new proposal to the successful leadership is "Emotional Intelligence" [14,15]. Emotional intelligence is “the ability to process emotional information, particularly as it involves the perception, assimilation, understanding, and management of emotion” [28]. The basic principle of this philosophy is that all great leaders mobilize and appeal to our emotions. Great leaders work through the emotions. “Great leaders move us. They ignite our passion and inspire the best in us” wrote Goleman et al., [16 p.3]. Understanding the powerful role of emotions in the workplace effectively distinguishes outstanding leaders from the others. The leader of any human group is the one to whom others turn for security, confidence, reassurance and clarity in case of uncertainty or threat, or a project to be completed. The leader acts as an emotional leader. Three of the most important aspects of emotional intelligence for a leader’s ability to make effective decisions are self-awareness, communication and influence, and commitment and integrity. Managers who do not develop their emotional intelligence have difficulty in building good relationships with peers, subordinates, superiors and clients [14].

Feelings play an important role in leadership [17]. Feelings are spreading like viruses. But they are not transmitted as easily. For example: Fun and warmness spread more easily., Nervousness is less contagious, Depression is spread only a little, Laughter spreads almost instantly and is a safe indicator of a good climate because it is almost impossible to pretend!

Some skills of emotional intelligence are very important, because they have to do with how we handle ourselves and others. According to Muchinsky[36] emotional Intelligence is the ability to understand your own emotions and those of people around you by having a self-awareness that enables you to recognize feelings and helps you manage your emotions. According to Sala et al., [42] emotional intelligence is the capability to monitor one’s own and others’ feelings and emotions, to discriminate among them and to use this information to guide one’s thinking and action. Emotional Intelligence explains why despite equal intellectual capacity, training, or experience, some people excel while others lag [10].

5 Blake – Mouton’s Manager

Blake and Mouton [7,8] studied leadership behavior and described two extremes of leadership concern. Concern for Production: The leader cares little about people and operates in fear of something going wrong. This person's focus is on achieving results and productivity. Concern for People: This leader cares little about productivity and operates wholly from a desire to be loved and approved of.

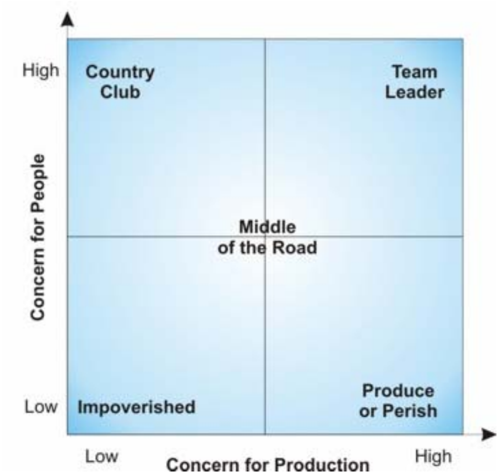

Fig. 1. Blake Mouton Manager

According to Managerial Grid of Blake-Mouton [8] leadership styles are: the "Impoverished Leadership" his characteristics are the low concern both for people and the outcome (the production). The leader here maintains a neutral position and cares only to verify that the beaten track is followed. "Middle of the Road". The leader here shows moderate interest for people and the outcome (5.5). Here the Head follows the middle way approach, which will provide a reasonable level of efficiency without destroying the of employees' morale. "Produce or Perish Leadership", the purpose of the leader is to achieve the goals set by applying rigorous planning and constant monitoring of work. "Country Club Leadership", here the goal is to ensure harmonious relations between the staff and create a good working environment. And finally "Team Leader" the manager's purpose is to achieve high performance, creating the best conditions for the participation of employees while making the best out of their concepts and skills.

Blake–Mouton grid [8] has often been used as the basis for organizational interventions designed to improve the performance of managers on both dimensions a grid organizational development.

6 A Proposal of an Organizational Plan of School Units in Primary Education

Intending to provide an effective and efficient organization plan for the administration of a school unit, principals of TQM are adopted in this proposal. . The plan proposes a structured and systematic effort of self-study and improvement changing informal and formal processes, procedures, rules and structures. TQM can provide the tools to help the education system develop quality students and performers.

The main axes of the proposal are:

1. Long before and up to the end of the school year a research over the school's culture should be made.
2. Teachers Union should practice in decision making.
3. The challenge and the detailed discussion on the whole project.
4. At the end of the school year, formation of teacher teams and assignment of responsibilities and powers to them with clear and distinguished responsibility and accountability.
5. At the beginning of next school year, definition of school year goals and allocation of classes and responsibilities

Principals have a particular critical role to play. As leaders of the ground at their school they can see the challenges and success of the adoption of the plan and have the potential to create lasting change

6.1 Leadership

The issue of leadership for school improvement is high in the research and policy agendas in many countries worldwide [20]. In our case, the Principal has to pay high concerns both to people and production and to encourages teamwork and commitment among teachers. The Principal involves teachers in understanding organizational purpose and determining production needs. The success of the organization plan relies heavily on making teachers feel they are constructive parts of the plan. An environment organization based on trust and respect will leads to high satisfaction and motivation of teachers' and, as a result, to improve the quality of people's lives, schools operation and performance.

Regarding the factors that determine decision making the most important are: The leader's personality, the quality and maturity of his team, in our case the teachers' association, the conditions under which a decision is made, particularly if these are certainty, uncertainty or risk.

6.2 Investigation of School Culture

The search of the internal culture of the school-organization is crucial factor of a Principal's work. These characteristics that distinguish a school and define the "mood" in it and characterize the status of "atmosphere" in it, is obvious from the first look. The Principal of the school is the driving force for change. Therefore, before attempting anything, he should examine the current situation in depth, so as to prevent the risk of denaturation of students and educational staff the identity, which can lead to unpleasant consequences.

Exploring the culture of the school - organization, the Principal have to answer the following questions: 1.Who are the pupils / students of the organization? 2. Who are the teachers of the organization? 3.What are their expectations and ambitions? 4. Why are they here? 5. What is their social and cultural background? 6. How their attitudes or opinions, which maybe foreign or wrong to me, can be justified? 7. What can I do or learn, that will help me better understand them and be close to them? 8. Are there some parts/aspects of them that cannot be questioned or altered?

Exploring the culture of the educational organization is very important because this defines the communication "mood" – "atmosphere", under which ideas, information, actions and emotions are exchanged. Factors that can improve the communication ambience are: 1. Instigation of teachers to make suggestions 2. Open doors and the sincere interest of the Principal 3. Research 4. Operation of an advisory group 5. Publications 6. Conducting events.

6.3 Team Management

An important role of the Principal is to combine the most appropriate people in teams. Emotional intelligence of the principal does not only entail being aware of one's own emotions, but also using these emotions in functional ways [17]. In successful teams each person takes one or more of the following eight roles according to Everard & Morris [12]

1. Processor (he must be of a stable and solid character, to turn ideas and plans into action)
2. Coordinator (he must be stable, dominant and extroverted in order to monitor his team's path towards its goal by exploiting the resources available)
3. Modulator (who is solid, dominant and extroverted so as to shift team's focus to the priorities, group discussion and the outcome of team's activities)
4. Innovator (who is mostly dominant, intelligent and introspective and proposes new ideas, strategies and innovations)
5. Investigator of resources (who is mostly dominant, stable and extroverted in order to investigate, to report ideas, developments and resources outside the team)
6. Assessor (he must be intelligent, stable and introverted to analyse and evaluate issues, ideas and suggestions, leading the team in informed decision-making)
7. Partner (he must be stable, outward-looking and not at all dominant in a way to support others and improve their communication)
8. Integrator (he is usually introverted and anxious to guard the team from mistakes and to seek aspects of work that need special attention).

This does not mean of course that all roles are met in every school. Also a teacher can play many of these roles depending on the project or goal. Usually, stable and extrovert characters perform well as team members. Anxious and introverted characters may not integrate so well, but as people are often very creative

The development of teams responsible for different sectors of the school is also an important step. The Principal must follow certain steps so that the outcome of his work is an effective and functional organization. The major phases are:

1. The stage of formation: the objectives, orientation and the new roles are clarified.
2. The phase of the conflict: in this phase apparent disagreements, aggression, irritability and withdrawal are expressed.
3. The phase of rule formation. Its features are reconciliation, communication, collaboration, clarification of the procedures and practices relating to the organization and functioning of the team.
4. The stage of maturity: characterized by balance, trust and friendship between members [44].

Another parameter related to the output and the smooth functioning of the school, is the motivation of teaching staff. It is based on the principle that the greater the satisfaction enjoyed by the staff, the better their performance. The participation of teachers in setting goals and in decision-making is a moral commitment.

The problem is that organizations are "dynamically" conservative [26] Only when it is impossible to halt the upcoming change they accept it.. Many parameters of the school's operation are related to the issue of change: 1. Change management is much harder than we can imagine even if someone has considerable managerial experience. 2. The rush of the training organization to finish the design and put it into action. 3.Not all participants see the need for change the same way. 4. The syndrome of "foreign idea" often possesses school's stakeholders. 5. The fear of the unknown is usual. Reorganization is often an illusion and causes confusion, inefficiency and discouragement.

The ability to handle a conflict is one of the Principal's keys of success. Whenever we try to change something, a latent conflict may arise. However this is not necessarily negative. In case of conflict the Principal guarantees that the different possibilities will be properly considered, and, as teams discuss the alternatives, new possibilities we haven't thought may arise. Often, due to some conflict, a chosen rule of action is tested as early as possible, and thus, the risk to escape a major flaw that will appear later, is reduced. The lack of conflict could mean throwing off responsibility, indifference or indolence. The conflict sometimes can take alarming dimensions. If this is the case the Principal, in order to overcome these problems, has to adopt some basic principles of positive negotiation.1. Listen and understand the perspective and needs of others (we do not to waste time repeating our position). Try to be fair.2Negotiate trade-offs. Can we make a concession that means more to another than to us? 3 Focus on issues and data and do not personify the conflict. 4. The final outcome is the "mutual benefit".

There are three distinct areas covering the whole spectrum of the education provided at school and teams have to cope with. The first is the internal area of education. This area refers to pedagogical visits and excursions, books, innovative programs, events, writing and research, documentation of educational issues, students' performance, the disabled, presentation of teaching methods, delinquency, etc. The second area is the one of external relations and partnerships. It refers to relationships with parents, the local community, the City, the District, the Church, European programs, the All Day School, cultural activities, contacts with neighbouring schools, the university community, taking advantage of opportunities. The third area is that of infrastructure and finance, which includes the improvement of school facilities, equipment, monitoring resources, school libraries, cleanliness, safety, health facilities, the computer labs, suggestions for purchases to the school committee, etc.

6.4 The Implementation

School management is the process of coordinating people (students, teachers, and support staff), activities and existing resources in order to provide education in the most effective manner. This definition implies the central role of the Principal, which is the overall coordinator of this effort. Administration is the most important part of Management. Administration, as the third function of Management, is based on planning and targeting, Organization, Administration, Control and Feedback [38,44,49].

The proposal starts with the planning and targeting at the end of the school year (with feedback at the beginning of the next school year), continues with the organization and management (for which the feedback is constant throughout the year) and ends with assessment (through the meetings of the Teachers Committee in December, March and June when the assessment for the whole school year takes place).

So the whole proposal is a process of planning and goal placement → organization and management → assessment that iterates throughout the school year [38,49].

7 Discussion and Conclusions

A key element of an effective school is an effective principal. School success is influenced by many people however running of the school by effective administration. In the proposed plan the Principal first of all has to research over the school's culture, then to plan, to place goals, to organize school Principals remain one of the most important factors in this success. Principals play a crucial role in establishing school discipline and in smooth and manage the project and take feedback throughout the school year. The Principal has also to motivate teachers in order to play main role in the decision making process in the school. Effective principals recognize the unique styles and needs of teachers and help them achieve their own performance goals and cultivate them to assist in planning and effective and efficient running of school. In that way school is democratizing, the school unit takes decisions and Teachers Committee take responsibilities.

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Evolutionary Approach of Virtual Communities of Practice: A Reflection within a Network of Spanish Rural Schools

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Abstract. The isolation of rural communities creates special necessities for teachers and students in rural schools. The present article describes "Rural Virtual School", a Virtual Community of Practice (VCoP) in which Spanish teachers of rural schools share learning resources and teaching methodologies through social software applications. The article arrives to an evolutionary model, in which the use of the social software tools evolves together with the needs and the activities of the VCoP through the different stages of its lifetime. Currently, the community has reached a high level of maturity and, in order to keep its momentum, the members intentionally use appropriate technologies specially designed to enhance rich innovative educational approaches, through which they collaboratively generate creative practices.

Keywords: VCoP, social software, affordance, appropriate technologies.

1 Introduction

It is recognized that rural communities are one of the disadvantaged groups in Europe due to their physical distance and isolation of other communities. Rural schools and teachers, as part of such disadvantaged group, also encounter difficulties in accessing services and resources for working with peers. New opportunities for bridging the gap between the rural and the urban teacher could emerge through the use of ICT tools.

Traditionally, communities of practice (**CoPs**) have been defined by Wenger as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" [1]. In many cases, the forming of a CoP of individuals scattered over a broad geographical area, can also occur. In such contexts, collaboration needs to be supported by ICT and, thus, forming Virtual Community of Practice (**VCoP**). In this paper we study how a group of rural school teachers, scattered around remote Spanish rural territories, created and consolidated a VCoP, and appropriated the technologies through an evolutionary process in which technology affordance was challenged by their practical needs.

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2 Supporting the Evolution of VCoP with Social Software

CoPs are complex processes which naturally evolve on time. In this sense, Wenger et al. [2] formulate five typical stages of community building and community development, which might be observed in many cases (Table 1).

Table 1. Stages of community development (Wenger et al., 2002, p. 69)

Stage	Definition
Potential	A loose network of people juggles with the idea of forming a CoP; structure, members, and common interests are identified and agreed upon.
Coalescing	The CoP is officially launched. The CoP activities are starting. The main focus is on establishing value.
Maturing	The CoP develops a stronger sense of itself. While its core practice is better defined, members develop new areas of knowledge. Members know each other; a level of trust has developed.
Stewardship	The CoP goes through a stage where the biggest challenge is to sustain its momentum.
Transformation	An event in the community will trigger the need for renewal. The CoP may start all over again on a new basis or simply fade.

Palmisano [3] lists some of the technologies that can be used within VCoPs, among them: e-mail (one-to-one communication, sharing of knowledge within a group), web forums (sharing of ideas, opinions and knowledge among members), blogs (sharing of information and knowledge internally and externally), wikis (co-authoring of documents), social media (social networking web sites such as Facebook and YouTube, that provide personal information, such as pictures and videos). These technologies can be tagged as social software.

Social software is generally accepted as supportive tools for VCoPs, since they provide affordance for most of their activities. An affordance is “a quality of an object, or an environment, that allows an individual to perform an action” [4]. The term is most commonly linked to the visual perception of clues in the environment that indicate possibilities for action. In this article, we use this terms in relation to the potentialities of specific functions and characteristics of ICT tools as key attributes or “educational affordances” in rural educational settings. Technological affordances are however not enough when the socio-educational context is very specific. “Appropriate technology” concept takes special consideration of the environmental, ethical, cultural, social, political, and economical aspects of the community it is intended for [5]. The term is usually used to describe simple technologies proponents considered suitable for use in developing nations or less developed rural areas of industrialized nations. In this article we refer to appropriate technology as technology which matches the economic, learning, and social environment of the rural schools. Appropriate technology means integrating technological solutions, carefully structured, organized, and interrelated, materializing the concept of a shared space for communication, exchange, and mutual support among users. The appropriate technology would be invisibly integrated into learning activities that are central to a matured VCoPs, only if their affordances pass the filter of the evolving needs of the users, in this case rural school teachers.

3 A VCoP of Spanish Rural Schools

Rural education in Spain has been significantly improved in the recent years [6]. With the decentralisation of the educational system, each autonomous regional government has developed educational structures and services adapted to the needs of rural schools. However, there are still clear needs to be tackled [7]. Indeed, rural schools need to be re-thought as embedded within the information society.

In the context of several EU-funded projects locally cordinated by the University of Barcelona (**UB**) Future Learning research team, and through a continuous communication process supported by social software, a VCoP named "Rural Virtual School" was created and consolidated over time during more than four years. Fifteen primary schools with students aged from 3 to 12, scattered in three different Spanish regions, made their way to an active collaboration by initiating common telematic-based projects, sharing learning contents and exchanging about teaching methodologies. This section presents a short overview of the evolution of the formed VCoP. It formulates the different stages of its lifetime, through which the activities, the needs and the social software tools used have been progressively evolving.

- *Stage 1 ("potential").* In 2004, in the context of NEMED[1] (Network Multigrade Education), a EU project aiming at bringing multi-grade education to the policy front, three rural schools have entered in contact, under the coordination of the UB, in order to start a collaboration. In this first stage, the common interests and needs were identified: a) Communication with other schools featured by similar contexts; b) Individual training for rural school teachers regarding ICT; c) Access to new learning resources; d) Promotion of the visibility of rural schools. To this end, a Moodle platform was proposed by the UB in order to share training resources with teachers. According to them, this system was satisfying to receive information such as tutorials and links related to ICT-based teaching methodologies, however, they encountered difficulties to communicate in a spontaneous way. This is why e-mail was widely used among the schools in order to communicate at distance.

- *Stage 2 ("coalescing").* In 2007, Rural Wings project[2] provided the schools with satellite connections, thus breaking many of the previous communication barriers. First, schools communicated with each other in order to get acquaintance; afterwards, they tried to define some lines of actions and started to collaborate. They defined their first common activity named "Sharing Traditions", in which each school attempted to present its specific environment to the rest of the community. During this stage, mainly communicative tools have been used among the network, such as Google group (to communicate spontaneously and to organize their collaboration), chat (for informal one-to-one communication), video sharing (to show the schools' environments and the conducted activities). These tools can be characterized by their easy-to-use, spontaneity and possibility for the participants to express their personality. They enabled the group to get to know its members and form its identity.

- *Stage 3 ("maturing").* Once a stable communication process was established, the VCoP was refining its core practice, as well as broadening its knowledge areas.

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[1] NEMED - Socrates Programme, Comenius 3 Action (2004-2007).

[2] RuralWings - VI Framework Programme (2006-2009).

Schools agreed they needed to focus on more specific subjects (e.g. Meteoreology, Astronomy). Thus, related educational activities were shared among schools by means of pictures, videos and videoconferences. New schools were incorporated into the community. The VCoP grew thanks to the motivation, satisfaction and initiative of the teachers, who felt a sense of belonging. Rich personal relationships developed at distance. In parallel, the network started working on their own, applying for a national project ("Grouping Schools") funded by the Spanish Ministry of Education. The previous tools were still widely used, however, the interest in some of them decreased. Indeed, some new generative and interactive tools were introduced to enhance the network's new activities. For example, a shared blog was created and used as an open platform for exchange and communication (Rural Virtual School blog[3]), in order to display and share the conducted activities, illustrated by pictures and videos. The blog was also a reference point for sharing external educational resources in relation to topics, or local traditions and schools' events. The blog enabled to regulate the communication flows between teachers, to show the activities to external audiences, while acting as a motivational element for students and teachers when seeing its impact outside the classroom. Thus, with the maturity of the VCoP, the tools necessary for supporting its dynamic became more complex, combining a variety of media for supporting comprehensive exchange of resources among the participating schools.

- *Stage 4 ("stewardship")*. Currently, the educational activities among schools continue. The community can now be defined as a mature one, while its members are in constant search for personal growth and group progress. In order to keep the CoP's momentum, a need for defining new scenarios that are goal-driven has emerged, which would involve the participants in a contextualized collaboration process. In this stage, part of the VCoP started participating in a new European project, SoRuraLL[4], which enables a context to develop new educational scenarios in which the goals are defined by the teachers. As an example, four schools are co-designing a hypermedia story of the type "choose your own adventure" by using a wiki platform. To this end, the VCoP needed a platform which can facilitate the definition of specific goal-driven collaborative learning scenarios. As an answer, teachers were provided the SoRuraLL Virtual Learning World (**VLW**), a web-based platform which integrates several social networking tools carefully structured and interrelated, materializing the concept of a private shared space, facilitating the exchange and mutual support of the community. The VLW combines technologies which have emerged as appropriate to the context of the rural schools.

The following table represents the evolution of needs, learning activities and social software used within the VCoP "Rural Virtual School". Furthermore, the table shows the needs that have been identified at the beginning of each stage of the VCoP's life-cycle, as well as those needs that have been really covered at each stage. Thus, the Table 3 explicitly shows how new needs emerge on each stage.

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[3] http://escuelaruralvirtual.wordpress.com/

[4] *SoRuraLL - Lifelong Learning Programme, Key Action 3 (2009-2010).*

Table 2. Evolution of VCoP needs, activities and technologies

Stage	Identified needs*	Supported needs	Learning activities	Technology
Coalescing	- *Initial Teacher Training* - Continuous Teacher Training - *Communication with other schools* - Access to Learning resources - External visibility of the rural school	- Initial teacher training (new pedagogies and ICT) - Communication with other schools - Access to learning resources provided by third parties	Definition of activities to be implemented in the future, such as "Sharing Traditions"	Communicative (e-mail, Google Group, Chat) Generative** (Moodle)
Maturing	- Activities and resources related to specific learning subjects - External promotion of the schools' activities	- Access to a repository of shared learning resources - External visibility - Continuous teacher training	Sharing traditions, activities related to Astronomy and Meteorology	Documentative (blog, video conference tools)
Stewardship	- Goal-driven scenarios - Meaningful activities	- Goal-driven scenarios - Meaningful activities	Wiki storytelling	Interactive, Generative, Collaborative (VLW)

* Needs marked in *italic* are the needs that have been covered in the stage they were identified, thus disappear. All other needs continue as explicit need to next stages.
** See the discussion on Moodle usage

4 Discussion

Learning occurs in a socio-cultural system in which learners use various tools and multiple forms of interaction to create collective activities supported by technology affordances. Social software tools are pedagogical tools that stem from their affordances for exchange, communication and information discovery. The creation of a VCoP enabled Spanish rural schools to enter into such rich socio-cultural system through properly selected technologies that served as affordance to respond to their needs: to communicate through technologies in a more spontaneous way, thus creating ritcher relationships; to easily share learning resources and teaching methodologies; and to show the activities to external audiences. As a result of this process, to empower the rural school.

Once these needs were met, the community was experienced enough for new educational endeavours. Moreover, new interests emerged, such as to conduct meaningful activities that would give sense to the collaboration and keep the momentum of the community. The use of social software tools enabled teachers to learn how to contextualize the use of the ICT tools in the classroom, as well as for their own development. Indeed, the VCoP gathered the necessary skills and abilities to manage social software tools, which allowed them to distinguish between the adequate characteristics and functionalities of the tools, and the inadequate ones. We can claim that teachers are now able to identify the *adequate* affordances of the technologies.

Furthermore, for sustaining its momentum, the VCoP needs tools that facilitate complex and comprehensive goal-driven activities for which appropriate technology integrating interactive, generative and collaborative tools, is crucial. As a consequence, due to the access to appropriate technologies designed for their specific context, teachers from the Spanish rural schools are now able to build their own goals and define new learning scenarios.

The Figure below demonstrates the Evolutionary model of the VCoPs supported by technology. Various technological affordances enable the creation of the community and its first stages of maturity. While maturing, the network identifies and selects the appropriate ones for the activities and the potentially interesting characteristics for their context.

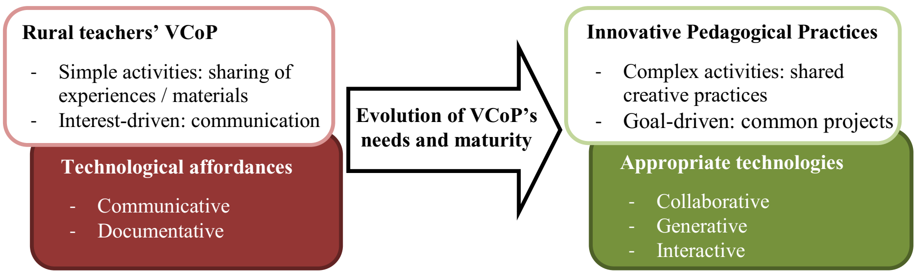

Fig. 1. The Evolutionary Model of VCoP and Technology

The use of technology creates new needs and gradually brings the community to a new level of innovative pedagogical practices. Shared creative activities, however, needed the support of appropriate technology where the technological affordances are especially adapted to the socio-pedagogical context of the community.

5 Conclusions

This article presents how a VCoP - "Rural Virtual School" - has naturally evolved during four years. The above reflection outlines an evolutionary approach, according to a multiple dynamic:

- According to its evolution stages, the needs of the VCoP have been constantly evolving, from communication and teacher training, to goal-driven scenarios. Through these stages, the VCoP develops more and more focused activities, until arriving to rich innovative educational experiences. Indeed, at first stages, the activities conducted among the VCoP were related to exchange and communication. Progressively, they evolved to subject-based activities. Finally, innovative educational activities were conducted, in which schools collaborated in the objective of a common result.

- The use of the social software tools evolves together with the needs and the activities conducted in the different stages of VCoP. Indeed, among the tools used at the first stages, some "survived" (e-mail, chat), some evolved in their community role (the Google Group), some disappeared (Moodle), while some new tools appeared

(Blog). Currently, the VCoP needs specially designed appropriate technologies to enhance its innovativeness (SoRuraLL VLW).

As a conclusion, the VCoP has reached a level close to the Transformation phase (according to Wenger), in which members intentionally use appropriate technology to enhance rich innovative educational approaches, through which they collaboratively generate creative practices, and at the same time extend the community to parents and other rural stakaholders.

Acknowledgments

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Union Catalogs of Learning Objects: Why Not?

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Abstract. This work presents a combined view of digital libraries, union catalogs and digital learning materials; union catalogs of metadata of ETD – Electronic Theses and Dissertations are shown as a paradigm. From this integrated view, and based on the existing ETD solution, it suggests that union catalogs of learning objects (digital learning materials with independent identities) be implemented with the participation of institutions worldwide. Open and free software solutions, and training are part of the overall proposed strategy.

Keywords: Metadata; Learning Objects, Digital Libraries; Union Catalogs; Open Archives Inititative Protocol for Metadata Harvesting.

1 Introduction

This instroduction presents a scenario of union catalogs of digital libraries in the world with a particular focus in the Brazilian situation; learning objects and online courses are also addressed.

Every day, thousands, if not millions, of digital contents are created worldwide. According to McMillan & Skinner [01], more than 93% of the world's information today is born digital, i.e., it originates in digital files.

This fact yields two conflicting situations. The first is the challenge of digital preservation; in this context the authors presented their work. The second is the potential of accessing the knowledge that these contents hold. The last offers an opportunity mankind had not thought possible, though it had been an objective of the work of Paul Otlet and Henri La Fontaine in the 19th century [02].

The huge quantity of digital information available on the Internet poses a problem – finding the qualified contents one needs. Even with the efficient search mechanisms that are available, the results must be filtered by the user and the outcome may be visits to many websites in order to retrieve the files. Another strategy, when websites are already known, is to search each one individually, but this may lead to missing new contents providers.

Libraries have worked with the concept of union catalogs for many years. The idea of grouping the records of the collections of different libraries is very old. It goes back to the 13th century when an inventory of manuscripts in all English monasteries was started, though never concluded [03]. Union catalogs of traditional library records are quite common and have been used for decades.

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In the last 20 years or so, digital libraries have been introduced and widely used worldwide. In the same way of their traditional counterparts, they have a standard for the description of their collection items; it is ISO 15836/2003, also know as DCMES – Dublin Core Metadata Element Set [04]. Analogously, the OAI-PMH – Open Archives Initiative Protocol for Metadata Harvesting [05] has provided a means of transfering metadata records among digital libraries and/or union catalogs in an automated and easy way. OAI-PMH is the digital library correspondent of ISO 2709 used to transfer records files among library systems.

1.1 Union Catalogs of Digital Libraries

DCMES and OAI-PMH have allowed union catalogs of digital libraries to become a common facility. Once a digital library system implements an OAI-PMH data provider and makes its URL available, OAI-PMH service providers will harvest metadata records and transfer them to other systems (the union catalogs). These can be specialized, as for example in types of contents, subjects, languages, or can be general. There are many examples to be cited.

Among the specialized union catalogs, good examples are the ones of ETD - Electronic Theses and Dissertations that can be found in all continents.The catalogs the host the most ETD metadata records are related to NDLTD – Netwroked Digital Libraries of Theses and Dissertations [06]; one is the VTLS Visualizer [07] and the other is OCLC XTCat NDLTD [08]; both have over 830K records of the same collection. There are national and regional union catalogs of ETDs too, as for example, the ADT – Australasian Digital Theses Program [09] and BDTD – Biblioteca Digital de Teses e Dissertações [10]. In order to create the union catalogs, the ETD community got organized to extend the metadata set to include elements that are necessary to identify ETDs; it also defined the XML schema to transfer data.

An example of a general type union catalog is OAISTER® database [11]. It began as a service of the University of Michigan and last year it was incorporated by OCLC – Online Computer Library Center [12] as one of the databases of the WorldCat; it holds 23M metadata records of all types of digital contents. Its search mechanisms are very flexible and easy to use, besides providing a structured and clear return information set. The metadata on the database are harvested from OAI-PMH data providers. Though it allows the type of contents to be selected for search, since it is not specialized, it does not offer some important elements for learning objetcs, like educational level or the type of audience.

A secondexample of a general type union catalog is Biblioteca Universia [13].Its focus is digital learning resources, but this must be understood is the wide sense, since there are articles, ETDs, etc. The number of metadata records is 10M. The description of the items is confused, since elements and values seem not to match properly,others are missing in some records, in others the values are incomplete when compared with the original source of the record and some values seem to have been assigned by the system and not by the original source. There are other usability problems, but this is not the focus of this work..

Union catalogs of digital librairies are becoming quite common and are very useful.

1.2 Courseware/Learning Contents in the World and in Brazil

Brazil has a very large territory and many remote areas, as for example, the Amazon states. For this reason, it is a country that can benefit from distance learning as well as from any type of technology enhanced learning; portability is of paramount importance. There is a considerable activity related to courseware development in Brazil. A visit to the ABED – Associação Brasileira de Educação a Distância website [14] yielded some interesting results:

- There are over 3K items listed as "courses". They are classified as extension, enrichment/enhancement, refreshment, qualification, etc. There was no clear definition of the classes; neither was there a suggestion of their granularity and how to combine them to make up some type of curriculum. In some cases, there were full undergraduate courses that grant degrees. The courses are offered by innumerous universities, institutions, companies, schools, etc.
- There are hits in all states of Brazil.
- The subjects are in every possible area; some examples are a high school level theology course and another on health of adult individuals.
- There is no metadata database with a search mechanism; the courses are listed in alphabetical order under each class.
- There are courses that seem to be very similar. For example, under free courses, there are four on administration of time and three on management of time.

The lack of a standard description of learning resources makes the lives of potential students more difficult. The same happens for persons or institutions that want to work cooperatively. At the same time, there are many groups devoted to developing courseware for institutional use that are not listed on the website.

Considering the international scenario, a very important activity is developed by MERLOT – Multimedia Educational Resource for Learning and Online Teaching [15]. MERLOT focus is on higher education and it holds more than 20K (some of them peer reviewed) contents in all areas of knowledge. Contents are submitted and made public with some description elements; digital objects remain at the source.

But MERLOT is not a union catalog because it may examine contents (peer review process) after they are made public. The process is not automated either, since it requires submission. MERLOT is not an OAI-PMH service provider.

2 A Union Catalog of Metadata of Learning Objects

The considerations of the previous section allow examinig the idea of following NDLTD's steps towards the implementation of a union catalogs of digital libraries of learning contents to be instanced by identifiable (metadata description) digital objects.

It is interesting to remark that there are many union catalogs of ETDs in different regions of the world; some are national like the one in Brazil, some are regional but multi-national like in Australasia and there are even regional within countries. This model stimulates descentralized initiatives since it offers the methodology and the tools to help institutions and groups to cooperate.

Clifford Lynch [16] created the expression Institutional Repository (IR) in 2003 after DSpace [17] was made available. The definition is:

"A university-based institutional repository is a set of services that the university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution."

This concept extends the digital library solution to digital learning materials.

The integration of all digital contents of an institution is very interesting since some are, at the same time, inputs to and outputs of learning process. ETDs and senior projects are examples of this double role. The use of an IR yields the sharing of authority catalogs, user control and administrative information, thus facilitating operation.

Currently, many institutions are using DSpace for their institutional repositories. DSpace is an open code and free product, allowing customizations to suit specific needs. This means that besides operating as a digital library of ETDs, articles and other scholarly information, it can host learning contents. It is an OAI-PMH data provider for DCMES, but customization is possible to support other metadata sets. This customization may be performed by an institution and shared among users as a free and open solution.

DSpace is not the only solution, any IR that complies to specifications can be used. Once institutions have their learning contents on OAI-PMH system, the union catalog of learning materials can be implemented. The general steps follow.

2.1 Some Steps to Follow

- Identify the group to engage in the project – this is the first step and the persons should be experienced in the area and, at the same time, be willing to commit their knowledge to the project.
- Define the model – the group must work together, it can be remote work (discussion forums, wikis, etc), to define the model of the "complete system" and assign responsibilities to members. It is suggested that the solution be based on IRs and OAI-PMH metadata harvesting.
- Specify the metadata set to be used on the union catalog as well as the XML Schema to transfer info from data providers to it. A minimal internationally recognized set for learning materials is suggested.
- Identify an institution to analyze the necessary customizations on the chosen free and open IR solution.
- Customize the IR and develop an online training program for users. (*)
- Define the host of the union catalog.
- Implement the union catalog system and the OAI-PMH service provider. (*)
- Contact leading institutions in different parts of the world to join and regionally lead the "membership" drive.
- Operate the "complete system".

(*) Funding and/or volunteer work necessary.

2.2 Possible Members and Funding

Union catalogs are fed by member institutions. Some of them are active participants in the "complete system", they contribute with volunteer work, suggestions, software development, etc. Others just allow their metadata to be harvested by service providers. The two types are important and necessary. In order to start the first steps, contributing members are required. They should be seeked in institutions with solid experience in technology enhanced learninig and/or digital libraries.

Funding should come from funding agencies in each country. Companies could cooperate as many do in many other projects.

3 Comments

There seems to be a good use for union catalogs of learning materials. They have to be based on solid digital libraries practices and offer contents description (metadata) that allow the technology supported education community to search, find and retrieve the desired contents. The development of such a project with the involvement of worldwide institutions would allow cooperation and sharing of contents, specially among countries that have common languages.

This would be a win-win game.

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Evaluation Study of Pedagogical Methods and E – Learning Material via Web 2.0 for Hearing Impaired People

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Abstract. The primary goal of this paper is to study whether WEB 2.0 tools such as blogs, wikis, social networks and typical hypermedia as well as techniques such as lip – reading, video – sign language and learning activities are appropriate to use for learning purpose for deaf and hard of hearing people. In order to check the extent in which the choices mentioned above are compatible with the features of the specific group and maximize the learning results we designed an empirical study which will be presented below. The study was conducted in the context of SYNERGIA, a project of Leonardo da Vinci of Lifelong Learning Programme, in the section of MULTILATERAL PROJECTS TRANSFER OF INNOVATION, The evaluation was conducted on data that came up through questionnaire analysis.

Keywords: empirical study, Web 2.0, e-learning, social networking, wikis, blogs, video – sign language, lip – reading.

1 Introduction

Around 90's web (Web 1.0) appeared as a store-house of information and as a means of access to static content. However, in just a few years the content turned into dynamic and the user was then able to receive results. The philosophy of the new Web 2.0 aims not only to high quality communication but also to accomplishing cooperation and networking among users' community. Education has also been affected by this evolution and from chat and forum new technological tools have come up, tools that seemed to enhance collaborative and cooperative learning. Especially in cases

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like the studied one, where the aim is adult learning, a task known to mainly be based on group working, internet tools could be the solution that provides users with opportunities of easy networking and collaborating.

Consequently, with the abundance of new technological tools, virtual communities of practice and virtual learning communities keep getting more and more popular in higher education [1]. To be more specific, current computer systems provide with a combination of synchronous and asynchronous communication for access from and to geographically dispersed communities as well as for exchange of information in world scale [2]. Additionally, those tools constitute a powerful aid to "learning by doing" and to "addressing real problems" and that is a proof that new technologies and the famous Situated Learning theory are more than compatible.

Indeed, especially during the last decade numerous applications of WEB 2.0 tools in education have been listed in relevant literature and the results were in most cases impressive. Important research has been conducted on the use of blogs in education and very interesting results have come up especially when it comes to the use of this tool as a digital diary [3]. A research, sought in University of Minho, Portugal, investigated the application of blogs as flexible educational tools that not only enhance learning process but also develop important social skills [4]. The participants in this project were 23 undergraduate students who enrolled to an Educational and Communication Technology (ECT) class. They were separated in small groups and were asked to keep a blog during the semester in order to have access to a common portfolio of the group work. The project may be considered successful as at the end of the semester the participants thought of weblogs as powerful educational and communication tools that promote cooperative learning and stated that the weblog experience helped them obtain a deeper understanding of the course subject. Wikis also have been widely introduced in education. For example, it was attempted to analyze the use of wikis in online learning classes in the context of a symbolic logic class and later, as a collaborative environment in several online classes [5], [6]. Another study, after the implementation of wiki technology in the context of statistics classroom at the University of Haifa, proposes the wiki - based version of every collaborative discipline as from the studies conducted so far very encouraging results have come up [7]. It's a common remark that deaf and hard of hearing people are a group that has very limited access in information and learning in the Internet. Thus, it is quite challenging for the research community of the specific field to determine efficient ways of familiarizing in a smooth way the specific group with new technologies and even better to give them the possibility to incorporate those tools in their learning and professional activities.

2 Empirical Study

The program was realized in 2007 – 2009 and four countries –partners (Greece, Cyprus, Italy, England) were involved. Several formal features are listed below:

Technology used: LMS Moodle
Tools and Services: Blogs, Wikis, social networking tool Ning.com, Hypermedia
The learners' participation and interaction model: In this community Hybrid Learning was set as the participation model, as both synchronous and asynchronous instruction took place.

Target group: 10 – 20 learners from every involved country, chosen by the partners of the project in cooperation with unions of hearing impaired people.

The learning system, which consists of the educational scenario, the learning material and the used technological solutions were tailored to the special needs of deaf and hard of hearing people of every country – partner.

The most important targets of the specific project were the following:

1. The expansion of the employment horizon of the hearing impaired people,
2. The familiarization of impaired people with Internet and digital education,
3. The promotion of equal access in the initiative and continuous training of impaired people, who have limited access,
4. The empowerment of vocational training policies, especially for the unemployed deaf and hard of hearing people, for their lifelong training in the fields of e-business, e-commerce, and economy, via innovative e-learning content.

2.1 Process/ Methodological Approach

2.1.1 Actions/Methods of Instruction and Learning Process

In the first phase of the program, the material was studied and the learners' prior experience and tacit knowledge was explored while the second one was mainly about finding appropriate resources and extracting from them the educational material. In addition, in the second phase of the program learning groups were formed and different activities were assigned to each individual group.

2.1.2 Assessment (Assessment Criteria)

Two assessment criteria were taken into consideration. Firstly, in what extent the e–learning proved to be useful for the participants of the project and secondly, whether they would be able to integrate e – commerce in their professional life or not.

2.1.3 Sample Description

The sample in this study consisted of 45 hearing impaired individuals, who participated in the courses offered in the context of SYNERGIA. Demographic data concerning the learners are in our possession.

2.2 Data Collection Tool

Data collection for this survey took place via questionnaires, consisted of closed type questions. The questionnaires were designed in increasing Likert scale (not at all, a little, enough) so that the respondents would specify their level of agreement to the statements of the study.

2.2.1 Questionnaires

AGE: 20 – 30, OVER 30,
SEX: MALE, FEMALE,
EDUCATION: HIGH SCHOOL, UNIVERSITY,
DEAFNESS: DEAF BY BIRTH, HARD OF HEARING BY BIRTH,
LANGUAGE: NATIVE, SIGN,
ENGLISH: YES, NO.

After the completion of the program, the participants were asked to answer the following questions:

1. Do you think that lip – reading which was used in the context of the course concerning dyscalculia has been a useful method?
2. Do you think that wikis are useful as a tool in the context of a course?
3. Based on your experience via SYNERGIA, do you think that wikis are easy to use?
4. Do you think that blogs are useful as a tool in the context of a course?
5. Based on your experience via SYNERGIA, do you think that blogs are easy to use?
6. Do you think that text with no sign language but supported by hypermedia was efficient?
7. Based on your experience via SYNERGIA, do you think that video – sign language was useful?
8. Do you think that the activities set up in the context of e – commerce course were helpful?
9. Would you say that the enrolment and navigation process in our social networking tool was easy?
10. Do you think that social networking helped in acquiring team spirit?

3 Questionnaires Analysis

Many important conclusions can be drawn after thoroughly studying the answers extracted from the filled out questionnaires. Consequently, it is important that we point out the most primary results with the help of the respective diagrams.

From the answers to the question concerning lip – reading, it is more than obvious that in general, the participants consider the specific method a very valuable one. Indeed, the great majority (80%) of the hearing impaired people that took part in this study claimed that lip – reading proved very helpful in facilitating the learning process in the context of the course concerning dyscalculia.

According to the following question, which meant to determine the usefulness of wikis in the context of a course, only a few learners in this study (7%) consider the specific WEB 2.0 technology a much helpful tool in learning and working after using it for their participation in the course introducing e-commerce.

In addition, based on their experience via SYNERGIA and on their participation in the wiki – based course of e – commerce, most of the participants (75%) came to the impressive conclusion that wikis are not at all easy to handle.

The question that follows examines in what extent the blogs are considered useful by our sample. Here, exactly as happened in the respective question concerning wikis, only a small fraction of our sample (7%) shares the opinion that blogs can be useful in a satisfactory level.

As it is probably expected, conclusions drawn from the respondents' answers to the question concerning the easiness of use of blogs for learning activities are similar to those concerning wiki use. Indeed, most of the participants (93%) in SYNERGIA believe that blogs also were a little or not at all easy to use in order to achieve the learning goal of the program.

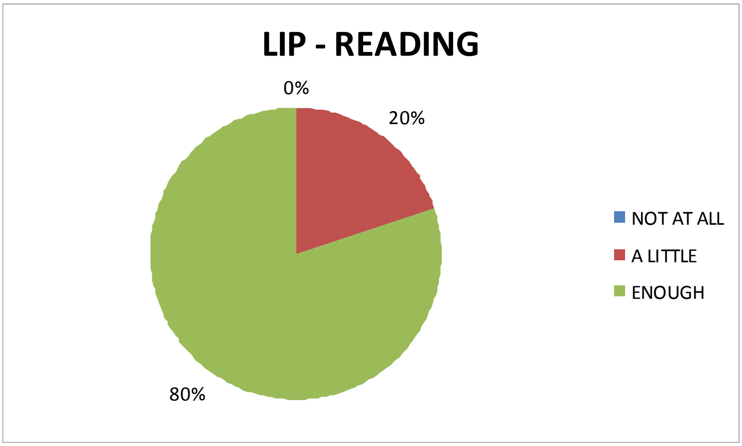

Diagram 1. Lip – reading

A much important question is the following one which explores whether plain text with no sign language but supported by hypermedia is a fruitful way for hearing impaired people to absorb learning material or not. Only a small percentage of the participants (4%) claimed that plain text supported by hyperlinks, a method that was used in two courses (e – commerce and International Account Standards), was a considerable help in learning process.

Via the following question, respondents, based on the acquired experience in the context of the course introducing e – commerce, showed almost unanimous preference in video – sign language,. Indeed, the great majority (91%) of the students was very positive towards video sign language as they consider that it has been a much valuable help for the understanding of the learning material.

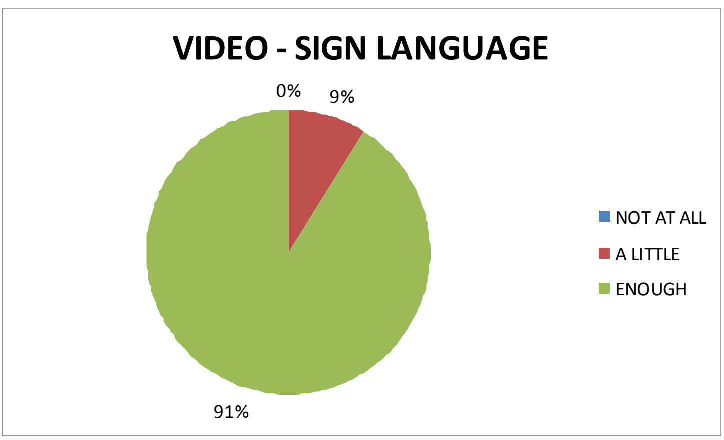

Diagram 2. Effectiveness of video – sign language

Activities set up in the context of the course introducing e – commerce proved to be an important ally in acquiring knowledge and developing skills via learning material. To be more specific, most of the participants (71%) shared the opinion that the activities taken over during the project SYNERGIA were an efficient way to enhance their learning performance. The answers to the question exploring whether the enrolment and navigation process in the social networking tool was easy or not, made it clear that our sample handled the specific tool significantly more easily compared to wikis and blogs. In fact, more than half of the respondents (55%) claimed through the questionnaire that handling the social networking tool was simple enough for them to use without serious problems coming up.

Finally, in the last question that examines the extent in which the social networking tool that we used in project SYNERGIA managed to promote a healthy team spirit among the participants, a large percentage of the participants (78%) answered that Ning.com helped them bond as a team and consequently promoted cooperative learning.

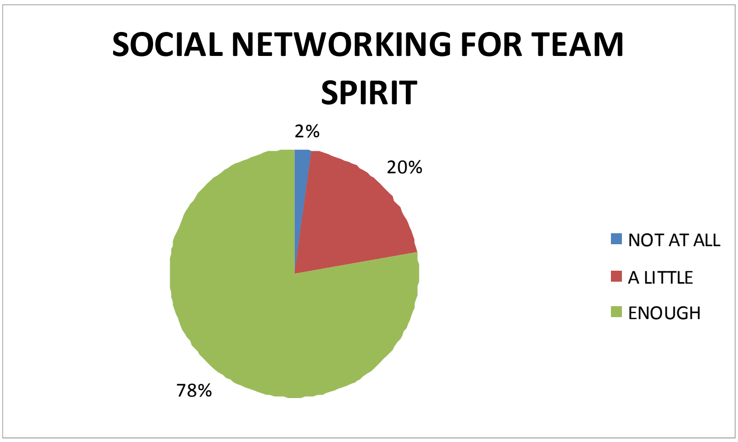

Diagram 3. Effectiveness of video – sign language

4 Conclusions

The empirical study that was conducted in the context of SYNERGIA, a project of Leonardo da Vinci of Lifelong Learning Programme, was presented in this paper in order for a general stream of hearing impaired people's preferences for specific technologies and learning strategies to be expressed and diagnosed. Indeed, based on the filled out questionnaires one can easily conclude that deaf or hard of hearing people tend to be really positive when it comes to using lip – reading as it is a method that provides them a natural way to communicate and learn. Additionally, video – sign language is almost unanimously considered a very efficient method for facilitating absorbance of learning material and activities taken over by the learners in the context of a course seem to be a fruitful way to maximize learning results. However, commonly popular WEB 2.0 tools such as blogs and wikis as well as typical internet tools such as hypermedia do not seem to help them in the learning process and in general are considered non practical in their use. Finally, in spite the fact that in several cases social networking has proved uneasy to handle, it finally earned a large percentage of the sample due to its usefulness in empowering team spirit. The important conclusions that were drawn from this program could be the starting point for further determination of efficient methods to promote the physically impaired individuals' digital education as well as to expand their professional activities in numerous innovative fields.

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Towards a Pragmatic Model for Group-Based, Technology-Mediated, Project-Oriented Learning – An Overview of the B2C Model

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Abstract. The poor assimilation of ICT in formal education is firmly rooted in models of learning prevalent in the classroom which are largely teacher-led, individualistic and reproductive, with little connection between theory and practice and poor linkages across the curriculum. A new model of classroom practice is required to allow for creativity, peer-learning, thematic learning, collaboration and problem solving, i.e. the skills commonly deemed necessary for the knowledge-based society of the 21st century. This paper describes the B2C model for group-based, technology-mediated, project-oriented learning which, while being developed as part of an out of school programme, offers a pragmatic alternative to traditional classroom pedagogy.

Keywords: group-based learning; Constructivism; Constructionism; computer outreach.

1 Introduction

The potential of technology to enhance teaching and learning for the 21st century remains underexploited, as individualised and teacher-led learning systems militate against collaborative learning and peer-peer learning. The failure, thus far, to fully exploit the potential of technology in formal education is rooted in attempts to corral ICT within the existing school system and practice. The reliance on computer science labs that are remote from the normal classroom and used infrequently, or at best within a strict timetable, is a tangible example of how existing practice imposes constraints that neutralise much of the power of ICT in learning. Teachers are constrained by an inherited model of learning that is determined by overriding constraints of school timetables and examination systems.

In order to fully exploit the potential of ICT, alternative approaches to pedagogy must be explored and classroom practices must be transformed. However, an underlying problem is that current notions of pedagogy tend to focus on teacher-pupil relationships and fail to recognise the significance of peer-peer learning amongst students. Resnick [1] suggests an alternative approach to pedagogy – "knowledge-based constructivism and effort-based learning".

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This paper describes a research project which focuses on exploring the key components of an alternative pedagogical model founded upon a group-based, technology-mediated, project-oriented learning paradigm. The model combines best practice from a number of diverse areas to offer a pragmatic alternative to traditional classroom pedagogy. Its origins derive from an out-of-school computer outreach activity run in our university – the Bridge to College programme. Although research to date has been based on out-of-school activities in a specifically designed control location, the focus going forward is exploring, in partnership with schools, how the B2C model can be deployed in formal learning settings.

The layout of this short paper is as follows. The related work section looks at two key areas which informed the design of the B2C model, namely technology-mediated learning and group-work. Section 3 outlines the key principles of the model. Section 4 describes the research methodology applied to evaluate the model and gives details of the data sample upon which the findings of this paper are based. Section 5 discusses preliminary findings and the paper concludes with a summary and an indication of current and future research directions.

2 Related Work

Although a number of principles underpin the design of the B2C model, within the scope of this paper two key aspects are focussed upon – technology-mediated learning and group-work. This section will present these components in detail.

2.1 Technology-Mediated Learning

Conole [2] [3] suggests that if the potential of technology in education is to be realised then what is required is a genuine understanding of how technologies can be used effectively. It may be argued that the difficulty in exploiting technology in the classroom is rooted in the pedagogy and praxis applied. Over the years, given the difficulties in experimenting with and changing classroom practice, a number of innovative technology-mediated models have been developed and applied in out-of-school learning contexts in an attempt to exploit the potential of technology to engage young people positively and to facilitate a new model of learning. Freed from the constraints of formal schooling and assessment these programmes share common characteristics in their attempts to encourage creativity and learning through the affordances and motivational potential of ICT [4].

The Computer Clubhouse model devised at Massachusetts Institute of Technology (MIT) is an exemplar of such programmes. The Computer Clubhouse model seeks to strike a balance between structure and freedom in the learning process, facilitating young people to express themselves and gain confidence as active, independent learners [5]. Now sponsored by Intel, there are 100 such clubhouses in 20 countries around the world. The evaluation framework applied to the Computer Clubhouse is particularly attuned to the distinctive qualities of the Computer Clubhouse model and makes no observation on broader learning outcomes [6]. Other examples of such models include: KLICK, Fifth Dimension and Pincel y Ratón [7], [8], [9].

Despite the fact that it is generally acknowledged that group-work and ICT are powerful learning partners [10] [11], the systematic building of learning teams accompanied by the appropriate deployment of group-based ICT learning projects is generally absent from learning programmes in both the formal and informal domains. Accordingly the following section explores the issue of group-work in more detail.

2.2 Group-Work

It is generally accepted that group-work has great potential as an educational resource [12], [13], [14], [15]. There is however a glaring dissonance in the espoused belief in the power of group-work and its practice and implementation in formal education [16]. Teachers typically view group-work as problematic, often resorting to more traditional approaches in the face of initial difficulties, and, in general, they see the problem associated with group-work rather than the opportunity [15]. The UK based SPR*in*G project[1] researched the wide gap between the potential of group-work to influence learning, relationships, motivation and attitudes towards learning and its limited use in schools. Results provide very strong evidence that group-work can have a positive impact on academic progress, pupil behaviour and relationships between teachers and pupils and among pupils themselves [16].

Progress in the implementation of a group-work based pedagogy is more evident in the informal field of youth work [17], with perhaps the most widely adopted model being that envisaged by Baden-Powell [18] and implemented worldwide under the auspices of The World Scout Movement. Teamwork and team-based learning is integral to Scouting's learning model and is encapsulated in its Patrol System. The Scout Patrol is a learning community, by which a group of young people, of different ages and gender, support each other's development, commit to a shared project and interact with similar groups [19]. This facilitation of interaction with a 'more expert peer' enables a Vygotskyian Zone of Proximal Development (ZPD) and the concept of learning from a 'more expert other' [20]. The power and potential of group-based learning approaches as practiced in non-formal educational models offer exemplars to formal education.

3 The B2C Model for Learning Based on Technology and Group-Work

The B2C learning model presents a particularised approach to team-based, technology-mediated creative learning, and its key components are: 1) The application of a highly structured team-based pedagogy inspired by the learning model of the World Scout Movement [19]. 2) Organising the physical learning space to support the requirements of the team-work model. 3) A mentoring model that seeks to support rather than lead students 4) Structured project-based learning in which responsibility is placed on the team to deliver product to hard deadlines. 5) Collaborative sharing of ICT resources within the team. 6) Team and individual reflection. 7) A teacher that adopts a strategic approach in scaffolding and orchestrating teams' work.

[1] http://www.spring-project.org.uk/index.htm

The B2C model is a particular assembly of what may be considered common elements in learning contexts. Some of these elements may be seen, to varying extents, in other technology-mediated learning experiences, but B2C is distinguished by the combination and focus, and the scaffolding and consistency in the application. The key components are elaborated upon below.

3.1 Components of the Model

The team approach of the B2C model is borrowed from the Patrol System of the World Scout Movement. The Scout Patrol has shared objectives and challenges and this contributes to the bonding of the Patrol members. Other bonding factors include; the participative leadership of the Patrol Leader; building group success through task achievement; carrying out of individual internal roles within the Patrol; consensus building in planning activities; reflection as a group [19]. The B2C model uses a similar framework. The team dynamic is consistently developed and teams are encouraged to work together, meet as required and to employ collaboration and cooperation to meet their objectives. Team stability is maintained so that the team can develop mutual strategies to overcome insecurities and conflict and to get used to building success and fun together [15].

Configuring a learning space to provide for group learning through breakout areas and alcoves has been identified by Lackney as essential to facilitating social learning and stimulation [21]. The design of a learning space to embrace these elements could usefully allow for three dimensions of learning: information exchange, peer interaction and reflection. Creating a space conducive to group-work requires a rethink on the traditional classroom seating layout [15]. The B2C Model proposes that the learning space should be designed to promote teamwork, collaboration and an appropriate social setting to encourage peer-peer learning. The team should be afforded a measure of separation and privacy through the creation of team spaces. A presentation area is required to allow teams to present and discuss their work with the other teams in a plenary setting.

Mentors provide guidance and support to the teams, assisting and pointing the way but not leading or directing the learning avoiding interfering in the teams. The model draws on the concept of a Vygotskian ZPD and seeks to exploit peer learning, to maximise the opportunity for participants to learn from each other and from expertise within the team [20]. This approach reflects the intention of the B2C model to place responsibility on the team to succeed in their challenge, rather than creating a reliance on an external mentor. Mentors do not have to be domain experts to facilitate the operation of the model. Domain expert support can be provided as required while maintaining the integrity of the team system.

The teacher's role in the B2C learning model is significantly different from that adopted in the traditional classroom. The teacher is required to orchestrate the learning experience, provide guidance and support, frame and scaffold the work for the teams. If the teacher is not a domain expert then expertise can be provided by appropriate input both in the preparation of and during the learning activity. One of the key roles of the teacher is to develop learners' group-working skills. This investment in the development of group-working skills delivers a dividend for the teachers as they are freed to reflect and think strategically [15].

Teams are presented with scaffolded, large-scale media rich challenges and are tasked to deliver product to a deadline. The projects are framed by a guided instruction rather than a pure discovery approach. This allows an engagement in exploratory, self-directed learning while providing sufficient guidance to ensure the construction of useful knowledge [22], [23]. Team Leaders are the channel of communication at checkpoints in the production process and they are supported and encouraged to lead, organise and motivate their team in the achievement of the task. The team is equipped with sufficient computers and technology so as to enable sharing and collaboration but avoids individualisation of workstations. This approach helps to build team interdependence, peer-peer learning and inhibits singular activity. Presentation is a key component of all learning activities, with teams required to present and demonstrate their projects to their peers and mentors.

Following activities, time is allocated for the team to reflect on their actions, which contributes to bonding between team members. The output of this reflection is shared with the other teams. Additionally, opportunity is provided for individual reflection on the learning experience. The individual reflection is shared on a voluntary basis with the other participants in plenary session. The individual reflection is intended to foster a sense of personal responsibility for learning and to encourage a meta-cognitive perspective on the learning experience.

4 Research Methodology and Data Samples

To date, the B2C model has been developed and deployed over a two year period. Data gathered in the first year of operation has informed the ongoing refinement of the model and the development of data gathering instruments. This section will firstly outline the practical implementations of the model, focussing on two particular education outreach instances. It will then present preliminary results from analysis of data from the first year's instances of the model. Data analysis from the second year of operation is ongoing and the residual and longer term impact is being investigated.

4.1 Implementations of the Model

The first deployment of the B2C model is an on campus setting at Trinity College Dublin. The learning space is purpose-built to promote teamwork, collaboration and an appropriate social setting to encourage team based learning. Semi-enclosed 'team pods' encourage the sense of identity, self reliance and independence of the team. The learning space also features team break-out spaces to facilitate team meetings and collaborative working. The décor is stimulating and is complimented by flexible furnishing contributing to an unconventional and dynamic learning environment. A presentation area with a theatrical style provides a space for teams to present and discuss their work. The team pod is equipped with 2 workstations to support a team of 5 students.

The B2C model has been implemented in various instances involving 2nd level school students. Participants in these instances were aged between 15 and 17 years and were drawn from a total of 20 schools. In both instances, students attended on block release from school, during term time and within school hours, for 3.5 days (22 hours). This engagement required negotiation and compromise in school timetabling and it also imposed restrictions and requirements that would not affect a purely out-of-school intervention. A maximum of 25 students attended per session, with participants working in teams of 4 or 5, of mixed gender and from different schools, with each team electing one student as their leader. As per the B2C learning model described above, the team leaders and members were encouraged to adopt personal responsibility for their learning and achievements. Following the B2C model of peer-peer learning and collaboration, learning activities were assigned on a large-scale project basis to teams.

4.2 Research Question and Methodology

The primary research questions aim to demonstrate the enhanced effectiveness and impact of the educational model. Specifically, the ongoing research attempts to evaluate the distinguishing components of the B2C model that set it apart from similar schemes and contribute to its overall effectiveness. The research also explores the impact of the learning model on the young people who participate in various instances. For the purposes of this paper, two specific instances will be discussed. A general education outreach programme, the Bridge to College programme, involving 567 students (256 girls / 311 boys) from areas of social disadvantage and a computer programming workshop, called CS-TY, for 39 students (19 boys, 20 girls) with a specific interest and ability in the area of Computer Science [24].

Evaluation of the instances of the B2C model follows a methodology of qualitative research and multiple case studies. The primary data gathering tools used in relation to the participants are pre- and post-questionnaires, focus group interviews and a sample of their creative work output. Other data is gathered through teachers' post-questionnaires and informal interviews and focus groups with the 3rd level mentors. The first step in the evaluation of the qualitative data was to conduct a preliminary exploratory analysis in order to gain a general sense of the broad findings. Following on from that, data was examined in greater detail in order to extract relevant codes. Finally, aggregation of similar codes formed overall themes[2] [25].

4.3 Preliminary Results and Discussion

The preliminary results emerging from the instances described above reveal that the model is effective in the following ways: 1) In raising sense of personal responsibility for learning 2) In fostering a more positive attitude to continuing learning 3) In encouraging an improved attitude to technology and its role in students' learning.

Additionally there is strong evidence of a positive response to the team experience and its role in the students' learning, and the participants strongly reference teamwork and co-operation as a positive contributor to the learning experience. Few students participating in the programme had previous experience of collaborative team-based working either in or out of school. It is clear from the initial results that the team experience had a significant positive impact on a high proportion of the participants. It is also evident that the students linked their broader learning in the workshop with the team experience. Students reflected on how they personally worked within the team and the role they played. This suggests an opportunity to promote meta-cognition and higher order learning through reflection on personal experience within the team.

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[2] This coding and theming process was completed using NVivo software.

The participants' confidence and competence using technology and taking part in technically-mediated learning activities is evident from an analysis of their comments, with many of them referencing the development of technical skill over the course of the programme. Participants also strongly referenced an improved attitude towards using technology to benefit their future learning and an increased sense of responsibility for personal learning.

5 Conclusion and Future Work

Collaboration with technology has tended to concentrate on the technical affordances of particular systems rather than the dynamics of a team working with and through technology. The results from the B2C workshops resonate with the results of the SPRinG programme in UK schools which indicate an exciting potential for gro up-work in formal education beyond what current theories allow, a need for its acceptance in authentic classroom contexts and an appreciation of group-work as part of the teacher's general approach to classroom organisation [15].

The short duration of the instances of the B2C model to date leaves the question of residual and longer term impact open to discussion. Further detailed data analysis will examine these outstanding questions. Future work will also include implementation of the B2C model across the curriculum in 2nd level classrooms. The research focus going forward is to explore, in partnership with schools, how this alternative educational can be integrated into formal education settings.

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Video Conferencing and Knowledge Management in In-Service Teacher Distance Lifelong Training and Development

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Abstract. In Greece, the training system and education can be adapted to distance lifelong e-learning and the teachers, the society and the economy can be benefited via the introduction and training of in-service teachers in a) the Video Conferencing (VC) technology and mode of distant training, granted that_VC is put into a learning framework, and b) Knowledge Management (KM) methodology, through lectures and seminars. Incidentally, VC technology and KM methodology can be integrated into in-service teacher distance lifelong training and development, and to this end, an example, a hybrid model, of the manner VC technology and KM methodology can be integrated into in-service teacher distance lifelong training and development, that is, a microteaching session via VC and KM, which is advisable for Greek teachers of all specialisations in Greece or abroad, is given.

Keywords: Video conferencing, knowledge management, distance lifelong in-service training, managed learning environment, microteaching.

1 Introduction

Distance learning is associated with distance education, while interactive distance learning systems are a highly valuable tool in the delivery of education and training to widely dispersed trainees, and in cases where the trainer cannot travel to the trainee's site in accordance with the European Commission's [1] policy on e-learning, which gives priority to those who live in remote areas or the disadvantaged, since distance education offers opportunities in situations where traditional education has difficulty to operate. E-learning is suited to distance learning, flexible learning, and blended learning and is associated with advanced learning technology, while in higher education, a virtual learning environment – sometimes combined with a Management Information System (MIS) to create a Managed Learning Environment – is used [2]. MISs are used a) to analyse other information systems which are applied in operational activities in an organisation, and b) to automate or support human decision making [3].

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In this paper, focus will be on distance lifelong training for in-service teacher development on and via video conferencing and knowledge management. Desktop video conferencing, on the one hand, links geographically dispersed groups or individuals using powerful Computer-Mediated Communication technology, which learners perceive as a motivating factor, appeals to different learning styles, and makes learning fun [4]. Knowledge management, on the other hand, is the management of an organisation with a special focus on knowledge [5]. Firstly, according to connectivism, learning is defined as actionable knowledge, resides within an organisation or a database, connects specialised information sets, and the connections which enable people to learn are more important than their current state of knowing [6]. Secondly, connectionists challenge Chomsky's cognitivism and hold that learning and cognition are associated with the manner neurons interconnect and communicate in the brain; construct artificial and highly simplified networks of neurons which exist as computer simulations and are a minute fraction of the size of the real brain, to mimic the behaviour of the brain; and have proved that a network can be trained to perform any mapping operation [7], that is, to discover, for instance, what knowledge exists at the beginning of a KM project (:knowledge audit) [8].

The paper is organised as follows: Section 2 presents VC in relation to computer-supported collaborative software, the European as well as the Greek Research and Education Network, and the Greek Schools Network. Section 3 presents a premise associated with the manner VC and KM can be integrated into in-service teacher training and development so that the training system and education can be adapted to distance lifelong e-learning, and the intrinsic operation of the school units can be improved since past knowledge will be integrated and new knowledge will be created. Section 4 presents an analysis of the impact of VC and KM on the teachers, the society, and the economy. Section 5 presents the following steps that are being pursued in this research, and finally, section 6 presents the conclusions of the work presented in this paper.

2 Video Conferencing

Video conferencing serves groups in two or more locations who interact simultaneously via two-way video and audio transmissions with the use of electronic transmitters, such as computers over Internet telephony (VoIP). In e-learning, seminars are transmitted via webcasting, which is broadcasting over the Internet, and in which a content source is taken and distributed – live or recorded – to many simultaneous listeners or viewers by streaming media technology. Video conferencing is supported by the European Research and Education Network, GÉANT2, as well as the Greek Research and Education Network (Ethniko Diktuo Ereunas kai Technologias – EDET). Collaborative software related with computer-supported cooperative work as well as research and education networks in Europe and in Greece will be presented in short.

2.1 Collaborative Software

Collaborative software can be either web-based or desktop systems, while electronic communication tools, electronic conferencing tools and collaborative management (co-ordination) tools constitute the three categories of collaboration groupware [22]. Electronic communication tools include synchronous conferencing, Web publishing, wikis, faxing, e-mail, voicemail, and revision control, while electronic conferencing tools include telephony, video conferencing over VoIP, instant messaging, application sharing such as desktop sharing or screen sharing, data conferencing or electronic whiteboard with annotation, online chat as well as Internet forums for virtual discussion, and Electronic Meeting System Tools [9] which facilitate group decision-making such as electronic brainstorming and rank order vote among others. Additionally, slide presentations created via Power Point, live video, as well as polls and surveys with multiple-choice answers [10]. Collaborative management tools, finally, include electronic calendars, project management systems, workflow systems related to collaborative management of information, knowledge management systems which collect, manage, organise, and share forms of information, prediction markets, extranet systems and hosted intranet systems where the information is associated with the delivery of a project, social software systems which organise social relations of groups, and online spreadsheets which are related to collaborative and shared structured data and information [9].

2.2 Research and Education Networks in Europe and in Greece

A National Research and Education Network (NREN) is a specialised Internet service provider that supports research and educational communities within a country by providing the infrastructure -- for instance, virtual collaborations, teleteaching, school networks -- which is fundamental in order for education to respond to the rapid developments and to stay competitive and attractive to Europeans and non-Europeans [11], and all aspects of research and education networking to be developed by different types of users. GÉANT2, the backbone network of the European NRENs, interconnects Europe's national research and education networks, while it is connected to research networks and academic backbones worldwide so as international collaboration and development to take place in the frame of the European strategic objectives of education. The non-profit association of the European NRENs is called TERENA, an acronym of Trans-European Research and Education Networking Association. TERENA supports the European research and education community via the promotion and development of high-quality international information and telecommunications infrastructure [12].

GRNET is the non-profit Greek National Research and Education Network which is interconnected at the Pan-European network GÉANT2. GRNET2 is the generation of advanced technology at extra high speeds [13], while GRNET3 supports e-science applications and Internet Usage [14] at a Pan-Hellenic level. GRNET offers among others, the following services to researchers, professors and students of Universities and of Technological Education Institutes: newsgroups and news feeds, diodos that offers permanent ADSL connection from residence at the minimum charge as long as the academic studies last, real-time multipoint video conferencing sessions and teleteaching activities, IP telephony service which allows the communication of data across the Internet, webcasting, and video on demand.

Along with the Greek Universities Network (GUnet), GRNET supports the Greek Schools Network (GSN or SCH.gr) providing it with Internet Services. The GSN offers the following services to its basic and middle education units and users: a) the WWW portal which offers among other telematics services, Web mail access, calendar, notes agenda, task list, discussion forums, collaboration environment for asynchronous e-learning, and news services which distribute informative material related to the GSN registered users who are allowed to post news and announcements; b) the users administration service which provides the users with remote network access (dial-up), Web space of their own Web pages, and e-mail service; c) instant messaging integrated with teleconferencing where a web interconnection permits the user to select day, month and week views; d) asynchronous e-learning platform; e) video on demand; and f) the users support service (Helpdesk) which provides telematics services and solutions to connection problems as well as technical aid to the users by phone or with ad loc visit.

3 State of the Art

Video conferencing meets the needs and demands of the Greek teachers and is in conformity with the aim and the goals of in-service teacher training as well as the goals set out by the Lisbon European Council and the concrete strategic objectives of education and training systems adopted by the Education Council. As concerns the needs and demands of the Greek teachers, research [15], [16], [17], [18] conducted in Greece has shown that teachers of both primary and secondary education engage in critical reflection on their experiences in order to change their meaning schemes, a fact that according to Mezirow [19] leads to perspective transformation which leads to transformative learning. Granted that 76,000 Greek in-service teachers of all specialisations have already been trained in the use of ICT in education [17], in order for transformative learning to be realised, lectures and seminars on and via video conferencing and knowledge management should take place.

3.1 ICT Induced Training for Professional Development

Research a) conducted in Greece and related to the needs and demands of the Greek teachers has shown that teachers of the Primary and the Secondary Education carry a positive feeling towards the use of ICT in education [15], [16], [17], [18], are aware of distance education and favour it when contrasted with face-to-face education [18], and desire to attend training programmes related to the use of ICT [16], while b) research conducted abroad has shown a) that the quality of online education equals or is better than traditional education [20], b) that students prefer the electronic classroom at a local site [21], and c) that in the field of microteaching, the use of videotape recordings is an effective method of teacher training [22]. Moreover, Vassala and Motsios [18] characterise conventional training as not flexible, while Papadakis and Fragoulis as well as Papadouris [18] state that distance education could be implemented in introductory training and in other training environments.

Therefore, as regards distance lifelong in-service teacher training and development, video conferencing along with knowledge management meets the needs and demands of the Greek teachers and is in accordance with a) the aim of in-service teacher training, which is to supplement and integrate their knowledge substructure in order to make it practically beneficial as well as the goals of in-service teacher training which are related to their personal and professional development and the effectiveness of the educational system within which they work [23]; and b) the goals set out by the Lisbon European Council and the concrete strategic objectives of education and training systems adopted by the Education Council [11], granted that firstly, it aims at the development of the adult throughout his professional life and aids teachers to get a real advantage from multimedia resources and interactive possibilities, secondly, it facilitates the access of all to education and training systems through collaborative software as well as the GSN which is supported by the GRNET and the GUnet, and incidentally, the skills of the labour force correspond to the technological and economic evolution.

3.2 VC and KM in In-Service Teacher Distance Lifelong Training and Development

In order for transformative learning to be realised, lectures and seminars on and via video conferencing (VC) and knowledge management (KM) grounded on the following learning theories should take place: a) constructivism related to distance learning and supported by VC, since it offers flexibility to teachers who use technology tools to augment cognitive and metacognitive processes [24], and b) connectivism associated with rationalism – since tacit and explicit knowledge is expected to be available throughout the school unit – as well as connectionism related to artificial neural networks and KM activities driven by KM needs and supported by ICTs, artificial intelligence and needs analysis techniques.

Firstly, lectures and seminars on VC and KM should be based on the aim and the goals of in-service teacher training and could be organised at national level by the Ministry of Education, the Pedagogical Institute, and Bodies and Services (such as the Adult Education General Secretariat and Computer Technology Institutes) which aim at the promotion and diffusion of lifelong learning, while experts should be assigned in order to incorporate technology into learning environments. Furthermore, support could be provided by a) training institutions and scientific unions of adult education and distance learning as well as b) GRNET which works in partnership with the European NRENs and supports GUnet and GSN, and c) European universities and the European Union.

Secondly, in the frame of seminars via VC and KM,

- ✓ a microteaching (that is, a minute lesson which a) consists of self-study, evaluation and peer supervision, and b) is a valuable training method that increases training effectiveness, granted that the foundations of its protocol are immediate, focused feedback and encouragement as well as the opportunity to practice the suggested improvements in the same training session so that the trainees improve both methods and content of teaching, and develop specific teaching skills [25]),
- ✓ real-time nation-wide or world-wide broadcast link (which connects two or more nodes)
- ✓ video conferencing flexible blended learning distance lifelong in-service teacher training and development session
- ✓ accompanied by control access activities and interactive data conferencing, constitutes a hybrid model so as best use of the literature and technology discussed to be made.

Assessing KM activities last 10′-15′ and indicate according to Bornemman et al. [5] a) the knowledge available before microteaching, -- through constructive electronic portfolios [24] -- granted that focus is not on the actual process of learning, but on the value of what is being learned and on the meta-skill of evaluating the worthiness of learning something before learning itself begins [6] according to connectivism, b) how it has been developed over time and c) the extend to which non-explicit knowledge goals have been reached. Connectionist knowledge mapping and connectivist assessment is related to self-improvement (external), while evaluation of the training centre's goals is related to accountability (internal) and is in conformity with KM methodology.

In KM planning and organisation activities, teachers of the same specialisation from Greece or abroad, select the time, the location, the place, and the duration of the session according to their needs and demands, with the help of collaborative management tools and via the collaboration platform of the GSN, in collaboration with the executives of education, the assigned experts, and the training centres. Two groups of teachers, which consist of four or five peers each, constitute the participants. Three or four of the peers from both groups assume the role of the teacher and schedule the lessons, and with the students-trainees of both groups form one self-study group and have three or four complete microteaching cycles of ten to fifteen minutes each, so as VC to operate in relatively short, interactive sessions, in line with the theory [26].

Both groups interact from the same location each, being at a VC room at a school, or at a training centre of the public sector, or at the nearest university campus, or at a mobile VC studio. One of the two groups, nevertheless, can attend the VC session and interact from different locations of the country or from abroad with the four or five peers being at their home each without having the possibility to teach, but only to play the student role, since blended learning is used. At the same time, another microteaching session via VC takes place with similar audiences.

In microteaching, each new skill is introduced to trainees in varied combinations of face-to-face training sessions, printed materials, and multimedia presentations [25], and therefore, VC technology is treated as one component of a multi-mode approach to delivery [26]. In KM creation and transfer activities, online training materials, information, and general presentations can be created with Adobe Flash multimedia technologies which add animation, interactivity and video to web pages, while a document camera transmits images of documents, slides or overhead projectors to remote sites. An electronic whiteboard with animation allows the presenter, the attendees, or both, to make notes on a blank whiteboard, or to mark or highlight items on a slide presentation. Other VC tools are web browser spreadsheets, slide presentations created via Power Point, live video through a digital video camera or webcam, and recording for viewing at a later time be anybody who uses a unique web address [10], while group decision-making is facilitated by electronic meeting system tools, which are idea generation techniques. Accordingly, VC facilitates conventional learning with face-to-face meetings, and distance learning with more class materials and better preparation of teaching materials [21].

There follow KM creation, transfer, integration and maintenance activities. The teachers watch and comment on the single-concept microteaching lesson, while a) peer evaluation of the teaching episode is provided by each of the teachers who play a student role and consists of -- one or -- two compliments and -- one or -- two suggestions related to the specific skill being emphasised or to other aspects of the lesson; b) trainees feel empowered by the compliments and suggestions of the peers and trained supervisors -- or assigned experts – chairmen, when present, in the frame of constructivism -- ; c) the teachers who have taught the lessons, have a brief time to use the feedback they have received to replan and reteach the same lessons to another group immediately [25], since at the same time, another microteaching session via VC takes place with different audiences so as feedback on the retaught lessons to be given by another audience.

Feedback is aided by playing back the video recordings [25], since research has shown that the use of videotape recordings is an effective method of teacher training [22]. Eventually, the video material of the broadcast, that is, the session, is uploaded to the GSN's Video on Demand server and is retrieved by the end-users later. After the session has ended, the teachers can be in contact whenever they select to be, via the GRNET's news service which provides message exchange in discussion lists and article exchange to all its partners. Apparently, the intrinsic operation of the school units will be improved, since rationalist and cognitivist tacit (cf. Chomsky's competence) and explicit (cf. Chomsky's performance) knowledge will be made available throughout the school units in which the teachers work.

4 Impact of VC and KM on the Teachers, the Society, and the Economy

The rationale of the paper resonates with the aim and the goals of in-service teacher training and development as well as the goals set out by the Lisbon European Council and the concrete strategic objectives of education and training systems adopted by the Education Council [11].

In Greece, the training system and education can be adapted to distance lifelong e-learning and the teachers, the society and the economy can be benefited, granted that VC along with KM a) reduces the inequalities among the trainees and constitutes an effective means of communication, cooperation, interaction, development, and active citizenship for a wide range of trainees around the country; b) contributes to the development of the school units' and training centres' core competences and core performance capabilities with improved or faster learning and new knowledge creation; c) offers a competitive advantage within the national and the European educational system as well as the economy, since firstly, the skills of the teachers correspond to the technological and economic evolution, and secondly, innovation stakeholders are encouraged to contribute to the creation of innovative educational training environments; and d) strengthens cooperation among European and non-European Unit countries in the field of education and training systems via GÉANT2 and TERENA, and thus, European education and training systems become competitive, and in consequence, attractive to Europeans and non-Europeans.

5 Future Research

Granted that video conferencing will be universally accepted as the next mode of communication [21], as research conducted abroad and in Greece implies, further research could focus on preservice teacher training, on the training of the executives of education and of post-secondary education students and teachers on and via VC and KM as well as on KM as regards school unit or Academic Institution management. Furthermore, since societies in which adult education and training are seen as separate from compulsory schooling, are always going to be of marginal concern [27], decision makers, at all levels, should be supported to address education policy issues, such as innovation, European and international collaboration, and integration of new learners [28] so as high-quality, selected and up-to-date education developments to take place -- in Greece and -- throughout the Community [29].

6 Conclusion

VC has been put into a learning framework and a premise associated with the integration of VC and KM into in-service teacher distance lifelong training and development has been put forward. Both axes of the premise, that is, a) the introduction and training of in-service teachers in the Video Conferencing technology and mode of distance training and in Knowledge Management methodology through lectures and seminars as well as b) an example, a hybrid model, of the manner VC technology and KM methodology can be integrated into in-service teacher distance lifelong training and development, that is, a microteaching session via VC and KM, which is advisable for Greek teachers of all specialisations in Greece or abroad, make up solid foundations for in-service teacher distance lifelong training and development, meet the needs of the teachers, the society and the economy, and are in line with the aim and the goals of in-service teacher training and development as well as the European Education Council's [11] strategy as regards education and training systems in Europe.

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Supporting Teachers to Automatically Build Accessible Pedagogical Resources: The APEINTA Project

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Abstract. Most of the universities in Europe have started their process of adaptation towards a common educational space according to the European Higher Education Area (EHEA). The social dimension of the Bologna Process is a constituent part of the EHEA and it is a necessary condition for the attractiveness and competitiveness of the EHEA. Two of the main features of the social dimension are the equal access for all the students and the lifelong learning. One of the main problems of the adaptation process to the EHEA is that the teachers have no previous references and models to develop new pedagogical experiences accessible to all the students, nevertheless of their abilities, capabilities or accessibility characteristics. The APEINTA project presented in this paper can be used as a helpful tool for teachers in order to cope with the teaching demands of EHEA, helping the teachers to automatically build accessible pedagogical resources even when the teachers are not accessibility experts. This educational project has been successfully used in 2009 in two different degrees at the Carlos III University of Madrid: *Computer Science* and *Library and Information Science*.

Keywords: European Higher Education Area, EHEA, Teaching Support, Inclusive Technologies, Technology Enhanced Learning, People with special needs.

1 Introduction

Nowadays, the use of new technology is growing in every field of education. This technology can be useful not only for students but also for teachers. The proper use of the technology permits to support the students learning, adapting the pedagogical resources and strategies to each student individually, but also permits to support the teachers in the adaptation to the European High Educational Area (EHEA) learning model.

Currently, most of the European universities are adapting their pedagogical approaches towards a common educational space according to the European Higher Education Area (EHEA). More than 40 countries are involved in the EHEA in order to improve the quality and competitiveness of European universities, fostering student's mobility throughout Europe. The convergence towards the EHEA demands new

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methodological learning process and structural changes that can be summarized in three main pillars when the subjects are been adapted: the new role of teachers and students (the use of student-oriented methodologies), the need to introduce ECTS credits and the importance of transversal competences.

This paper and the APEINTA project[1] are focused in the social dimension of the EHEA. Two of the main features of the social dimension are the equal access for all the students and the lifelong learning, which should be used in order to face the challenges of competitiveness, the use of new technologies and to improve the social cohesion, equal opportunities and quality of life.

The APEINTA project is a Spanish educational project where the Spanish Centre of Captioning and Audiodescription (CESyA) and the Computer Science Department and the Electronic Technology Department of the Universidad Carlos III de Madrid collaborate in order to provide inclusive education for all, independently of the students' abilities. This project has two main objectives: first to avoid barriers among the students and the education, proposing inclusive proposals in and out of the classroom; and second, to prevent one of the main problems of the adaptation process to the EHEA: the teachers have no previous references and models to develop new pedagogical experiences accessible to all the students. APEINTA can be used as a helpful tool for automatically build accessible learning courses and to adapt to the EHEA's requirements in its social dimension. Then, APEINTA is student-centered and teacher-centered.

APEINTA has been successfully used in 2009 in two different degrees at the Carlos III University of Madrid: *Computer Science* and *Library and Information Science* and this project received in 2009 the FIAPAS[2] award for research and innovation in education.

2 State of the Art

Different reports, documents and declarations have been generated about the Bologna Process, providing teachers information for facing the challenge of adapting their subjects to the new system. Moreover, different projects as the Turing Educational Structures in Europe project [1] present methodologies and studies for redesigning, developing, implementing and evaluating study programs for each of the Bologna cycles.

The EHEA process began in 1999 in Bologna and the main objectives fixed in the official declaration [2] were adapted and modified through subsequent governmental meetings in Prague (2001), Berlin (2003), Bergen (2005) and London (2007). The social dimension of the EHEA was included in Prague (2001) and adapted lately. Currently, two of the main features of the social dimension are: first, the necessity of making quality higher education equally accessible to all and second the necessity of responding strategically to the lifelong learning agenda. The institutions may enhance student-centred and flexible learning, tackling the social objective of ensuring equality of access to higher education for all [3].

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1 APEINTA was partially founded by the Spanish Minister of Education and Sciences (EA2008-0312).

2 FIAPAS is the Spanish Confederation of Parents and Friends of Deaf People.

Today, the use of Learning Content Management Systems (LCMS) or Virtual Learning Environments (VLE) is been widely extended in the educational sector, above all in e-Learning systems [4]. LCMSs provide tools for authoring and reusing or re-purposing contents as well as virtual spaces for student interaction (such as discussion forums, live chat rooms and live web-conferences). Last years European universities have started to use this LCMS in order to support the teachers in theis adaptation to EHEA, however, most of the LCMS used present accessibility problems [5] that teachers do not usually can notice because they are not experts in accessibility issues. For instance, the teachers should need to validate the HTML code automatically produced by the LCMS in order to check accessibility problems, but s/he could not be prepared for it.

Most of the LCMSs are web-based systems and they can present accessibility barriers that could affect different types of users. Therefore, in order to build an accessible system using a LCMS, it is necessary to follow Inclusive methodologies [6] and Principles of Universal Design [7] from the very beginning of the system design.

The APEINTA project presented in this paper not only provides an accessible LCMS in order to support the teachers in the building process of pedagogical courses, but it also is able to automatically build accessible resources thanks to services provided in the classroom by APEINTA.

3 The APEINTA Project

The APEINTA architecture shown in Figure 1 presents two well differentiated applications: a real-time captioning and synthetic speaking multisystem used in the classroom in order to avoid physical barriers for hearing impaired students and students with speaking problems [8]; and a Web platform with accessible digital contents that can be used in and out of the classroom for students of all abilities, including benefits in their learning [9].

0ut the classroom, a Web platform provides access to pedagogical contents such as video, slides and other documents. The Web-platform is an accessible Virtual Learning Environment that has been developed using the dotLRN v.2.4.1[3] LCMS, building accessible templates and modifying some configuration parameters in order to ensure a minimum of accessibility when an inexpert person is building new pedagogical resources.

Moreover, the real-time transcription service used mainly in the classroom allows to automatically generate educational resources such as audio and synchronized subtitles or notes in different formats. All this resources automatically generated joint to the podcast videos of the classes can be lately published in the Web-platform as an accessible resource available for all the students.

For the teachers, the use of APEINTA is really useful because they could be able to generate accessible pedagogical resources in accessible Web-learning platforms without the necessity of be accessibility expert.

The APEINTA project has been sucessfully used in the Universidad Carlos III of Madrid University (SPAIN) in 2009. Teachers of *Computer Science* degree and *Library and Information Science* used APEINTA and all of them agree in the usefulness of the project for adapting to the EHEA. In figure 2 an accessible video of *Database*

[3] dotLRN v2.4.1 (2009). Available at http://dotlrn.org/download

Design class of *Computer Science* degree is presented. This video is currently published in the private Web-page of the subject, so every student could download it. This video presents real time captioning generated automatically during the class thanks to the real-time transcription service of APEINTA.

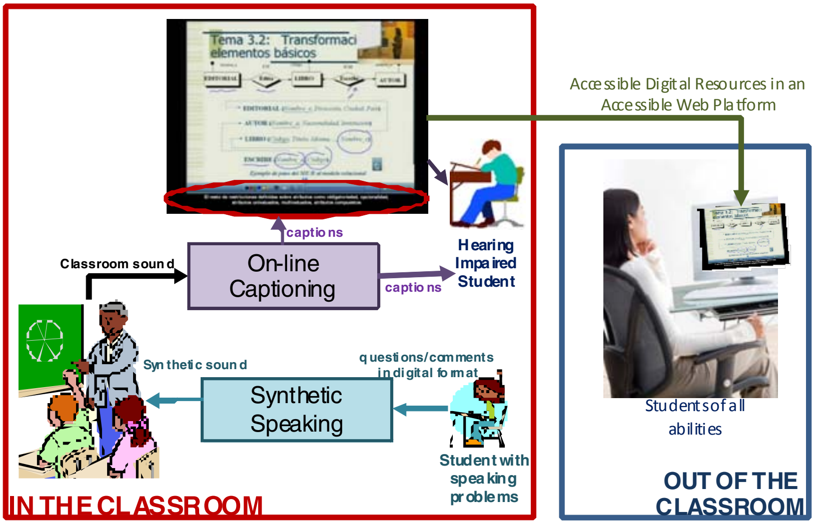

Fig. 1. APEINTA architecture

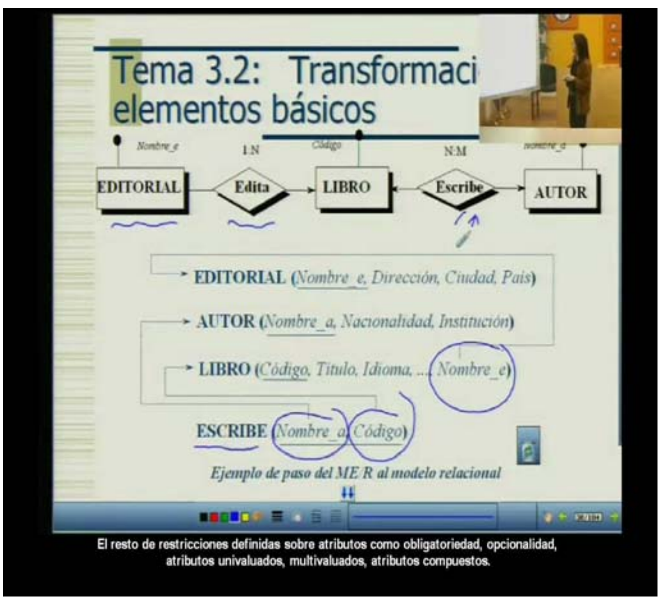

Fig. 2. Podcast video of a class with captioning automatically generated by APEINTA

4 Conclusions and Further Research

The APEINTA project is a student-centered and teacher-centered project that provides helpful services for the convergence to the EHEA. This project has two main objectives: first to avoid physical barriers among the students and the education, proposing inclusive proposals in and out of the classroom; and second to support the teachers in the process of building and editing accessible learning courses with accessible digital resources.

This paper is mainly focused in the teacher support for generating accessible learning courses and resources, underlying that teachers do not have to be accessibility experts in order to build accessible learning systems. This characteristic makes easier to the educational centers to adapt to the EHEA.

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Developing the School of the Future Based on Quality Principles

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Abstract. Our school's vision is to deliver a more attractive, qualitative and technologically equipped school to our students in order to prepare them to be active 21st Century citizens. In this paper we present the on-going effort that we have made during the last years, towards this direction. Our initial step towards building the "School of the Future" is the implementation of a "Classroom of the Future", as well as the experience gained through our participation in the homonym project. In this classroom our students have a light-weight portable "electronic schoolbag" (Tablet PC) and are connected wirelessly to the interactive whiteboard of their classroom and their teacher's "electronic" tools. This schoolbag contains all of their books and sheets as well as virtual labs, simulations, multimedia material, their schoolwork and every tool related to the educational process.

Keywords: 1:1 Computing, Classroom of the Future, 21st Century Skills, Tablet PC, quality.

1 Introduction

Once, it was difficult to foresee that each student would have their own pencil (1 student: 1 pencil) and in succession their own book (1 student: 1 book), or their own computer (1 student: 1 computer). According to such a course, it could be stated that in the future each student would even have their own curriculum (1 student: 1 curriculum) [1]. The term "1:1 educational computing" describes the educational practice, where each student has their own computing device. These devices are mobile and equipped with wireless connection. They can also have various forms and possibilities: from specialised devices such as response pads, calculators and e-dictionaries up to general type devices, such as mobile phones, PDAs and Tablet PCs.

Moreover, following the Partnership for 21st Century Skills' vision for the 21st Century Student success in the new global digital economy, students should master skills, knowledge and expertise in order to succeed in work and life. Among these skills are Information, Media and Technology Skills [2]. We should deliver a more attractive, qualitative and technologically equipped school to our students and prepare them in order to be active 21st Century citizens.

In this paper we present the on-going effort that we have made during the last years towards this direction, the experience gained through our participation in the PAVET

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"Classroom of the Future" research project, as well as an initial study on its impact. In the context of the project the International Conference "The School of the Future & the Future of the School" under the auspices of the Hellas Ministry of Education was organised in April 2008 [3].

In the context of development of quality procedures in education we have as a goal one unified, educational, cross-curricular design that defines:

- the basic educational cross-curricular aims,
- the cognitive possibilities, abilities and skills that students should attain,
- the students' course from grade to grade.

In the context of student satisfaction, we presume most effective learning in school so that studying at home would be less time-consuming, leaving more time for the development of students' social and other skills.

2 Background

A large number of researches shows the benefits of the active and collaborative learning, and a number of tries have occurred as a result of the use of technology equipment for the support of these techniques, in the educational process [4; 5].We made a thorough review of projects, technologies and systems before we start the implementation of our "School of the Future" vision.

The Project "Classroom 2000", Georgia Tech University [6; 7] uses a variety of technological systems (interactive whiteboards, touch screens and styluses, internet) in combination with software that allows the automatic capture, saving and retrieve of multimedia information. The aim of the project was the gradual integration of innovative technologies in the traditional classroom teaching and the study of its impacts. Teaching and learning has been considered as participatory multimedia authoring by teachers and students. Project's researchers claim that technology usage for the multimedia information record produced into class, may lead to more effective teaching and learning experiences.

Wireless Technology Enhanced Classroom (WiTEC, National Central University, Taiwan) project [8] combines Personal Digital Assistants (PDAs) with wireless connection for the creation of a technologically advanced classroom with the following features: minimisation of dull activities, students' engagement and activation, collaborative learning support, saving of students' activities in Porfolios.

Other innovative technologies reviewed include: E-Chalk [9], PDAs for Entry of Both Bytes and Locations from Extend Sources - Pebbles [10] which deals with the creation of applications for the connection of PDAs operated by students and in a PC operated by the teacher and Classroom Presenter [11], that allows participatory annotation of presentations in class, developed by researchers in the University of Washington.

Among the schools case studies reviewed were: School of the Future, Microsoft & School District of Philadelphia, where innovative technological solutions were integrated in all the school's functionalities. Aim of this project is the creation of a model that can be deployed by all educational school communities, the Swedish School Kunskapsskolan [12] and the English School New Line Learning (NLL) [13].

Also, a large number of quality methodologies have been researched. Our school has chosen the EFQM Excellence Model as an approach for 'committing to excellence' [14].

3 Methodology

Our objective is to design and build the "School of the Future" (SoF) progressively, through a developing action plan with the following steps: register the current and future educational needs; study the international experience and methodology; prepare the new technological infrastructure required; prepare our teachers; collect - create the appropriate educational digital content (see Fig. 1).

The School of the Future, as we plan, design and create it, is a combination of the past, the present and the future. Students change from passive recipients, they participate actively in the educational events, teachers become collaborators and guides, they organise, inspire and create biomatic activities and finally, parents participate actively in the educational family.

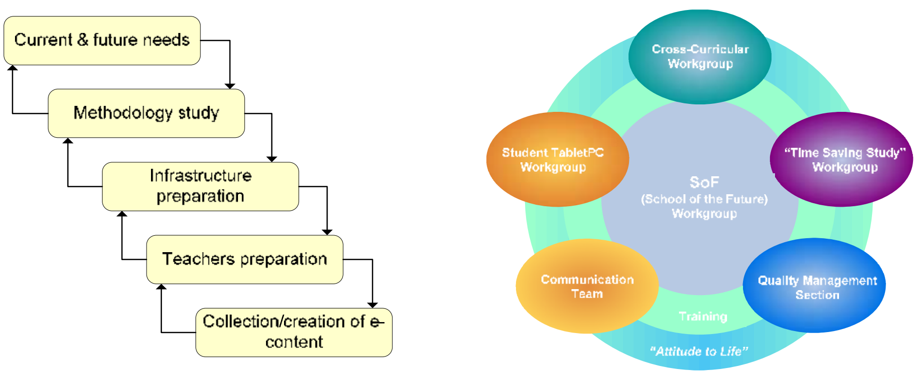

Fig. 1. Action plan of building the SoF

Initially, we studied and defined the skills that our students, the students of the 21st Century ought to have. According with the Total Quality Management principles [15], the whole personnel of an organisation should be involved in the quality procedures and have as an aim the quality improvement of the organisation. Having this in mind the following workgroups were created involving the majority of the personnel:

- *School of Future Workgroup* with a coordinating role in the study, design and methodology in the gradual implementation of the "School of Future" in cooperation with all grades and teams.
- *Cross-curricular Workgroup* which shapes the Academic Curriculum Chart, defining the basic educational aims and the competencies-abilities that students already have from the previous grade and also conducted the collection

of digital content in accordance with the Cross-Curricular Study Programme of the Pedagogical Institute.

- *Student TabletPC Workgroup*, studying and introducing the Student TabletPC in the educational process.
- *Quality Management Section* dealing with the systematic inspection of the educational and administrative processes of the organisation and the improvement of the educational strategy.
- *'Time Saving Study' Workgroup*, which designs and applies programmes so that students assimilate the knowledge in school and either have not to study at home or study will be less-time consuming.
- *'Attitude to Life' Workgroup* that designs and applies programmes for important 'life' and emotional intelligence skills.
- *Communication Workgroup* communicating the activities of the school.
- Last but not least the *Training Workgroup* defining the training programmes for our teachers and our students' parents.

Next step was to share knowledge and experience with other educational institutions from abroad. Educational visits in European Schools, such as the Swedish School Kunskapsskolan [12] and the English School New Line Learning (NLL) [13] took place in order to record their educational practice and features concerning their educational procedure, infrastructure, assessment process, relations between school administration and students, parents and teachers and out-of school activities.

Also, an educational portal was designed and implemented for the management of educational content and activities. Then, the supply, installation and adjustment of the hardware took place (servers, portal/classroom equipment). The next step was the creation, collection, and publication of the educational content both locally in students' Tablet PCs and remotely in the portal.

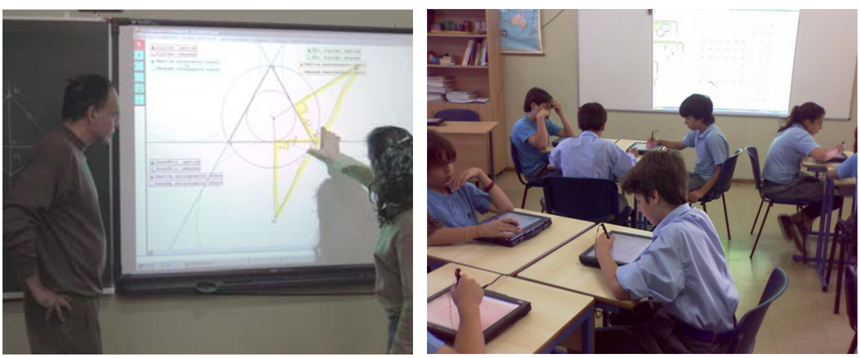

Fig. 2. Instances from the implementation of the SoF; students working in isolation and in collaboration with their teacher

Next step was the organisation of workshops in which our teachers participated in order to be able to administer the new needs and finally the preparation and application of pilot lessons in class (see Fig. 2).

Having as an aim the development of quality procedures in our organisation, we shape student-centered and inquiry-based didactical models; collaborative and interactive ones, give emphasis on the new role of the teacher that becomes facilitator of the student's effort, offer the possibilities to the students, so that they develop their creativity and thus digest the knowledge in class. Finally, we integrate the new technologies in didactics and the student procedure, with an aim to create multiple representations to our students.

4 Implementing the "Classroom of the Future"

One digital classroom with students having a light-weight portable "e-schoolbag" requires the activation of various didactic strategies, educational content and equipment in order to function. Basic elements of a digital classroom are: Students'/ Teachers' Devices, Audiovisual Infrastructure, Interactive Whiteboards, Tablet PCs Management System and Communication Equipment.

The classroom can be of various arrangements (such as "traditional" class, "laboratory" or "collaborative"). The classroom arrangement can easily be changed due to the wireless equipment and portability of computers.

The Tablet PC contains all the educational content connected with the educational process. A dedicated workgroup conducted the collection, evaluation of existing material and the creation of new for all grades and principles in accordance with the Cross-Curricular Study Programme of the Pedagogical Institute. The content developed has as aim the promotion of the critical thinking of our students [16]. Apart from the multimedia material many open-ended applications, mind tools and constructionism tools are included for the cross-curricular study of domains [17], such as Logo-like environments, Geogebra, Sketchpad, etc.

Other applications that enrich this environment are the school registers (enriched with students' photos and profiles), electronic grading and absence keeping, e-assessment, electronic project assignment. Access to this content is possible even from home, so that students can keep track of the lessons even if they are absent, while parents are also participants in this process.

5 Evaluation

Following the principles of the EFQM Excellence Model and using the self-evaluation tool, we measure in a systematic way the results and our procedures and make dynamic interventions in points that need improvement.

At the moment the school has been awarded with the EFQM Award for the administrative procedures, while we are preparing to apply the EFQM model in the educational procedures as well.

This has been the third year in the row that the Quality Management Workgroup of the School organises and plans efficient tools of needs assessment of our students, their families and personnel. Through different tools (interviews, questionnaires) we constantly search new ways in order to fully satisfy the needs of our stakeholders.

Also, we have a performance evaluation system of our teaching personnel that aims in the indication of the strength of each partner and the indication and improvement of the weaknesses. All the collaborating parties are evaluated each year through a transparent procedure and with different evaluation criteria depending on the nature of their work.

Furthermore, the «Classroom of the Future» initiative was evaluated with the use of students' questionnaires with the goal of determining the educational impact that Student TabletPCs had on teaching practices, student learning and other student outcomes. In the school year 2007-2008 researchers from the Aristotle University of Thessaloniki observed student usage and surveyed students. It was observed that the increase in students' participation during the lectures through activities had also an increase in students' performance and concentration.

6 Conclusion

In a poll answered in 2008 by students from all over Greece participating in the annual web-based Pan-Hellenic Student Competition "LYSIAS" [18], one of the initiatives that our school has undertaken the results to the question: "How attractive is the way that you learn in school?" 2.462 answers were collected. The distribution of results was: very attractive (15%), attractive (22,3%), little attractive (29,8%), not attractive at all (33%).

In the question "Which of the following features do you think is the most important for the School of Future?", 2.125 answers were collected and the results were: laptop/tablet PC (29,8%), environmental sensitivity, energy saving (13,1%), audiovisual infrastructure and new technologies (12,8%), change of educator's role (9,7%), new building/campus (9,6%), active student's participation (7,8%), team work, collaboration, communication (6,9%), "learning to learn" (6,9%), other (3,4%).

Moreover, according to the Partnership for 21st Century Skills' vision for the 21st Century Student success in the new global digital economy, students should master skills, knowledge and expertise in order to succeed in work and life. Among these skills are Information, Media and Technology Skills [2].

As we can infer from the above, we should deliver a more attractive, qualitative and technologically equipped school to our students and prepare them in order to be active 21st Century citizens. With this vision we started implementing the "SoF" three years ago. Some indicative comments from the pilot lessons conducted in our school in the context of the "School of Future" are:

- Students got instantly familiarised with the basic Tablet PC functions and features,
- Students got motivated and participated actively in classroom activities,
- ICT skills are required by teachers,
- Better functionality is achieved in classrooms of 20 students the most.

These initial and encouraging results lead us to the fulfillment of our vision. In a staged process over the last years Doukas School has fully equipped the classrooms, library and computer labs with technology infrastructure. Moreover, from the school year 2009-2010 our students of the fourth grade of primary school and the first class of secondary school are using their own personal Tablet PC in class; the school year 2010-2011 this initiative will be applied from the fourth grade of primary school to the second class of secondary school and gradually this will be expanded to all school students according with the relative time schedule. Further research will show us the impact of this initiative on our students. Also, further work remains the application of the EFQM Excellence Model in all the processes of our organisation and especially the teaching and learning ones, through the application of the EFQM Excellence Model in the educational context, which our teachers could use in order to make self-assessment of quality in their classrooms.

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Digital Literacy Development of Students Involved in an ICT Educational Project

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Abstract. The impact of the Information and Communication Technologies (ICT) has become the core of a change that involves most of the society fields, consequently the technological and informational literacy are essential requirements in education. The research is a quasi-experimental and ex-post-facto study in schools from Spain. The aim was to describe and analyze the involvement showed by 219 students who participated in a development of ICT's Project named Ponte dos Brozos. The research objective was to respond if the students who usually worked with ICT, had better knowledge and management with computing tools, and if they are better prepared in researching and selecting information. Results showed that students who have a higher contact with ICTs know about the technology and how to use it, also better knowledge and control of the computer and operative systems, a high information management level trough the Internet, although their literacy in information is devoid.

Keywords: ICT, Digital literacy, ICT skills, Internet search, Education.

1 Introduction

Currently, a progressive increase in using ICT because of easy access to its different applications in varied scopes of peoples' lives, especially in education, is evident. This fact impacts considerably on school practices, introducing continuous change in both formal and informal education, and provides greater autonomy and protagonism in their learning tasks [1], [2].

The alphabetization practice, a fundamental characteristic of today's society, is articulated over ICT. Thus, it is necessary to be competent in that practice due to function in the domain of the different codes, symbolic systems and ways of interacting with the information, an unquestionable fact for all who are part of it [3], [4].

Digital literacy in schools is introduced in the acquirement of some ICT technical skills. Ortoll [5] and Casado [6] define two subconcepts making the difference between technological skill and informational skill.

Technological skill refers to the knowledge about what the technology is, how it works, what it is for, and how it can be used to achieve specific objectives. Informational skill is the ability to recognize a need for particular information, and know how

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to locate, evaluate, select, summarize, and use the information effectively. Different institutions independently attempt to define what we understand and which are the ICT competencies needed for students. An important investigation in our region executed by The Higher Assessment Council of the Catalonia Educational System identified 39 ICT basic skills grouped in 11 dimensions [7] the students should achieve at the end of their obligatory school time.

Of those dimensions, *Knowledge of computer systems*, *Use of operating systems* and *Control and modeling* are instrumental and indispensable knowledge due to interface successfully with ICTs. This is understood in the present research as *Technological skill.* And *Search and selection of information through the Internet* is focused on the usability of the network of networks, understood as *Informational competence*.

This complex and dynamic reality, characteristic of the XXI century, makes evident the presence of important educational challenges, such as the effective education and training in the digital literacy. Following these needs, Spain has promoted different initiatives that bring ICT closer to schools: *The Ramón y Cajal* program in Aragón, *The New Technologies and Education* program in Navarra, or *Ponte dos Brozos Project* (PdBP) in Galícia, on which is based this study.

This initiative is defined as an educative–pedagogical renovation, not exclusively technological. Consequently, it has enabled grants of complete technological equipment to participating centers, consisting of didactic resources, interactive whiteboards, audiovisual systems, computers, laptops, scanners, printers, and a series of connectivity points to the Internet. Moreover, training activities for teachers, students and their social surroundings were provided; specifically, between 2002 and 2007, 69 workgroups took place, with computing courses, training-in-common tools, and teacher-and-student seminars.

The aim of this quasi-experimental ex-post-facto research is to determine if the students who usually work with ICT in their classrooms have better knowledge and management with computing tools, and if they are better prepared in researching and selecting information. It is intended to describe, analyze and compare the technological and informational skills of the students' participing in PdBP.

2 Methodology

Our research is based in Ponte dos Brozos Project and the present characteristics show an ex-post-facto study. The research raises a quantitative methodology.

2.1 Participating Sample

The population target over which we are executing the research is represented by 219 kindergarten, elementary and secondary students in the Town of Arteixo, Galicia (Spain). We recognize as Experimental Group (EG) the schools involved in PdBP: Ponte dos Brozos Kindergarten and Elementary School and Pastoriza Secondary Education Institute students. The Control Group (CG) doesn't have such technological material: students from Villarodis Kindergarten School, San Xosé Obreiro Elementary School and Manuel Murguía Secondary Education Institute.

Participating students' ages, according to the educational level, were in average 4 to 5 years old in the Kindergarten Education (KE) sample, 11 to 12 years old in the Elementary Education (EE) sample, and 14 to 15 in the Obligatory Secondary Education (OSE) sample.

2.2 Instruments and Proceeding

In order to measure the students' technological and informational skills, the Social Pedagogy and Information and Communication Technologies research group (PSIT-IC) created two data collecting instruments for each one, called Technical Test of ICT (TTICT) and Challenging.

The first instrument is focused on the students' technological skills, and consists of a system observation grid with 29 items for KE and a questionnaire of 27 items for EE, 50 items for OSE. It starts from the orientations about basic ICT competencies published by the Educational Department of the Catalan Government [8]. The contents can be classified as follows: computing systems, operating systems, control and modeling, and the Internet.

The second instrument is focused on the EE and OSE students' informational skills. It intends to go deeper in the strategic use of ICT and the Internet, and how students' contact with ICTs influence their achievement of those skills. *Challenging* consists of developing an informative poster (EE) and a diptych (OSE). Content afforded in 8 items considered search and selection of information understood as the process carried out through the Internet, based in The Higher Assessment Council of the Catalonia Educational System [7] mentioned in the introduction.

The TTICT test in KE level was carried out by researchers during the completion of an exercise by children with the computer and it was adapted in a questionnaire format for students in EE and OSE. The timeframe was 20 minutes for KE students, 30 minutes for the EE students and 50 for the students in OSE. The *Challenging* was developed in the same space in soft copy, giving each student a computer connected to the net. During the 60-minute test for both age groups, we proceeded to tape each student's screen actions using the digital blackboard software tool *Smartboard*.

To observe the possible significant differences between the study groups in the variables studied, we have applied the parametric statistical methods *t*-Student and Pearson correlation; and non parametric, *U* the Mann-Whitney with a confidence interval of 95%. SPSS v18.0 was used for the analysis of the descriptive statistical variables.

3 Results

3.1 Technical Test of ICT: KE

The analysis results embodied in the Figure 1 shows that in computing system content there aren't significant differences between CG and EG in the verbalize' category (t= -.346, p= .732). However, the students of control group identify in a significant way more objects than the EG, like computer elements and functions, peripheral devices, the uses of this objects, among others (t= 2.166, p= .039).

There isn't significant difference between CG and EG in operating systems content. Thus belong or not to PdBP isn't a relevant factor in the skills as save and recover the information in the computer and in different supports, get to know different utility software, switch the computer on and off, among others. In addition control group is more effectiveness in solving the requests meanwhile the experimental group solves the demand in less time making it more efficient (See Figure 2).

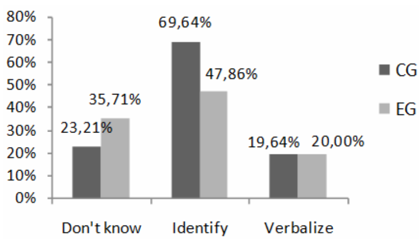

Fig. 1. Results in computing systems content in KE

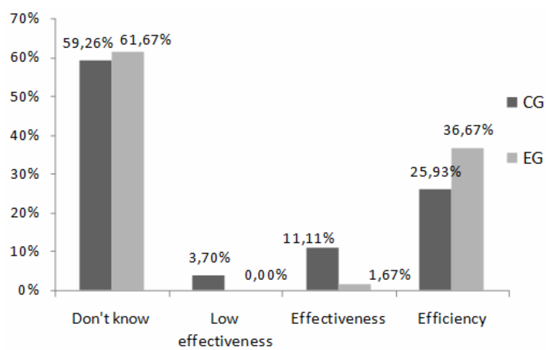

Fig. 2. Results in operating systems content in KE

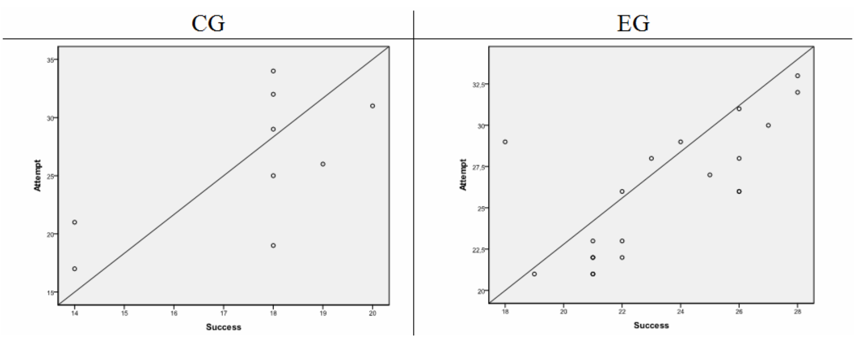

Fig. 3. Correlation of attempt with success scores in control and modeling content in KE

The control and modeling content results is referred on the number of attempts and success that students made during the test exercise and the correlation between them. Data analysis indicate a positive relationship among the attempts and successes by the experimental group (r= .723, p= .000).

According to the Figure 3, the correlation of EG is significant so it can be assumed that there is an association between the attempts and successes; because of this students who have high attempt generally have high at success and vice versa.

On the other hand, the correlation in CG is not significant; there would be no systematic association between the student's attempt and success.

3.2 Technical Test of ICT: EE and OSE

In examining the general impact generated by PdBP in the acquisition of basic ICT skills for the students, results show that EE (p= .005) and OSE (p= .000) students who participate in the project have a greater control of the instrumental use of ICTs, and there are significant differences between means for Technical ICT skill if they belong or do not belong to the project (See Table 1).

The analysis results according to gender indicate that there is no significant difference (t= .532, p= .597) between boys ($\overline{X}$= 6.90) and girls ($\overline{X}$= 7.09) in EE, but girls obtain a slight superior average. In the gender comparison between OSE students, the results are inverted and boys obtain higher averages ($\overline{X}$= 7.0541) over the girls ($\overline{X}$= 6.79), though there is not a significant difference (t= -.589, p= .558).

3.3 Challenging Resolution: General Results

The analysis results show significant differences among the students who participated in the Project and the ones who did not. Also, the EE students (p= .000) and OSE (p= .002) of the GE obtained higher means to those from the CG (See Table 1).

Table 1. Results depending on variables. Statistical significance legend **p < .01. ***p < .001

	EG		CG				
Variable	$\overline{X}$	*DE*	$\overline{X}$	*DE*	*T*	*U*	*p*
Technical ICT EE	6.42	1.57	5.41	1.47	2.910		.005**
Technical ICT OSE	5.76	.95	2.52	1.95		190.5	.000***
Challenge solving EE	6.29	1.65	1.97	1.94	9.224		.000***
Challenge solving OSE	6.30	.892	3.95	1.25	4.463		.002**

Relating to gender, the information indicates an insignificant difference (t= -.440, p= .667) between EE boys ($\overline{X}$= 4.95) and EE girls ($\overline{X}$=4.70). In the OSE students' comparison the trend is maintained and boys achieve higher results ($\overline{X}$= 5.81) than girls ($\overline{X}$= 5.00), even though the difference is not significant (t= -1.046, p= .324).

3.4 Challenging Resolution: Search Proceeding and Information Selection

EE and OSE student involved in PdBP created a higher amount of questions for the browsers, specifically Google, using key words, non-verb phrases and verb phrases; moreover, they opened more web pages in their search process surfing the Internet.

Student in EE taking part in PdBP accomplished a better strategic process in the information selection, with more than 69% of correct results. While the OSE students had a better control of the search and information selection processes than students who were nonparticipants in PdBP, they were not very strategic, obtaining correct results under 50%.

4 Conclusion

Ponte dos Brozos Project offered students the opportunity of regular use of ICTs, providing the possibility of improving their abilities and development in personal productivity, creativity, critical thinking, and cooperation in the classroom, and in their lives as well.

As a result of the study, we conclude that students -especially EE and OSE- who frequently use ICTs in school show better technical achievements, as well as improved technological and informational skills.

Particularly in KE, not always EG obtain better results than CG as contents analyses have showed. This can be due to different variables such as previous knowledge, personal motivation, family context, and the fact that KE children are *digital natives*. It does not surprise that belong to PdBP, or not, isn't a relevant variable in those early ages in the ICT technological skills acquisition.

With reference to technological skills, and concerning the orientations about basic ICT competencies published by the Educational Department of the Catalan Government [8], it is mentioned that he *TTICT* results of students participating for less than five years in PdBP exceed significantly the level of skills required in what they named *Technologic literacy dimension*.

Regarding informational skills, this research allows us to conclude that when confronted with an informational need, EE and OSE students participating in PdBP are much better prepared to surf the Internet, and to store, recover and print the information found there. They also get higher results browsing and localizing specific information in the Net, being sure of the search objectives and surfing in significant contexts for their work. This fact includes the criteria of acquisition, to evaluate the reliability of the information found. In conclusion, the PdBP students find, organize, use, and evaluate the information in a better way.

A recent report about national educational technology standards for students, produced by the International Society for Technology in Education (ISTE) in 2007 [9], describes the ICT competencies students are required to master, in order to have a productive life in a world that is becoming more and more digital. It includes the standards of the technical and informational skills. In this sense, we consider that our results show that the students' profile in PdBP approaches the standard achievements of research and operational information, critical thinking, solving problems, making and choosing decisions, and ICTs running and concepts.

Bearing in mind the informational results of the study in a holistic way, beyond school limits, and trying to predict the middle- and long-term consequences, we consider the ICT training as a primary knowledge in their future professional immersions: a confirmed fact picturing the Spanish employment characteristics context. Following the *Infoempleo 2007* [10] report that analyzes over 250.000 job offers published, the links between school education and work life are clear: the 91% of the businesses require ICT knowledge to the graduates, and the 82% to vocational school students. In fact, we find new skills that have in turn basic functions required, such as how to create a text document, or search for information in a database.

We consider that students' educational situation participating in PdBP is the variable that offers the description of the results. The interaction and living together in school with the ICTs, their continuity in time, and the school head directors' and teachers' implementation, are main elements in the core of the achievement of the valued digital literacy.

Finally, we conclude that the study reinforces the significance of the relationship between ICT training and teaching quality; of student ICT skills achievement and teaching quality; as well as the consequences of the emphasis in digital issues in a school curriculum.

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SOLE: Applying Semantics and Social Web to Support Technology Enhanced Learning in Software Engineering

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Abstract. eLearning educative processes are a challenge for educative institutions and education professionals. In an environment in which learning resources are being produced, catalogued and stored using innovative ways, SOLE provides a platform in which exam questions can be produced supported by Web 2.0 tools, catalogued and labeled via semantic web and stored and distributed using eLearning standards. This paper presents, SOLE, a social network of exam questions sharing particularized for Software Engineering domain, based on semantics and built using semantic web and eLearning standards, such as IMS Question and Test Interoperability specification 2.1.

Keywords: Semantic Web; Web 2.0; E-Learning; Learning Community; Software Engineering.

1 Introduction

Distance Education, also known as open, flexible or distributed learning, is a mode of education whereby learners are physically separated from the institution and where the learning process takes place outside the education establishment [1]. Due to the undeniable importance of the Internet, online learning and online learning tools are hot topics for educational community. However, this new kind of learning scenario has proponents, adversaries and spectators [2]. One of the advantages of such environments is that now these environments self-sustainable and do not have a teacher present to supervise and mentor the learning and communication processes [3]. But to take full advantage of this, e-learning resources must be well designed and open for everybody.

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When we talk about the development of the web and where we stand today, we stumble across two main buzzwords: Web 2.0 and semantic web [4]. The new surroundings in which we find ourselves imply a technology enhanced learning, which Downes [5] calls e-learning 2.0. According to [6], learning systems evolve now towards Web 2.0, semantic web and also improving the learning process.

On the one hand Web 2.0 is about participation and reuse [4]. In the last few years, there has been an increasing focus on social software applications and services as a result of the rapid development of Web 2.0 concepts [7]. Web 2.0 technologies as outlined in [8] are exemplified by blogs, namely easy to update websites about a particular subject where entries are written in chronological order, picture-sharing environments such as Flickr or Photobucket, social bookmarking sites such as Del.icio.us, video-sharing such as YouTube or music preferences such as Last FM. Web 2.0, social software, social computing, online communities, peer networking, immersive web. This architecture promotes users' participation through blogs, wikis and folksonomies, turning learners into knowledge prosumers [9].

On the second hand, Semantic web represents a revolution in many senses. The term "Semantic Web" was coined by Berners-Lee, Hendler & Lassila [10], to describe the evolution from a document-based web towards a new paradigm that includes data and information for computers to manipulate. The Semantic Web provides a complementary vision as a knowledge management environment [11] that, in many cases has expanded and replaced previous knowledge and information management archetypes [12]. In this new scenario, the challenge for the next generation of the Social and Semantic Webs is to find the right match between what is put online and methods for doing useful reasoning with the data [13]. Given that challenge, semantic web and ontologies is seen as the key for forthcoming eLearning solutions [14].

Taking into account that the application of Information and Communication Technologies, towards more effective learning, is one of the most challenging contexts given the specific characteristics of the learning domain [15], in this paper we present SOLE. SOLE can be described as a social network of exam questions particularized for Software Engineering domain, based on semantics and built using semantic web and eLearning standards.

The remainder of the paper is organized as follows. Section 2 outlines relevant literature in the area about the field of study. In Section 3, the architecture for the SOLE approach is presented along with the description of the implementation of the proof of the concept architecture. Conclusions and future work are discussed in Section 4.

2 State of the Art

The great diffusion of Web 2.0 is having a tremendous effect in education and learning. Thus, the number of Web 2.0 empowered e-learning environments are booming [16]. Much of what goes by the name of Web 2.0 can, in fact, be regarded as new kinds of learning technologies, and can be utilized as such [17]. e-learning systems evolve to adapt their contents to this new tools provided by means of the Social Web including under their umbrella social networks blogs, wikis, microblogs [18]... Examples of the use of web 2.0 technologies in eLearning can be found in the works of [19], [20], [21] to cite just a few.

On the other hand, semantic technologies are gaining momentum in eLearning environments. In the e-Learning field, Brase and Nejdl [22] have showed the increasing importance of knowledge modeling through metadata definition standards. Semantic Web has been pointed out to be beneficial for learning environments, in so far as ontologies can effectively model and interrelate information describing learning content, learning activities and learners; and thus improving content personalization and feedback provisioning [23].

In spite of the incompatibility problem between metadata descriptions, an increasing number of systems have been developed to handle learning resources by means of Semantic Web technologies [24], [25], [26], [27], [28], [29], [30]. Following this research trend, in this paper, we present SOLE, a social network based tool for exam questions exchange and sharing based on social and semantic web.

3 The SOLE Approach

As stated before, SOLE can be seen as a platform in which exam questions can be produced supported by Web 2.0 tools, catalogued and labeled via semantic web and stored and distributed using eLearning standards. To do so, SOLE is based on state of the art technologies and defined standards.

3.1 Overview Architecture

SOLE is based on component-based client server architecture. Each component is independent from the others but can be invoked using Enterprise JavaBeans (EJBs) 3.0. Figure 1 shows main components as well as their connections.

- Service Handler: Focal point to web service invocation.
- Question Manager: implements basic task related to question persistence (insert, delete, update…).
- QTI Translator: enables the transformations from questions stored in the database to QTI XML complaint format or vice versa. QTI is Question and Test Interoperability specification, a standard format for the representation of assessment content and results. Using QTI applications can exchange education materials allowing more open and rich eLearning platforms.
- User Manager: basic tasks related to user management.
- Session Manager: enables login and logout features as well as session log.
- User Communicator: event driven agent in charge of communicate users certain events.
- Social Network Manager: handler related to social web users networks.
- Search: Consist in two main subcomponents. Firstly, Indexer will manage question index. Secondly, Seeker, that uses this index to give desired results.
- Semantic Engine. Clasifies questions (invoked by Indexer) and classifies search queries (invoked by Seeker). This implementation of SOLE acts as

a Software Engineering eLearning enabler, and due to this, Software Engineering Ontology (SEOntology) was used as a testbed.

- Knowledge manager. It's responsible of the management of the tasks in order to train Semantic Engine using user suggested terms.
- Syndication. Manages RSS feeds generated due to the use of SOLE. This feeds can be viewed using external RSS readers.
- Manager. Capable of encapsulating configuration and maintenance tasks related to server.
- Daemon. Agent that acts as a daemon to trigger administration and maintenance tasks.
- Web. Web interface for SOLE.

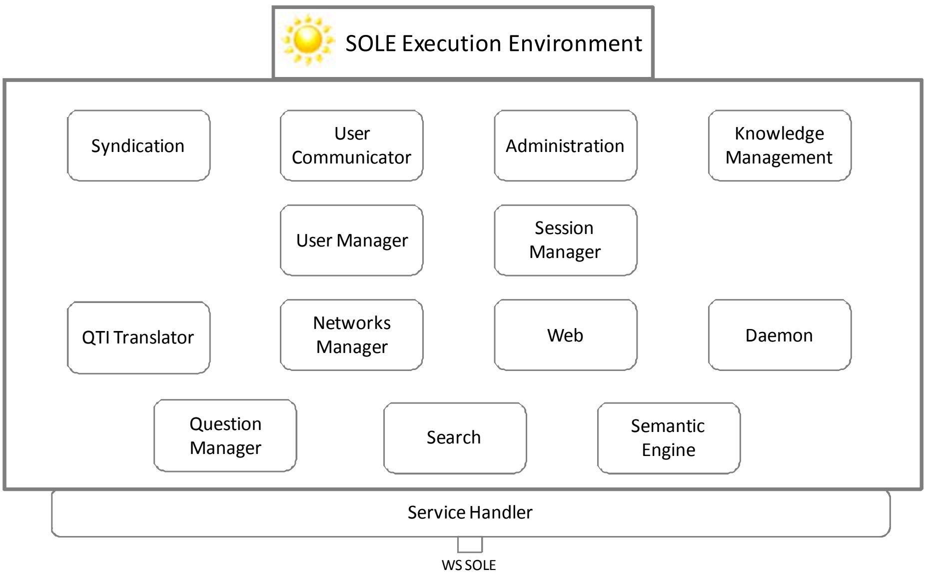

Fig. 1. SOLE global module architecture

3.2 Implementation Issues

SOLE can be seen as a Web based application build under Java EE (by using Java Enterprise Edition 5 SDK). Business logic design was done using MagicDraw. This tool enables Model Driven Architecture (MDA) architecture and automatic code generation by using AndroMDA.

External interfaces are enabled using Service-oriented architecture (SOA). Backend is designed using Hibernate and MySQL as database management system. Frontend is designed using ZK framework for AJAX integrated in Eclipse Ganymede through ZK Studio plug-in. Lastly, JAXB is used for XML handle (in order to communicate with others) and JENA 2 for ontology information issues. Finally, in order to enable RSS feeds and atom, ROME for Apache 2.0 is used.

3.3 Initial Testing

With the aim of getting feedback concerning the work performed, SOLE was implanted as a tool to support learning processes in their last year of the Computer Science degree program, “Software Engineering III” in Universidad Carlos III de Madrid, Spain. In such scenario, the students were asked to use SOLE tool as support for their course. The class was divided into groups. Every group must provide and label a set of questions (twenty five) to the system based on the course syllabus. These combined actions trained in a proper way the system. Once all questions were typed and stored, students were provided with a tool, namely SeSo-GEO in which they could build an exam for the rest of the groups. SeSo-GEO benefits from SOLE features of semantic search via web service. Exams provided by students consisted in ten questions from the questions base and are aimed to train groups in course syllabus.

Qualitative results of this test were successful. Students agreed that semantic search provides a plus to the system (‘reaching results that are hidden in the text’) and, moreover, that “having a way to rank questions is a powerful tool to choose better questions”.

4 Conclusions and Future Work

Combining Semantic Web and social networks is considered the future in eLearning platforms and solutions. In such a context, sharing and taking advantage of a number of users, tracing knowledge and contents in different contexts can bridge the gap of knowledge integration and knowledge reuse. In this paper, we have presented a novel approach to achieve test question share and reuse across learning environments through a social network and the use of semantics and eLearning standards, providing also an architecture and a proof-of-concept implementation.

The current work proposes three types of initiatives which should be explored in future research. In the first place, the integration of the functionalities provided by Web 2.0 in the mark of questions from the point of view of the student, giving, thus a double feedback from the field: students and teachers. In the second place, it is aimed to test the platform developed empirically by evaluating the capabilities of SOLE from a qualitative viewpoint. Finally, authors suggest extending the functional environment of SOLE to adapt other learning scenarios.

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Design Education in the Global Era

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Abstract. The aim of this paper is to show the collaboration of design disciplines to instill a broader sense of design for students through intercultural service learning projects. While there are programs that are reinventing their curriculum, there are still several that follow the classic structure of a first year art foundation program with the final years concentrating on the desired discipline. The interactions at a global scale, has heightened the need for graduates to learn to interact more effectively with people from different cultures. This approach combines the concern of addressing a need for design in a real world situation, with learning how to understand culture, place, and experience through a collaborative project. Referencing a specific international service learning project, and drawing from literature on internationalization of education, this paper explores key concepts, learning objectives, methods, and challenges faced in addressing the need to prepare students for practice in an increasingly integrated workplace.

Keywords: collaboration, international service learning, design-build, community engagement, interdisciplinary design.

1 Introduction

Design is about service on the behalf of others. Our work is a reflection and response to the communities we serve. This is not to say that we are subservient to our clients, but that design is fundamentally informed by the complex and systemic relationships of our communities. This notion of design in its broader sense, simultaneously reactionary and visionary, is often unattainable in traditional problem-based studio learning. While acknowledging the merit of carefully crafted design briefs, the results are often well-developed solutions that are disconnected from context, people and places [1]. Christopher Jarrett (2000) calls this disconnection in studio work the "blind spots" referring to the humane, political, and practical aspects that are difficult to address in the standard studio pedagogy. International service learning, or working with communities abroad, may provide a venue for educators to enhance design education through intercultural experience based learning.

2 Service Learning

There are many benefits of service learning, chief among them are the partnerships developed between universities, professionals, and the public. Service learning can

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provide opportunities for effective pairings connecting those in need of design with people who can provide the service. Service learning programs, such as the School of Design of Carnegie Mellon University (CMU), Pittsburgh. As significant as service learning can be to the community and to our professions, the benefits to our students are even more impressive. Jennie Smith-Pariola and Abiodun Goke-Pariola (2006) identify the following benefits:

1. 1.enhancing students' interest in and understanding of course concepts by demonstrating their relevance and usefulness;
2. cultivating concern for social problems, a sense of civic responsibility, and a commitment to public services;
3. challenging students' perspectives on social problems and on others who are in different social groups than themselves;
4. assisting students in developing skills for relating to others across social barriers;
5. teaching problem-solving techniques that rely on critical thinking and responsible research; and
6. giving students the opportunity to develop other important occupational and life skills (pp 73).

International service learning merges principles from service learning and study abroad pedagogy [2]. lthough presenting many challenges to the instructor, this type of course allows us to teach students an appreciation for the challenges others face, lead students in developing effective and appropriate strategies in respectful ways, and promote understanding of the meaning of global citizenship [2]. International service learning must be supplemented with pre-departure training, integrated experiences and constructive, reflective assignments. Although the rewards of international service learning are many, improved intercultural communication and intensified experiential learning are most notable [3].

3 International Service for Design Students

Studio pedagogy can provide effective opportunities for students to engage in unfamiliar environments, especially when projects involve community collaboration. In the design of studio courses, the architectural educator makes decisions about the content, requisite skills, and the method for imparting knowledge. Although the three components are mutually dependent, it can be said that content and skills relate to the 'knowledge' or 'what' of the course, while the 'how' of the course is concerned with the method of approaching problems. A closer look at the concepts of international knowledge and international competencies prepares the groundwork for establishing the learning objectives for an international service learning course. International knowledge, according to Susanne Weber (2005), includes the awareness of cultural values, communication styles, development of relationships, group interactions, conflict management and adaptation processes of specific nations. An effective internationalized curriculum implements interplay between knowledge acquisition, acculturation processes, and development of a common understanding and meaning [5]. Through integrated experiences students "learn to learn" by working "with communities". Displacement of culture, geography, or social reality provides opportunities for comparative analysis rich in exposure to new perspectives and methods informing the built environment. Students learn about the common needs and goals of societies, in addition to the complex relationships leading to disparities. Intercultural competence is the ability to interact effectively with people from other cultures to optimize the probability of mutually successful outcomes [6]. This definition implies that "concern for others" is a fundamental attribute of intercultural competency training. Demonstrated through communication and understanding, intercultural competency impacts how we approach given situations. Attributes of intercultural competency include adaptability, openness to change, cultural empathy, autonomy, non-judgmental perceptiveness and intercultural communication skills [7].

4 Case Study: Service Learning in the Global Community

The literature review verified that international service learning has the potential to enhance existing design programs while preparing our graduates to work in the global community. The concepts of 'collaborative process' and 'learning how to learn through community engagement' are instrumental in the course of transcending traditional studio environments. According to Salama (2005), collaboration can be seen as a "philosophy that should be internalized by students to be better prepared for professional practice" [4]. The following section will further explore these ideas through a discussion of the development of a course called Service Learning in the Global Community. The project explores the potential for international service learning courses to be offered across discipline, cultural and university borders. Recommendations, in light of the literature review, and observations from the course, will follow each section [4].

4.1 Course Description

The Faculty of Architecture, at the IADE- UNIVERSITY, Lisbon, offered the six credit elective course, Service Learning in the Global Community, for the second time in June 2007. With over forty applicants the instructors selected eight undergraduate and seven graduate students from, Interior Design, Architecture, Environmental Design and Graphic Design. The course responded to an interest of students at the IADE- UNIVERSITY, Lisbon to be involved in a community project overseas. As the director of ERAMUS-Intensive Programme, International Students often turn to Intensive Training for Young Europeans Entrepreneurs (international opportunities). With an interest in teaching skills that can be applied to international and domestic practice, Carnegie Mellon investigated the development of a design build course in Portugal. Once the project was located they contacted former colleagues from IADE- University, Lisbon and CPD-Portuguese Design Center, to help develop and deliver the course. In addition to interdisciplinary training, all the professors of these Institutions have experience with cross-cultural collaborations, working overseas, and design through making. The collaboration of students and professors from different disciplines creates a learning environment that allows the opportunity to learn how other disciplines arrive at solutions, while contributing to the process. Not only do the students learn from the professors and community members, but they also learn from each other.

Fig. 1. The students organizing their work

4.2 Course Framework

A detailed framework was developed to establish the learning objectives, methods and management of the course. This document served as the course outline and letter of memorandum between the students, instructor and partners. The following learning objective was identified based on discussion on international "knowledge" and "intercultural competency" described above.

The "knowledge" based objectives for this course are to:

1. learn about people, materials, and making through experience;
2. provide challenges through which students can see beyond their own space, time, and culture;
3. encourage the development of design solutions intended to enhance and support diverse human activities, realities and cultures; and
4. promote understanding of the complex interdependence of global economic, political, and cultural forces affecting the built environment;

The 'intercultural competency' based objectives for this course are to:

1. respond to needs identified by the community;
2. promote reciprocal learning between all participants through engagement;
3. develop effective strategies for addressing challenges in appropriate, respectful, and constructive ways;
4. practice critical comparative analyses between local and global conditions; and
5. challenge perspectives on social problems and of others who are in different social or cultural groups than themselves.

The management of the education refers to the administration of knowledge, people, time, space, and financial resources necessary to run the course. The following duties were divided between the students, local partners, international partners, and the instructors. The tasks included but were not limited to:

1. identify in-country partners;
2. select the project;
3. develop and deliver orientation, seminars, lectures, assignment and evaluations;
4. establish support from universities;

5. advertise the course;
6. organize guest speakers, trades people, local volunteers, translators, instructors;
7. plan and prepare for community meeting;
8. investigate design, detailing, and making;
9. propose design solutions to community members;
10. implement and organize construction and planting;
11. write journal entries;
12. document the course photo, print and video); and

Collaboration with local partners is required to identify and facilitate appropriate, respectful, and constructive community projects. The ERAMUS-Intensive Programme in Portugal was selected as that local partner based on the following criteria:

1. demonstrated ability to work co-operatively in multilateral and multicultural situations;
2. established long-term initiatives with local communities;
3. committed to service learning goals;
4. situated in a country of interest to our students;

Fig. 2. The rehabilitation of an old house in a historic center

4.3 Project Outcomes / Evaluation

The primary outcome of the course was the design and construction of an old house and garden. Each student was evaluated on his or her leadership role in at least one area of the project (house and landscape) as well as their overall contribution to the group efforts. The less tangible outcome was the high level of collaboration between disciplines, community members, students and faculty. Students were also evaluated on their participation in seminar discussions and a submission of reflective journal entries.

5 Reflections and Further Recommendations

The development of an international service learning course requires more time, preparation, and risk than traditional studio projects. A growing body of literature on the pressures of globalization supports that the work is worth the effort for our students, communities and universities [3]. The following are recommendations based on evaluations and comments made by students, partners, and instructors. Additional comments are based on the findings in the literature review.

5.1 Work with Experienced Local Partners

One of the greatest challenges of international service learning is finding a meaningful project that will benefit all participants. This demands an excellent working relationship with a local partner who understands the needs of the students, faculty, and the community. The local partner is also instrumental in the selection of an appropriate project and implementation of contextually aware problem solving techniques and solutions. Furthermore, the local partner's contribution to the program is significant as it allows the faculty to focus on course delivery as opposed to the everyday operations such as accommodations, meals, and transportation.

5.2 Design Workbook

It is important to clearly define the expected outcomes of the project. The international partner may underestimate the skills, work ethic, and maturity of the students.

A design workbook, was prepared by the students for the non-design partners, would provide an opportunity to increase participation and interest in the initial stages of the project. The workbook could inform the partners about the design process as well as gather information about intercultural use of space, materials and colors. It is possible for pre-design information, such as basic programming questions to also be included in the early stages of the course.

5.3 Identify the Roles of the Participants

A project of this nature is a very intense and fast paced experience for all participants. On any given day many decisions are made about design, construction, budget, materials, and course management. It is crucial that all of the roles are clearly established in order to make the management of the course secondary to the learning experiences [1].

5.4 Construction Experience and First Aid Training

When working with non-profit organizations for the first time the need for tools, professional expertise, and building materials must be clearly defined and communicated. Some of the local experts may not have the language or technical skills to provide proper guidance to the students. The faculty should have construction experience and first aid training for design-build projects.

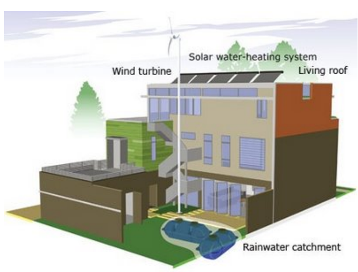

Fig. 3. The rehabilitation of the old house with sustainability improvements

5.5 Expect the Unexpected

All students should be prepared to expect the unexpected. Working with real people in a new culture has the potential to offer many surprises. In this case, the project changed from an old house to a rehabilided with sustainability improvements, and then grew from an old building to a new house and sustainability. This can be challenging for students accustomed to working in controlled studio environments. It is important for the instructors to demonstrate adaptable skills and to encourage the students to accept challenges as opportunities to respond to the actual, dynamic, and complex realities of providing service to communities [8]. Problem-solving techniques, which rely on critical thinking and cross-cultural communication, should be promoted.

5.6 Intercultural Experiences

Intercultural experiences were encouraged through partnerships with a local organization, community involvement, and family home stays. Several students were reluctant to participant in home stays, and prior to departure expressed concerns for privacy, security, and comfort levels [9]. Upon completion of the course most students indicated that the home stays were enjoyable and essential to the learning experience. Intercultural experiences were further encouraged through social outings, travel, and shared work experiences.

6 Measures of Success and Further Studies

A significant outcome of the project was the connection between design education and the communities we serve. The students quickly acknowledged that the success of the project would be realized by working ‘with’ the community rather than “for” them. The experience promoted awareness of relationships between culture, climate, economics, and the built environment. The design process and outcomes supported [3] claim that international experience encourages adaptability, openness to change, cultural empathy, autonomy, non-judgmental perceptiveness, and intercultural communication skills. The benefits of service learning identified by Smith-Pariola, Jennie and Goke-Pariola, Abiodun, were also evident in journal entries, seminar discussions and problem solving methods. The community members acted as mentors, co-workers and friends throughout the duration of the project. The rehabilitation of an old house with sustainability improvements is now fully operational thanks to the hard work and donations from the sponsors, community, the CPD, students, and faculty. Currently CPD, the instructors and the IADE, Lisbon and Carnegie Mellon University are in the process of planning a third project to be completed in June 2010. It would take more time and further study to truly understand the impact of the course Service Learning in the Global Community. It would be interesting to follow the careers and future studies of the students to see if they are more likely to pursue collaborative design, international employment, or design-build practice [10]. Academic contributions could involve volunteerism, practicum level projects, and research, documentation and design-build studios [11].

7 Conclusion

Within the context of globalization, professional education must transcend standard competencies to include increased collaboration, intercultural understanding and communication [12]. By considering literature on service learning and internationalized education, we can motivate studio learning and build on our understanding of domestic and international design practice. Furthermore, collaboration across cultures, disciplines and borders, can contribute to design education of global citizenship.

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Integrated Design of Basic Training, Practicum and End-of-Course Assignment Modules in the Teacher Training Degree: Perception of University Teachers, Students, and School Teachers

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Abstract. Teacher training at the Blanquerna Faculty of Psychology and Educational and Sports Sciences (FPCEE), in Barcelona, has a long pedagogical tradition based on teaching innovation. Its educational style is characterised by methods focused on the students' involvement and on close collaboration with teaching practice centres. Within a core subject in the Teacher Training diploma course, students were asked to assess different methodological proposals aimed at promoting the development of their personal, social, and professional competences. In the assessment surveys, from a sample of 145 students, scores for variables very satisfactory or satisfactory ranged from 95.8 % to 83.4 % for the entire set of methodological actions under analysis. Data obtained in this first research phase were very useful to design basic training modules for the new Teacher Training Degree. In the second phase (in process), active teachers are asked for their perception on the orientation of the practicum, its connection with the end-of-course assignment, and the in-service student's incidence on innovation processes at school.

Keywords: Methodology, teacher, competence, basic training, practicum, end-of-course assignment, innovation, school.

1 Introduction

The current model of university teaching style in teacher training is based on the development of cognitive competences, and personal, social and professional skills, so the student's leading role and the guiding nature of the teacher's task are combined in a social and constructivist vision of the teaching-learning process. The complexity of current society demands a profile of teacher as facilitator, tutor and learning manager (Mas and Ruiz, 2007), able to advise and guide students in their training process and in their professional future; a teacher away from routine performance, intellectually critical, with a multidimensional vision of the educational process, and suitable to work in interdisciplinary networks

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(Boqué, 2004). Thus, teachers need more qualifications and have to be trained by the principles of self-demand, autonomy, commitment, and collaboration in order to effectively affect a globalized, multicultural, and technological society, which requires them to have a reflective, creative and self-improvement attitude. Besides, students have to develop their capacity for learning to learn as an essential move to make lifelong learning possible (Tejada et al. 2008). In fact, from the working world, and not only from the academic field, competences related to learning to learn are considered to act as a decisive protection factor when ensuring an effective and efficient professional performance (Boqué in press).

In this didactic scenario, methodologies liable to promote these principles and particularly the practicum and the end-of-course assignment in the last year of their initial training represent an opportunity to manage many competences in an integrated manner within real contexts, as well as to incorporate different areas of knowledge. This should allow students to better understand the strategic connections between the knowledge of their discipline and its praxis (Alguacil and Pañellas 2009).

This study springs from the wide experience of FPCEE Blanquerna in teacher training, and is developed in two phases: The first phase, recently finished, and some results of which are presented in this article, aims at finding out the students' perception concerning different methodological actions used in their university training; the second phase, still in process, has the objective of finding out the perception of professionals from practice centres about the general orientation of the students' placement in their schools, and about the school-university cooperation. Data obtained in both study phases serve as guideline to design and implement the new Teacher Training Degree, which in our opinion should incorporate the basic tools to achieve a new, though claimed, profile: the profile of teacher as a researcher (Carr and Kemmis 1988; Hopkins 1989; Stenhouse 1987; Popkewitz 1988).

Therefore, this research sequence aims at analysing the points of view of three main actors in teacher training: university teachers, represented in this case indirectly by the guiding pedagogical principles of the "Blanquerna" model, which saturate the design and delivery of the modules in the new curriculum; the students, represented by a sample of 145 students from the Teacher Training diploma course, who finished their studies in June-September 2009; and active teachers, represented by a sample from collaborating practice centres.

2 The University Teachers' Point of View: Training at the Blanquerna School of Teachers

The Blanquerna School of Teachers appeared in the fifties as a training centre linked to the Church (Riera 1998). From the 1970/71 academic year, there was a change in the methodological orientation, inspired by the humanistic pedagogy of García Hoz, Faure, Mounier, Stefanini and Fromm, among others. The so-called "Blanquerna style" (Torralba 1996) consisted in replacing most lectures with the student's individual work and in promoting small group tasks. Later, contributions by paidocentric and constructivist authors —Ausubel, Vygotsky, Bruner, Stenberg, Feuesrstein, Tedesco, etc.—, who transformed the educational concept from "how we teach" to "how we learn," were incorporated. From this moment, the methodological proposal materialized in the basic principles: personalization, autonomy, and socialization. In the nineties, the School of Teachers was integrated into Ramon Llull University, consolidating these principles through individualized and team work, the seminar, and the practicum.

To these elements, two more were added recently: the virtual platform, which allows for the construction and exchange of knowledge through the participation of students and teachers; and the international vocation of studies, which promotes exchange with European universities and universities from all over the world. Networking, as is well known, is essential to manage knowledge in the information and communication societies (Castells 1998; Pañellas and Alguacil, 2009b). Exchanges with other universities are more and more frequent, and allow students and teachers to approach different realities, develop communication competences, be open to other ways of understanding culture and, finally, to different educational perspectives and problems.

Teaching settings have to integrate skills, idiosyncratic and academic knowledge, emotions and values, to place the student in the world as a constructive, committed, and reflective citizen. They have to become a classroom community where people enrich one another in their way of acting, thinking and communicating, with one's own actions and those of others. A critical community consisting of people committed to a life aimed at understanding the world. For this, a social framework has to be created in the classroom, as a pattern for interaction processes (Pañellas and Alguacil 2009a).

Thus, teacher training at FPCEE Blanquerna, resuming its pedagogical style —which is fully valid in the framework described by the European Higher Education Area (EHEA)—, is mainly based on those methodologies that promote in students: participation, decision-making, autonomy, research, debate, and cooperation.

3 The Students' Point of View: Methodological Approach of a Core Subject in the Teacher Training Diploma Course (Sociology of Education)

The aim of this study phase, which can be defined as research-action (Carr and Kemmis 1988; Kemmis and McTaggart 1988), is to consider the students' point of view on some methodological aspects, with a view to designing the new Teacher Training Degree modules.

To delimit the analysis, we will shortly describe the approach of the subject Sociology of Education, given in the third year of the Teacher Training diploma course. The content of this subject provides students with a general vision of the significance of education in a complex and changing world. Its objectives are to develop those competences related to the critical understanding of reality and to understand the role of teachers as socially committed professionals. This results in a methodology linked to the educational style of the university, which is coherent with the development of competences within the EHEA and its didactic principles (Tejada et al. 2008).

The main didactic strategies are organized round a reduced number of lectures, presented with audiovisual support. From the first moment, together with the programme, students are provided with a dossier with notes for the subject, a list of references, and a glossary of terms so that they can work autonomously. This material is complemented with different document sources (articles, audiovisual, talks, websites, etc.), with easy access in their electronic format from the virtual campus of the university. While the concepts are being consolidated, working teams are formed and tasks are organized. Students propose issues of current affairs susceptible to be analysed from a social and educational perspective, which interest them as prospective teachers. The selected issues serve as the basis for a research assignment prior to a debate, where the groups defend opposing positions in front of the class. Simultaneously, every student elaborates and discusses a press dossier on topics related to the subject and the debate. Practical exercises are varied and can be developed through cooperative work, resolution of cases, and using different creative languages. Assessment strategies, integrated into the learning activities, include: assessment of the student's progress by the teacher, assessment by other students, and self-assessment.

Sample. The study was carried out with three groups of Teacher Training third-year students, who did the subject Sociology of Education in the first term of the 2008-2009 academic year at FPCEE Blanquerna, with the final sample being of 145 students.

Instruments. To collect students' perception about methodological and assessment actions, a Likert-scale questionnaire was created and validated by experts, with 14 items and four possible answers. Without considering specific content of the subject, students were asked to assess the different strategies proposed to achieve the objectives of the subject Sociology of Education.

Analysis and discussion of results. The assessment of every item was calculated in percentages, being very satisfactory or satisfactory: material for individual study given at the start of the subject (95.8 %), glossary of terms (95.8 %), audiovisual material and its posterior analysis (95.2 %), research assignment in groups (93.1 %), and classroom debates (92.4 %). Lectures, support slides, press work on social and educational current affairs, and documents in electronic format were assessed as not very satisfactory or unsatisfactory only by 11.7 % of students. The general dynamics of the subject obtained scores of very satisfactory or satisfactory in 93.8 % of cases, and workload in 83.4 % . Therefore, the role of teacher as facilitator, tutor and learning manager —as required by the new teaching scenarios— is endorsed by students, more in favour of these new teaching methods where students learn by doing (Roe 2002; Rué 2007) and also achieve the leading role they are entitled to (Aguaded and Fonseca 2007; Hernández Pina et al. 2005; Morales 2009).

Conclusions. As seen in the results, the fact of having study and working material allows students to approach the subject through more active, participative, cooperative, creative and flexible methods, which contribute to the acquisition of competences particular to the teacher profile (González and Wagenaar 2003). The EHEA guidelines and methodological suggestions are in accordance with the previously analysed actions.

In our opinion, this methodology helps students to get involved in the subject, to continuously resort to their capacities in front of the others, to reflect on their motivations and performance, to acquire a critical vision of reality, to take advantage of team work, and to think about the challenges of their prospective profession, and agrees with such works as those by De Miguel (2006) and López (2005).

The results of the questionnaire were useful to confirm the appropriateness of most strategies and to elaborate the teaching portfolio for degree modules (Rué and Martínez 2005) with the students' positive assessment.

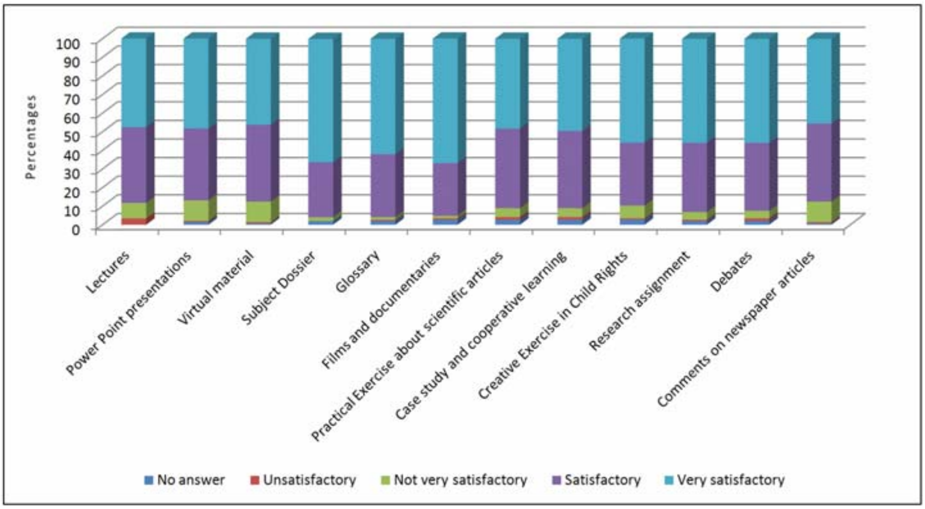

Fig. 1. Students' point of view about different methodological actions

4 The Teachers' Point of View: Practicum and End-of-Course Assignment

In this section, only a few first reflections are presented, as well as the general lines of the second research phase, which at the moment of writing this article is still in progress. In our case, the school practicum and the end-of-course assignment are considered jointly, due to their underlying component of getting to know the socioeducational reality and the complexity of the learning setting. In both cases, then, students are forced to resort to the competences they have developed, which helps them to find out their strengths and weaknesses in front of new situations and challenges.

Bearing in mind that the end-of-course assignment is to be implemented in Teacher Training studies for the first time in three academic years' time in most universities (2012-2013) and that this work represents one of the most significant novelties of the Early Childhood Education and Primary Education Teacher Training degree courses, it is essential to support those specific competences of the professional profile that contribute to integrating different areas of knowledge, to interpreting the intervention context, to collecting data concerning the learning processes in the classroom, to contrasting theory and practice, to considering the ethical dimension of the profession, to managing coexistence (Boqué 2009a, 2009b), to the family-school relationship(Pañellas and Alguacil 2009c), and to solving real and complex problems.

To assess and define the university-school cooperation, multiple choice questionnaires will be created and administered to a sample of 400 teachers —practicum tutors, and four groups of teaching experts will be set up. Both samples will be collected from the professionals of more than a thousand educational practice centres that collaborate with our Faculty.

In short, the methodological principles with more than 60 years of experience in the training of teachers have led, in FPCEE Blanquerna, to our particular and current educational style, as their assumptions are coherent with the EHEA proposals. In this sense, teachers consider it appropriate to go on in this direction, taking advantage of this background to design and implement quality training programmes. In turn, students widely confirm that the methodological actions developed so far are satisfactory and help them in their personal, social and professional development. We still have not finished collecting, analysing and interpreting data from the professional sector to have the point of view of active teachers concerning the practicum and the end-of-course assignment, which, as previously said, are essential in the competence approach.

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Students' Satisfaction with an Undergraduate Primary Education Teaching Practicum Design on Developing Technological, Pedagogical and Mathematical Knowledge

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Abstract. During the 2008-2009 spring semester, 25 fourth-year undergraduate primary teachers attended the compulsory course "Teaching Mathematics-Practicum Phase". The course was organised so as to incorporate ICT and special mathematical scenarios in the teaching approaches of undergraduate primary teachers. This article presents course satisfaction of participants as found in the research study. A set of powerful ordinal regression methods has been applied on a survey database. The most important results focus on the determination of the course's weak and strong points, according to the MUSA methodology. The results show a high satisfaction level from the course. The global satisfaction level reaches 98% whereas partial (per criterion) satisfaction levels range from 90% to 97%, the lowest rate corresponding to the theoretical component of the course. The findings raise a number of research questions regarding ICT integration in undergraduate primary teachers' teaching practice.

Keywords: Mathematics, Educational Scenarios, Students' Satisfaction, MUSA, Educational Softwar, TPACK.

1 Introduction

In Greece, the educational changes of 2003 led to the "*Cross Curricular/Thematic Framework*, (CCTF)", which has been implemented in compulsory education since 2006. One of its general principles is "*to prepare pupils to explore new information and communication technologies (ICT)*" [1]. In its effort to implement this new educational policy, the Pedagogical Institute has developed textbooks and Educational Software (ES) for all teaching subjects [2, 3].

Recently, research in educational technology suggests the need for "*Technological Pedagogical and Content Knowledge*" (TPACK), which is based on Shulman's [4] idea of "*Pedagogical Content Knowledge*", so as to incorporate technology in pedagogy [5, 6, 7].

Therefore, from a constructivist viewpoint [8, 9], educational software integration into undergraduate primary teachers teaching practice is a crucial factor for teachers' future "establishment" and improvement in classroom practices. During 2008-2009

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spring semester, our course on primary maths teaching during practicum (school attachment), was organised so as to incorporate ICT and specially mathematical scenarios [10] in undergraduate primary teachers' teaching approaches.

The framework in which the course is taught, as well as the need to discover its strong points but also those areas that require improvement, led to the investigation of the satisfaction level of undergraduate primary teachers. This investigation did not focus entirely on the evaluation of the teaching but on a wider spectrum of undergraduate primary teacher experience from the course.

2 Theoretical Background

2.1 Technological Pedagogical and Content Knowledge (TPACK)

Recently, research in educational technology suggests the need for "*Technological Pedagogical and Content Knowledge*" (TPACK), so as to incorporate technology in pedagogy [5, 6, 7]. This interconnectedness among content, pedagogy and technology has important effects on learning as well as on professional development. Mishra and Koehler suggest "*…a curricular system that would honour the complex, multi-dimensional relationships by treating all three components in an epistemologically and conceptually integrated manner*", and they propose an approach which is called "*Learning Technology by Design*" [6]. In Mishra & Koehler [6] approach they have conceived of a model that offers three unitary components of knowledge (Content, Pedagogy and Technology), three dyadic components of knowledge (Pedagogical Content, Technological Content, Technological Pedagogical Content) and one overarching triad (Technological Pedagogical Content Knowledge). The *"Learning Technology by Design*" approach can be effectively supported by educational scenarios. Educational Scenarios are in the form of "*lesson descriptions*" that share the following characteristics: they focus on multi-perspective study of mathematics and other disciplines; they take advantage of the available educational software; they include learning objectives, and, finally, they describe didactical sequence [10].

2.2 Student Satisfaction

Satisfaction has been defined as the perception of pleasurable fulfilment of a service [12]. Operationally, the construct is similar to an attitude as it can be assessed as the sum of the satisfactions with various attributes of a product or service [12]. Whereas attitude, however, is a pre-decision construct, satisfaction is a post-decision experience construct. Research studies on student satisfaction enriched the relevant literature with findings from the educational reality, too [13, 14]. Some of them focused on the quality of the provided education and the investigation of learning process effectiveness [15, 16]. Student satisfaction seems to be dependent on a number of factors: gender, favourite learning style, age [18, 19]. In Greece, the results of the research projects which have been carried out concerning student satisfaction have shown that global satisfaction is between 35.6% to 84% [19, 20, 14].

Taking the above in consideration, the aim of this study was to investigate the level of satisfaction of undergraduate students who participated in the course. Data collection methods and research results are presented in the following paragraphs.

3 Research Methods

The participants were twenty-five (25) fourth-year undergraduate primary teachers (16 female and 9 male) in the Department of Primary Education of the Aegean University, attending the compulsory course "Teaching Mathematics - Practicum Phase" during the 2008-2009 spring semester.

Two researchers had a three-hour meeting with the undergraduate primary teachers in the mathematics lab, twice a week. The need for a technologically elaborate working environment, led the research team to use many technological tools. The research work was divided into five stages: gathering quantitative data concerning undergraduate primary teachers, an experiment design procedure [21], assignments, an educational scenario, and semi-structured interviews. In the last meeting, undergraduate primary teachers were asked to anonymously complete a questionnaire concerning their satisfaction from the course. Twenty-four completed questionnaires were returned out of the twenty-five that were handed out. In the next section, the research data analysis and results from the study will be presented.

4 Undergraduate Primary Teachers Satisfaction Research

4.1 Development of the Questionnaire

The statutory rules and regulations, as well as the organization and structure of tertiary educational institutes in Greece differ substantially from the ones of the respective institutions abroad. Thus, taking into consideration a) the international literature, b) Greek reality, c) the structure of teaching of the particular course in the 2008-2009 spring semester and, finally, d) relying greatly on the existing research by [15] and [21], the following five quality dimensions (criteria) were defined and used: 1) *Educational Program*, 2) *Professor*, 3) *Mathematics Lab*, 4) *PhD Researcher*, 5) *Educational Material*. The criteria and sub-criteria used in this research project are presented in Figure 1.

A four-page detailed questionnaire was developed, based on the previously mentioned quality dimensions.

4.2 Results of Satisfaction Measurement

This chapter presents the most significant research findings, as these were derived from the analysis of the data. The methodology used was the MUSA-MUlticriteria Satisfaction Analysis [22].

Undergraduate primary teacher global satisfaction from the course was characterized as extremely high. The mean satisfaction value, as measured by the method, reached 98%, while it is of great importance to note that all comments were positive.

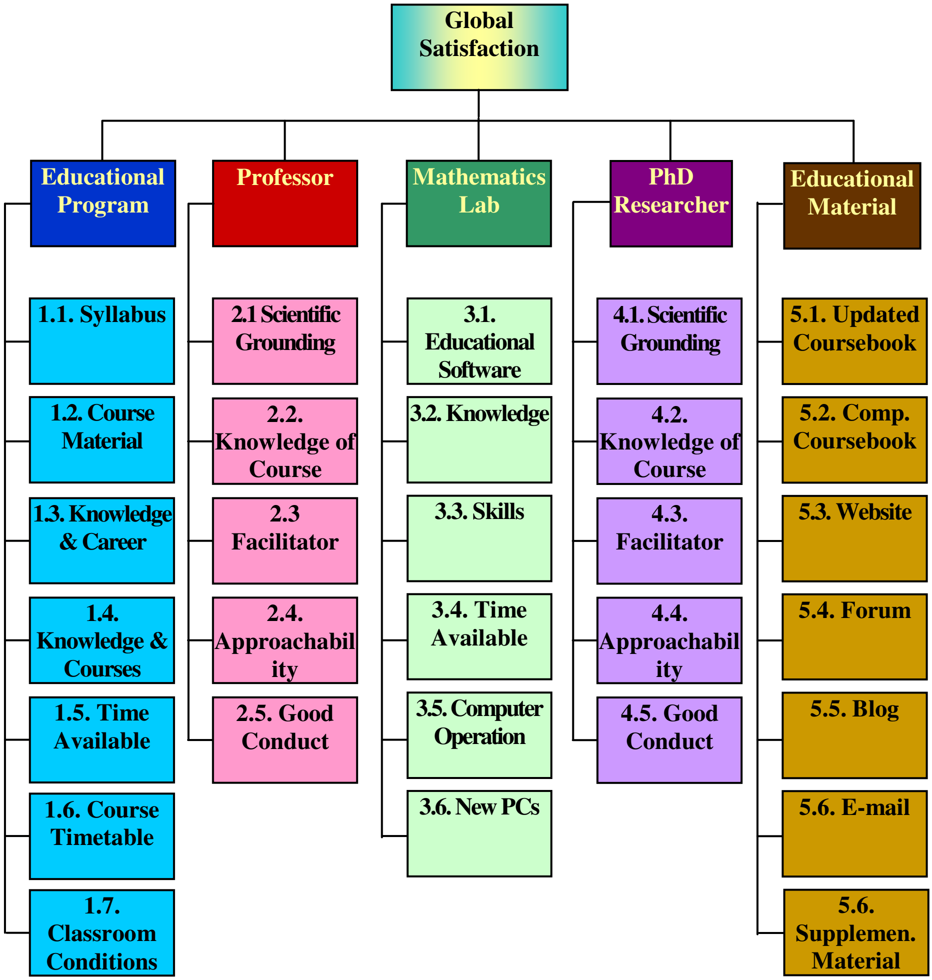

Fig. 1. Hierarchical structure of undergraduate primary teachers' satisfaction criteria and sub-criteria

Undergraduate primary teachers also appeared satisfied in the partial (per criterion) satisfaction survey, where negative comments were sparse. Levels of satisfaction ranged from 90% to 97%.

According to the results of the study, the global satisfaction value for the theoretical component of the course (Educational Program criterion) was 90%, 97% for the Professor, 92% for the PhD Researcher, 97% for the Mathematics Lab and, finally, 97% for the Educational Material. The global satisfaction level of undergraduate primary teachers from the course was very high, much higher than that of equivalent studies in other University Departments of the country [19, 20, 14].

5 Conclusions

In this article we presented briefly the design of an Undergraduate Primary Education Teaching Practicum on changing Technological, Pedagogical and Mathematical Knowledge via Educational Scenarios. Also, the research outcomes concerning the satisfaction of those undergraduate primary teachers who participated in this course were presented. Undergraduate primary teacher global satisfaction from the course was characterized as extremely high. These results lead to the posing of new research questions about the number of participants in the course, students' support during the course, the support by two individuals and the possibility of "self-defensiveness" of the participants. It is our belief, therefore, that undergraduate primary teacher satisfaction in a learning environment that combines teaching in the classroom and support via an appropriate learning environment plays a crucial role in the sustenance of programmes that incorporate ICT in teaching and learning [23].

The above mentioned findings lead directly to the conclusion that each educational establishment must adopt, on a regular basis, an evaluation system for their provided services, in order to obtain the necessary information on the level of undergraduate primary teacher satisfaction from their departments [24].

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Web-Based Optimization System Applied to the Teaching of Mathematical Programming

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Abstract. An approach is proposed that will easily enable operational researchers and systems managers to obtain an optimized response of the generated model. The Web-based Optimization System provides an environment for modeling and solving a model in mathemathical programming. The environment uses a distributed architecture that turned the system extensible and very independent of platforms and the fabricants of solvers, also being able itself to connect proper optimization softwares. The study demonstrates the importance that the Internet has potential to be an important component in optimization systems.

Keywords: Optimization, Web, Mathematical Programming, Decision Support System.

1 Introduction

According to Geoffrion and Krishnan (2001), the digital economy is creating abundant opportunities for operations research applications. The use of Operations Research (OR) techniques are leading professionals of financial services, electronic markets, network infrastructure, optimization software, supply-chain management, and travel-related services, to respond agressively. Because OR is well matched to the needs of the digital economy in certain ways and because certain enabling conditions are happening, prospects are good for OR to team with related analytic technologies and join information technology as a vital engine of further development for the digital economy. The objective of this article is to join the digital's econonomy and Web's Mathematical Programming prospects with a Decision Support System (DSS) that uses the OR techniques to offer optimized data. To make better decisions, managers are combining the OR with the DSS. Because models with thousands of restrictions and variables are not easily created and the solution returned by the solver needs to be analyzed, the figure of an OR analyst plays an important role in this context. When the detailed data supplied by this combination is analyzed, it can improve and facilitate the company's decision process. This means that the people in the field need, not just data at their disposal, but also models and systems that will analyze the data to show local trends and results and help solve everyday problems.

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As described in Little (1991), these kinds of applications travel on a one-way street. Efficiencies and improved service levels derived from OR/MS models and embedded in operational systems are essential to the firms using them and cannot sensibly be abandoned.

2 Web-Based Optimization

The Operations research is a science that possesses a fundamental role to act in the emergent digital economy and is demonstrating to be particularly favored of the innovations related to the Internet. For many types of problems, varied implementations of diverse methodologies compete in speed, trustworthiness, cost and convenience. New applications of optimization typically involve the construction of new models. In accordance with Pinheiro and Oliveira (2004), a professional who needs to construct an application in optimization will have to make available an environment that independently of the generated model can use a variety of existing solvers in optimization packages. Of this form, the environment to be developed must be flexible so that new solvers could be incorporated to the optimization environments.

As Czyzyk et al. (1997), the optimization algorithms are dynamics for nature, suffering changes in short periods, contributing to the Internet to be the mechanism that easily make available the access to the frequent updates. Cohen et al. (2001) distinguishes three categories for optimization software customers of general intention:

- Modelers that work directly with solvers and modeling systems to construct optimization models and to find ways to obtain acceptable solutions;
- Application developers creators of software that uses solvers, as part of a great package that treats since generic functions as management of data and graphical interface;
- Users who use application packages searching optimization at some point. Any environment to be developed must contemplate these three types of users.

Geoffrion and Krishnan (2001) stands out the importance of the development of an infrastructure to support the applications in the Internet, presenting the ASP (Application Server Provider), suppliers of application service, as important example of safe and flexible infrastructure and with center of data with high availability of connections to the suppliers of service of Internet (Internet Service Provider). Such ASPs offers a platform to make available software as service.

2.1 Solving the Problem of WEB-Based Optimization

Cohen et al. (2001) proposes to explore the Internet's potential by splitting up processing tasks between multiple servers and thereby solving the problem of optimization. In that way, the proposed distributed environment's architecture is formed by the following components: a browser, a Web server, an application server, a database server, and an optimization server. The distributed environment's process flow proposed by Cohen et al. (2001) is the following one: the user submits a request through a client program (browser). The Web server is the responsible for make available the static or dynamic content accessed by the browser. After the client application loads the web server pages and the user submits its solicitation, the application server loads the information to construct a model like, for example, a model in mathematical programming. Some of the information that the user needs to construct this model can be concentrated in any database, which can be accessed trough a database server. To perform the optimization, the application server initiates the process in an optimization server, passing this model (business rules) to find the solution.

The optimization server can also access the database server to require some complementary information to the received model. When the optimization process has finished the optimization, an email message is sent to the user with an URL (Uniform Resource Locator) that presents the solution, or can also be published a report with the solution in different channels of an Internet site. Another approach to Web-based optimization may be found in (Yen 1997) in which a four component design is proposed, as shown in Figure 1.

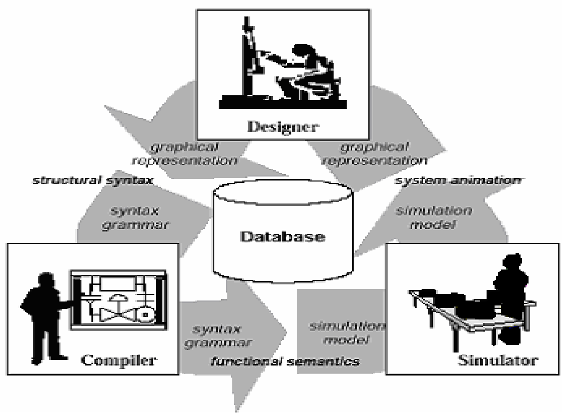

Fig. 1. Simulation Design

- Database - the structures and functions of objects are stored and manipulated in a database.
- Designer - the tool with graphical interface that makes possible the user to construct and to edit the system drawing. Using designer, users can drag or delete system's objects and specify corresponding attributes.
- Compiler - during the drawing process, the compiler checks if the system's structure or syntax is correct. The syntax check can be made on an interactive way, to verify the drawing immediately after each step, or on the batch way, to verify the correction after the submitted solicitation.
- Simulator - different of the structural correction, the simulator verifies the system's functional or semantic corrections. In addition, it also simulates the system's process with animations, and evaluates the performance.

The process flow of a simulation tool, in accordance with (Yen 1997), is the following one: the designer, from one database and through a graphical tool, edits the model and configures it in accordance with its characteristics, sending it to the compiler that checks the structure and sends to the simulator to generate the solution returning for the designer's analysis. This flow continues until the results are the waited ones.

2.2 Web-Based Optimization Systems

According to Fourer and Goux (2001) until a little time ago the Internet's use in optimization was limited in supplying softwares for download. Thus, per many years commercial solvers were available through the ftp protocols, which were maintained by the developers' own sites. The first site that supplied mathematical softwares for download, the NETLIB repository, was started in the early eighties offering a variety of solvers. The advent of the Internet has encouraged relating online resources, including extensive lists of hypertext links in downloads and other information. The 'Decision Tree for Optimization' software, developed by Hans Mittelmann and Peter Spellucci, organized available non-commercial optimization software.

Their site offers a list of testing problems as well as books, tutorials, system modeling resources, automatic differentiation packages and tools for model analysis. The site ZIB MATHPROG provides links and related information to many classes of optimization codes in the public domain. Geoffrion and Krishnan (2001) lists a number of statistical computation sources available on the Internet such as StatLib, StatPages.net, StatPoint Internet Statistical Computing Center, and SticiGui. Czyzyk et al. (2001) demonstrates on his work the NEOS (Network-Enable Optimization System) that was developed in cooperation by the Argonne National Laboratory and the Northwestern University. This environment makes possible the resolution of many varied types of optimization problems through the Internet. The environment is formed by three basic components: NEOS tool, NEOS guide and NEOS server. NEOS tool is constituted by a library of free optimization softwares and developed by the proper NEOS project researchers. This component possess the characteristic of being distributed, therefore each specific solver is considered one host that it is spread in different spaces of addressing connected through the Internet. In accordance with Czyzyk et al. (2001) the interface lacks to be worked in the NEOS optimization environment. Despite the environment possessing three forms of submission of models: through email, page in the Internet, or a tool available for download. The user less experienced in operational research, for not knowing the solver adjusted for each type of problem, wastes much time to submit the model for the optimization. Like the Maturana's idea (Geoffrion and Maturana 1995) of constructing optimization-based DSS with a design that serves adequately the users needs, the Web-based DSS was developed. It had as intention to create multiple interfaces to facilitate the submission of models and consequently to enclose diverse users profiles. For that, a simple interface had been used, henceforth called of direct interface, where the model is constructed directly by the coefficients, and the models generator interface, that mounts a model through a tool's proper language, providing the construction of more complex problems in a practical way.

3 The Web-Based DSS

3.1 Optimization Framework Design

The Web-based DSS considered on this work used concepts related to the architecture proposed by Cohen et al. (2001), distributing the tasks that are processed by the

Fig. 2. Multi-layer design for solving optimization problems

environment between multiple servers. In the figure 2 below, we present how the environment components were distributed.

The first component of this architecture is the browser, which is a client application, which is directly accessed by the user. The browser used by the DSS was the Netscape Navigator. It is through this application that the user will interact with framework, being able to access it through any computer that has a connection with the Internet. The second component of this architecture is the Web server, which will store the environment's dynamic and static pages on the Internet. In the tests that were made, it was used an Apache server, www.apache.org,, that stored the files that contained the page's codes presented by the browser. The third architecture's component is the application server. This server will receive the solicitations from the user, thus having that to pack the information so that they can be sent to the optimization server. After the information was sent and the optimization is performed, the application server will receive the solution from the optimization server, showing it to the user who requested optimization. The last component of this distributed architecture is the optimization server, which will be responsible for the receiving of the information sent by the application server, unpacking of the information, resolution of the sent model, and the sending of the solution to the application server.

3.2 Interfaces Offered

According to Little (1995), two approaches can be found when we concern the development of a DSS. The classical solution provided by the OR systems of having managers and analysts solving problems and delivering solutions to the problems owners is still in use and can be found in the major parts of DSS. The other aprroach is to create systems to the end user rather than OR managers or analysts, giving people systems with which they can create their own solution to problems. Little (1995) also afirms that when this kind of tool is developed to the users, it can boost the company's productivity.

3.2.1 Direct Interface

The first interface option offered by the Web-based DSS is the direct interface. This interface tries to contemplate simple submissions, which can easily be entered by a non-expert user. Problems that possess a reduced number of variable and restrictions are easily submitted through this interface. In this option, the user previously defines the number of variable and restrictions, and the environment generates all the necessary fields so that the user can type the values and submit its model. This type of interface is consistent with Little's idea (Little 1991) of empowering the organizational front line by creating systems directly to the end user.

3.2.2 Models Generator

Geoffrion and Maturana (1995) emphasizes different reasons to have an OR manager or analyst to assist the user during the modeling process. First, users usually don't have the time to think in depth about their problems, since they are too busy handling them. Second, modeling is an activity that requires a certain experience and most users don't have it. Contemplating the Maturana's approach (Geoffrion and Maturana 1995) of having an analyst modeling the hardest problems, another modeling option was developed by the Web-based DSS and is destined to the most experienced users and OR analysts. This type of interface is called of models generator.

The models generator receives through a proper language from the tool a formation rule from the model of integer linear programming. Differently of the interface demonstrated in the previous section, which receives from the user all the model's coefficients, the interface proposed in this section uses a program informed by the user for the generation of a mathematical programming model. Of this form, it makes possible a simple and robust way to construct models with thousand of variables and hundreds of restrictions. Difficult problems to be manually constructed in the previous interface for the typing effort would be modeled on a generic way, generating the model to be submitted to the environment's application server. During this phase is used the same principle of some famous commercial codes as the AMPL, www.ampl.com, and LINGO Schrage (1998), having as advantage the academic principle of free code and a more robust interface.

3.3 Application Server

As considered in the distributed architecture of Cohen et al. (2001), the optimization's environments should have an application server that is responsible for loading the information submitted by a browser. The developed environment uses this same idea for the application server, going a little beyond in the server's functionalities.

The application servlet will receive the user's solicitations and will pack them using optimized techniques that prevent the storage of redundant information, which would cause a loss in the model's performance. If the user has used the models generator of the previous section, the application server translates the model and packs the necessary information to solve it. Through a inter servlet communication, the application server will send the packed object to the optimization server. After the model's optimization is processed in the optimization server, he will send the solution to the application server. When the application servlet receives the object that contains the optimization result, he will unpack that object, and will show the solution at the user's browser.

3.4 Optimization Server

Basic component of the proposed architecture, the optimization server is responsible to supply the submitted model's solution. With the necessary information, the optimization server processes the data, thus producing the result. The optimization's result is packed in an object that will be sent to the application server. Because the data is being shared across the system, the solver is tightly integrated with the rest of the system Geoffrion and Maturana (1995). Although this approach of sharing data structures is difficult to implement, it has as advantage a closer interaction between the solver and the models generator, which could lead to faster and more robust solutions Geoffrion and Maturana (1995). In the architecture proposed by Yen (1997) it was used a simulation tool that solved the mathematical model using the techniques of entire linear programming, through commercial software of optimization installed in the optimization server.

The optimization servlet was developed using as a solver the LINDO API Schrage (2002), which encloses a complete set of methods, which offers total support to the framework. By implementing the Web-based framework based on the simulation tool proposed by Yen (1997) and with a distributed architecture proposed by Cohen et al. (2001) it becomes possible to apply new solvers to the framework without causing much impact on the other components.

4 Conclusion

We have presented a Web-based Optimization System Applied to the Teaching Mathematical Programming that provided a framework that makes possible and manages the interface between the mathematical models generator with the optimization solvers. To reach the objectives of this research, it was necessary the execution of the following stages: accomplishment of a study in literature to form a conception about the environment's architecture; definition of multiples interfaces that would contemplate different kinds of users; implementation of a system using distributed components, splitting up processing tasks between multiple servers and thereby solving the problem of optimization. To guarantee the environment's robustness for multi-user, some solicitations had simultaneously been submitted to the tool. The framework reached the answer in acceptable times in relation to a Web tool, because the tests have shown that the environment answers ninety percent of the requests. The models generator interface is still in phase of tests, and the framework is presenting difficulties to interact with the users when they submit their problems with syntax and/or semantics errors. Trying to obtain a greater performance, in the future we have the intention to migrate the Web-based DSS to the Java Web Services Technology.

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New Insights and New Approaches for Lifelong Learning

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Abstract. The EU have established a target of 15% of adults participating in lifelong learning by 2020. Whilst some countries, notably the northern European countries, comfortably exceed that target, many do not, including Ireland. Within Ireland the Institutes of Technology (IoT's) constitute almost half the total higher education population and two thirds of part time students at first cycle Bologna (Bachelor) or Level 6 to Level 8 of the Irish National Framework of Qualifications.

Whilst the IOT's have the larger share of part time students the numbers of people within Ireland as a whole participating in part time and flexibly delivered education is small when compared to the EU 27. This paper describes the results of a market research exercise undertaken as part of a major project on flexible and part time learning being undertaken by the Institutes of Technology aimed at increasing the amount of flexible learning being provided and taken up by learners. The research was designed to find out what triggers may be used to encourage adult learners back into education in Ireland and so contribute to more appropriate responses to their needs by the Institutes of technology for whom increasing flexible and part time education is a major strategic objective.

Keywords: flexible learning, Adult education, part time education, strategic change.

1 Introduction

1.1 Higher Education in Ireland

Among the key factors contributing to Irelands recent economic success has been the Irish education system in general, and the higher education system in particular. Higher Education in Ireland has undergone a massive transformation over the past generation. The number of students participating in higher education in Ireland has increased significantly in recent decades with about 60% of our students who complete second level education proceed to full-time third level studies, compared to just 20% in 1980. This is one of the highest participation rates in the world. The last 30 years have seen higher education transformed from an elite pursuit for the few to a

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mass activity for the many and now, some argue, to a universal entitlement for all. Consequently, the needs of the typical third level students have changed dramatically in that time. Higher education providers have had to evolve and become more *flexible* to satisfy those needs.

Flexible Learning provides learners with real opportunities for increased choice, convenience, and personalisation to suit the learner. In summary, flexible learning provides learners with choices about where, when, and how learning occurs. Flexible learning recognises the reality of students' busy schedules and provides multiple delivery modes, which allow students the greatest possible window of access to course materials. Flexible learning also recognises that different students have different learning preferences and requirements. This concept is sometimes understood as flexible delivery, which involves offering students different modes of study, which might include using different modes of delivery for course materials, including web-based, CDs, DVDs and so on. However, flexibility can also refer to curriculum design that offers students some element of choice, either in course content or course assessment. Students can be offered choices between different modes of assessment and different content focus. In addition to recognition of prior learning, work based learning.

1.2 Project Background

The Flexible Learning project is funded by the Irish Higher Education Authority (HEA) under the Strategic Innovation Fund (SIF). Through this initiative, the Institutes of Technology commit to mainstreaming supported flexible learning within and across the Institutes. Significant funds have been allocated to each of the institutes to help increase their capacity to be flexible. The rise in interest in, initially distance education, and more recently flexible education has been a feature of developed economies since the mid 1980's (and in Australia for a lot longer). Therefore the main theme of this project is not innovative. Nevertheless, this project also represents the coming together of independent and autonomous institutions to collaborate in the delivery of on/off campus education. This is a more unusual. This collaborative entity element of the project, a web portal, www.BlueBrick.ie was created specifically to meet the individual learners needs. It supports inter-institutional recognition of modules and higher awards and encourages people to continue educational progression. The portal provides information on academic programmes, modules and accredited professional courses suitable to future career/business needs. The availability, costs and means of access to the relevant modules, modes of delivery and a payment mechanism is also provided through BlueBrick. BlueBrick does not teach, deliver, accredit or evaluate any academic modules. It is exclusively an information and access portal, with the autonomy of the individual institute sacrosanct. Through a modular approach, BlueBrick enable individuals register for modules in an area of interest, from those on offer by the institutions and accumulate credit towards a graduate or postgraduate award. Registration for a single module to develop a particular interest is possible, with some modules designed to accommodate people in employment, or those who are seeking an opportunity to upgrade and advance their knowledge in their chosen discipline or area of employment.

This paper highlights the early developmental stages of this project, highlighting the investigation into the students needs and expectations with respect to higher education.

2 Approach and Research Methodology

The EU have established a target of 15% of adults participating in lifelong learning by 2020. Whilst some countries, notably the northern European countries, comfortably exceed that target, many do not, including Ireland. Ireland's latest figures highlight a serious issue with only 9% of adults participating in lifelong learning. For this reason the working hypothesis for the research was that higher education providers in Ireland do not completely understand the needs of potential adult learners.

The research methodology used was to

a) Analyse available market information on adult learners
b) Determine a target audience for the purpose of this research
c) Undertake specific market research using focus groups

2.1 Analyse Available Market Information on Adult Learners

A desk based research exercise was conducted analysing regional, national and international reports with respect to Lifelong learning and Access to Higher Education. This analysis was followed up by meetings with key stakeholders involved in adult learning in Ireland. Further research was conducted into the area of personal development – specifically relating to personal professional development.

2.2 Determine a Target Audience for Research

The next stage was to decide on our target audience. A series of interviews were drawn from a range of personal and professional backgrounds. The learners can be broadly characterised around their motivation, approach to course selection and web/pc competence. In order to have an effective brand it is necessary to pick a narrow target audience. Recognising this fact we decided to focus our research on learners motivation.

In terms of branding the site and devising a marketing plan we concentrated on career motivated learners. Nevertheless, every step was taken to ensure that our branding exercises would not exclude all learners. A vital stage of developing an effective brand is obtaining a consumer insight. Accordingly, it was this early stage of the project and subsequently when implementing the findings 'naming' the lifelong learner was a key observation that allowed focus to remain on the learner rather than on the provider. The target learners were identified as ‘Dave and Joan’.

‘Dave & Joan’ are in their mid thirties. They are either a supervisor or mid manager in a manufacturing plant. They live just outside town on a new housing development. Their children are aged 4-14 years and their involved in the local sports and leisure clubs. Life is busy and time seems at a premium during the week. Both got their diploma level qualification at college. Now with such change and uncertainty across all types of work, they’re conscious that they need to do something to help their prospects of staying in the workforce over the next few years.

2.3 Undertake Specific Market Research Using Focus Groups

Eight separate market research focus groups were conducted in three different regions across Ireland. There were six participants in each focus group. The groups had a variety of age ranges, (25-29, 30-39, 35-44, 50-59 years old), and social economic background.

3 Results and Discussion

3.1 Market Research

The Career Anchors model (Schein, 1990), used in the career training and coaching business for many years, identifies eight fundamental career motivations that underpin what people look for from their career. These anchors are:

Lifestyle	Managerial competence,	Autonomy/Independence,
Security/Stability,	Entrepreneurial creativity,	Dedication to a cause,
Pure challenge and	Functional competence,	

Different individuals display different motivations but in recent years anecdotal evidence suggests notable shifts in career motivations. There has been a sharp increase in those motivated by security. People are looking for more reassurance of a stable future in the career direction that they take. Consequently entrepreneurial creativity as a motivator has dropped sharply as people are avoiding the risk of new business start ups. Finally a significant number of people feel burnt out by recent turmoil and work demands. They want to re-balance their lives and improve their quality of life.

Our research illustrated that 'Dave & Joan' want to strengthen their career prospects without unbalancing their lives. The promotional tag line of Open University Australia - "your pace and your place" personifies flexible learning and this essentially is what this project aims to provide to "Dave and Joan" in Ireland. The following points summarise the findings from several focus groups with adult learners in the "Dave and Joan" category.

- People's concern is for their jobs and their career prospects, not their 'lifelong learning'.
- Learning is a tool – a means to an end.
- In fact there is little enthusiasm for the idea of Lifelong Learning. It sounds very long! Only for the few that continuously do courses.
- However most are positive about the need to further their learning and qualifications. Most see it as important in order to get in position when the economy picks up again.
- Others are disillusioned and see no point in investing in further learning if there are no jobs.
- Also, people in their 30s and 40s feel at a disadvantage to young college leavers.
- The start point for most education searches is Google. After that people contact colleges directly or look out for the book of night courses in September.
- People are looking for intelligence on where future opportunities will be and what they can do to get in position for them.

Our challenge as education providers is to prove that learning is achievable and that learning leads to better prospects. Kelly (2003) identified potential barriers to participating in higher education and also common characteristics of 'Dave and Joan' that were crucial in developing a consumer insight. The research has shown that 'Dave and Joan' have obvious, and not so obvious, fears, hates, needs and motivations that affect the way they think about lifelong learning. These include, but are not restricted to being successful professionally and personally, having the symbols of success, being listened to, having the possibility of future riches, seeing their children progress, spending time with their family and being in control.

A key aspect of the findings was the range of barriers, both real and perceived, that exist and that act as disincentives to 'Dave and Joan' taking up lifelong learning. Intriguingly these include, but are not restricted to, discomfort with the idea of 'going back' to college (a regressive step), the concept of lifelong learning (seems like a sentence) given that their concern is with keeping up to date professionally rather than their 'lifelong learning', whether they will get a return on their investment and whether or not will they be able to manage the time commitment. The section below highlights some of these points that emerged from the focus groups as barriers to lifelong learning.

3.2 Barriers to Taking Up Further Learning

People often dismiss further learning as something they couldn't do. Our research found that there are four main barriers for adults when it comes to pursuing further education.

3.2.1 Return on Investment

Most adults cannot give up work and return to college on a full time basis. Therefore the only option for the majority of learners is part time study. Higher education in Ireland on a part time basis is relatively expensive. Obtaining a degree on a part time basis is a significant investment. There is a limited supply of any financial support unless they are unemployed. In addition people are uncertain when it comes to determining the return on this investment.

- Will it lead to a job?
- What will the qualification be worth?
- Will I be able to complete the course?

3.2.2 Upheaval

How will they run their life around this demanding course? Will the time pressures become too much? No one wants to commit to a course and then drop out.

3.2.3 Self Discipline

Many doubt they will have the self discipline required for sustained study and exams over a period of years. This is especially true for Distance Learning. Distance Learning gives students greater freedom of scheduling, but it can require more self-discipline than on-campus classes. Some people learn best by interacting with other students and instructors, but Distance Learning may not provide much opportunity for this interaction. Despite the fact that technology has improved the level of interaction available, isolation experienced through distance learning can test a learners self discipline.

Although significantly higher interaction is available through part time education a high degree of self discipline is still required.

A significant number of those surveyed felt they need the discipline of regular classes and assessments to motivate them to do the work.

3.2.4 "Going Back"

Quite often people use the words "going back" when considering further learning "Going back to do a course", "Going back to school". This suggests that further learning is not something that is aspired to, rather something you have to "go back" to do. No one likes going backwards. The cultural challenge we face is for further learning to be talked about as a great step forward!

4 Conclusions

Students needs have changed dramatically in recent years and higher education institutions need adapt to satisfy those needs if national and European education targets are to be realised.

The findings of the research have been used to ensure that this new initiative, www.BlueBrick.ie, is positioned in the market place in a way that deals with the issues raised in the research.

In a short space of time we have achieved tremendous progress with BlueBrick.ie. Nevertheless there are some significant issues for future consideration: Ownership, Legal Arrangements, Future Academic Directions, Funding and Sustainability.

BlueBrick.ie while targeted at the learner illustrates that 14 autonomous institutes of higher education can successfully collaborate.

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GeoGebra: A Global Platform for Teaching and Learning Math Together and Using the Synergy of Mathematicians

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Abstract. In present age we are witnesses and practioners of computer-based education which is highly speed progressing. The computer-based education allows educators and students to use educational programming language and e-tutors to teach and learn, to interact with one another and share together the results of their work. The computer-based education is done possible by special electronic tools among which the most important are the mathematical programmes. There are many mathematical programmes, but one which is being embraced and used by a daily increasing number of users throughout the world is GeoGebra. The recently published software GeoGebra by Markus Hohenwater (2004) explicitly links geometry and algebra. GeoGebra affords a bidirectional combination of geometry and algebra that differs from earlier software forms. The bidirectional combination means that, for instance, by typing in an equation in the algebra window, the graph of the equation will be shown in the dynamic and graphic window. This programme is so much preferred because of its three main features: the double representation of the mathematical object(geometric and algebraic), there are not strong requirements as to the age and the knowledge in using it(the students of the elementary school can use it as well) and, it is offered free of charge(simply by downloading it). In this paper we are concentrating in the double representation of the mathematical object and its advantages in explaining and forming mathematical concepts and performing operations, in the global opportunities for using GeoGebra and the benefits of using it by cooperating and sharing experiences.

Keywords: Geogebra, double representation, virtual tools, dynamic demonstration, research work using computer programmes, interactive environment, platform of sharing knowledge and results, communicative bridge.

1 Introduction

What is GeoGebra and its main characteristics and tools? GeoGebra is dynamic mathematics software for schools that joins geometry, algebra, and calculus, it is an

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interactive geometry system. With Geogebra is possible to do constructions with points, vectors, segments, lines, and conic sections as well as functions while changing them dynamically afterwards. The two characteristic views of GeoGebra are: an expression in the algebra window corresponds to an object in the geometry window and vice versa. GeoGebra's user interface consists of a graphics window and an algebra window. On the one hand we can create geometric constructions on the drawing pad of the graphics window and, on the other hand, we can directly enter algebraic input, commands, and functions into the input field by using the keyboard.

What is the double representation?

While the graphical representation of all objects is displayed in the graphics window, their algebraic numeric representation is shown in the algebra window.

The geometric constructions are done by the mean of the main virtual tools. The virtual tools are found in the set of the toolboxes which have to be opened, selected a tool, activated it and used it during the construction process. In the toolboxes are found the virtual tools with their names linked with their functions like: New point, Move, Line through two points, Segment between two points etc., alongside which is their picture also. There are also buttons like: Delete object, Move drawing pad, Zoom in / Zoom out, Undo / Redo buttons etc… GeoGebra offers more commands than geometry tools.

2 What Are the Advantages and What Is the Power of Using GeoGebra with Double Representation in Math Teaching and Learning Process?

In this section, we present the advantages of using GeoGebra in our teaching and learning process by giving few examples, but there are more and more other examples confirming this advantage. This topic is to be explored and enriched by the activities and the experiences of many teachers in the teaching process.

2.1 Easy Teaching and Easy Learning

In geometry window is possible to display a grid and the coordinate axes. The coordinate system facilitates the work with integer coordinates. GeoGebra performs a double representation: the geometric one and the algebraic one(=GeoGebra). One can enter the objects either as geometric objects (via drop down menus) or as algebraic objects – pairs of coordinates, functions – via the entry line. Moving the objects in the Geometry window changes the expressions in the Algebra window accordingly. Editing the expressions in the Algebra Window results in the respective change in the Geometry Window. This is a main feature of GeoGebra meeting the demands of many didactics and educators to provide as many representations forms as possible for the students. Taking advantage of this double representation feature of GeoGebra it is easier for the teachers to explain the mathematical concepts, the properties of algebraic objects and to methodically reason the result of a mathematical operation based on the manipulations with their geometrical representations; on the other hand the students have the possibility to grasp faster, a common model and correctly what is taught and to add more to their knowledge through their experience while they use GeoGebra.

2.2 Quick and Correct Grasping of the Concept

Because of the double representation feature it is possible to perform dynamic calculus like functions in x, derivatives and integrals and draw conclusions about the properties of the algebraic objects within a short interval of time because there is e dependency between the algebraic object and its respective geometric object in the way that, a change done in the algebraic object is accompanied with the respective change in the geometric object. So, we can enter any function and show a visualization of generating the first derivative. Change f(x) in the algebra window and have other functions. Consequently, within a short time we can present many examples and observe the mutual change of the two objects and draw conclusions of how the two objects relate to one another. Otherwise, it would take a long time for the teacher to cooperate with the students to draw conclusions together with them or to convey his thoughts to the students. The double representation feature allows the students to quickly grasp mathematical concept. This is a real power of GeoGebra with double representation compared with other mathematical software. An excellent example is the concept of definite integral based on Lower and Upper Sum of a Function. You can see the graph of a function together with its Lower Sum (red) and Upper Sum (blue) for an intervall [a, b].

Inserting a slider bar fo the number of the rectangles and using Lower Sum and Upper Sum commands and by changing the number n of rectangles by moving the respective point on the slider bar can be observed the properties of the rectangles of the Lower Sum and Upper Sum by seeing their respective values in the algebra window. The fact is that the number n influences the Lower and Upper Sum and the conclusion is that: greater n be, less their difference becomes, tending to zero. This observation leads to a quick grasping of the concept for the definite integral by the students.

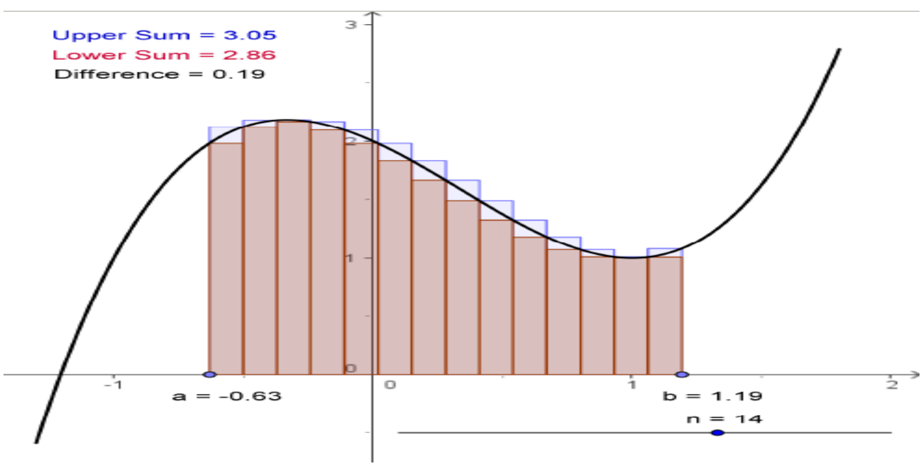

Fig. 1. The Lower and Upper Sum of a Function

The role of double representation in performing arithmetic operations. A very good and important example is the multiplication of fractions. In this case, each fraction of algebraic form is defined by two slider bars and it is represented by a part of a square divided in equal rectangles (geometric representation). For instance, let have to multiply 2/5 and 3/5 which are represented by their respective parts of their respective squares . To find the result of their multiplication is moved the right square by dragging it to the left over the left one. The solution of this simple operation is marked as the little "Solution square" which is the common part of the overlapped parts. By the mean of the slider bars can be taken other fractions and multiply them.

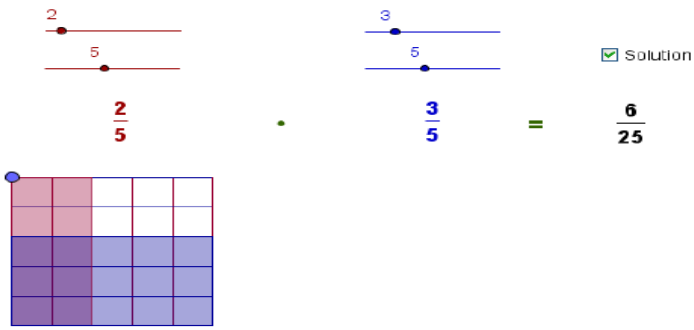

Fig. 2. The multiplication of fractions

This geometric representation is very important for the students of the low cycle system or primary level of education. To master the students in performing an algorithm is the same as in the case of making sense of formal concept definitions which have to be linked with the concept images. The concept images of the students are based on their prior knowledge got through their different experiences.

> “The tendency of many students to evoke their concept image[…] in many situations it is desirable to have and evoke rich concept images and,….research shows that visualization facilitates mathematical understanding”(Handbook of Research on the Psychology of Mathematics Education, Advanced Mathematical Thinking, pg.149).

In order the students correctly perform the algorithm of multiplying fractions is acquired prior experience and a very good and effective tool providing the environment for getting such experience is GeoGebra with its double representation feature.

The visualization of the algorithm leads to visual reasoning, as Gutierrez (1996) summarised much of the discussion on visualization noting that,

> “the visual processes are involved in interpreting: (a) External representations to form mental images and (b) The mental image in order to generate information.” (Handbook of Research on the Psychology of Mathematics Education, The Complexity of Learning Geometry and Measurement, pg.90).

So, by visualisation abilities the students form visual reasoning and get the right information in performing an algorithm and understanding and owning a mathematical concept. Many psychologists and researchers of the mathematics field are strongly stressing the visual reasoning in the work of today's mathematicians and teachers.

Suffice to quote here that:

> "In his 1991 plenary address to the International Group for the Psychology of Mathematics Education, Dreyfus urged mathematicians and mathematics educators to give increased importance to visual reasoning—not to elevate it above analytic reasoning but on an equal level with it. Visual reasoning plays a far more important role in the work of today's mathematicians than is generally acknowledged (Hadamard, 1949; Sfard, 1994)......

Other research, has shown the power of image-based reasoning in mathematics problem solving. Students who used images in their reasoning were more successful in solving nonroutine mathematics problems than those who approached the tasks procedurally." (Mathematical Reasoning: Analogies, Metaphors, and Images, pg. 154).

3 GeoGebra - An Interactive Learning Environment

GeoGebra provides an interactive learning environment where "the pre-requisites are built into the system and where learners can become active, constructing architects of their own learning" (Papert, 1980, p. 117). (Mathematics Education Library, Volume 13, Computer Environments for the Learning of Mathematics, pg.191).

The students, manipulating with the tools provided by GeoGebra software and making observations in the two windows, continually have a horizontal growth of knowledge, in which they build links between different representations, but even more they have a powerful vertical growth of knowledge that enables them to explore other aspects.

The teacher alone determines the effectiveness of curriculum by his or her decisions, behavior, attitudes, and cognitive processes, no matter how carefully the curriculum has been developed. The high expectations educators once had about the benefits of scientifically developed curricula have been supplanted by a more modest assessment.

> "Recent research has placed more emphasis on everyday curriculum in the classroom, on teachers' ideas and subjective theories concerning their quotidian preparation of classes, their subjective learning theories, implicit and explicit objectives, philosophy of mathematics, and the influence of these cognitions on their teaching." (Mathematics Education Library, Volume 13, Didactics of Mathematics as a Scientific Discipline, pg.52).

GeoGebra is a global platform where the students share together their knowledge and their creative works in the field of mathematics…There is a web page: GeoGebraWiki that allows the communication between the students and teachers in a global scale. In GeoGebra page the students can work and perform tasks individually or in groups, they are motivated and enabled to take necessary actions for deeper learning, they are involved in discussions that considerably facilitate their individual learning and provide the possibilities for learning from one another and exchanging their experiences not only locally but globally as well and, for measuring their own level of knowledge and capabilities. This way, the students become accountable for constructing knowledge and adding to it. As Alison Ruth writes in her paper “Learning in a mediated online environment”,

> “Students may then become engaged within their Zone of Learning Capability, which is analogous to Vygotsky’s (1978) ‘Zone of Proximal Development’. However, in the Zone of Learning Capability the student is enabled to take the actions necessary to facilitate their own learning rather than being led to a pre-determined point of knowledge. It emphasises students’ epistemic motivation and agency…. or the desire to know (Hatano and Inagaki, 1991), which is central to understanding the Zone of Learning Capability,”(Pg.138)

Epistemology helps researchers make sense of research information transforming it into data detailing how that analysis might be patterned, reasoned, and compiled and shows the belief they have about the nature of the reality they describe (Willis, 2007; Creswell, 2007; Scott and Morrison, 2005).

GeoGebra is an answer to the epistemological questions about

> .... ”how technology can help to construct an understanding of mathematics and how GeoGebra can be used interactively to scaffold the construction of mathematics knowledge . (Yu-Wen Allison Lu, Linking Geometry and Algebra, 2008, pg.22.)

GeoGebra creates an atmosphere where the teacher encourages the students to think creatively and promotes a problem-oriented approach to the teaching of mathematics.

4 GeoGebra Is an Open Source for Teaching and Learning for All

GeoGebra software is a tool and a platform that can be used by the students of any level. It can be used by the young people, even by the students of the primary school. This is because of the great number of varieties of the exercises and of different types like puzzle and entertairning, construction, testing, research, problem-solving etc. that can be accomplished by using GeoGebra tools and its platform. Young people are game-driven and curiousityproblem-driven. GeoGebra software is the right tool and the platfotm meeting the trends and the needs of this generation not only in the school but in their homes as well or elsewhere, suffice to have internet access. GeoGebra is an open source for teaching and learning, free of charge and for all.

Their mathematical formation by using GeoGebra is indisputable in this IT age and knowledge society where, as Miltiadis D. Lytras writes in his paper “Teaching in the knowledge society: an art of passion”,

> ”Young people are computer literate up to an extremely satisfying level, they use advanced software tools and hardware systems, ….. Furthermore, the new amazing communication capacities characterising our era (blogs, wikis, personal desktops, satellite connections) provide them with a global context..., the ultimate objective is the provision of fresh ideas on how Teaching can be transformed into an Art of Passion.”(Pg.2)

So, the young people potentialities and the communication capacities are present. Is required a respond by the Academic Institutions. GeoGebra software is a very good programme and tool to be used by them and GeogebraWiki is a respond added to the other efforts and approaches done for open teaching and learning and for incorporating new technics and technologies in the teaching and learning process. GeoGebra provides networking, open access, sharing of knowledge and teaching methods and results, accumulation of experiencies and further development of them. GeoGebra and other sources are very useful tools and opportunities that must be used by the Academic Institutions as the best means to reach communities and use the synergy of mathematicians for global progress, giving answer this way to the questions raised by Militiadis in the same paper like:

> "How can we exploit communities of teachers and learners aiming to match together common interests and to exploit the synergies of differences?
> How can we manage the various resources required for teaching, including Content, Technologies, Human Resources, Processes, Skills Competencies, Institutional policies etc.?"(Pg.5)

Finally, GeoGebra software provides a perfect link between mathematical textbooks and IT and a very comfortable and desired environment for problem-solving situations through research work. All the above examples and the discribed features of GeoGebra, this new technology itself, confirm this aspect.

Acknowledgements

Our thanks to Dr. Miltiadis D. Lytras who proposed us to sumbit our paper for the International Journals that are sponsoring TECH-EDUCA and who has encouraged us to present an extended version of our paper by providing new sources and journals via internet links.

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Reducing Stress within the Rehabilitative Work Setting – A Report on the ROSE Project

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Abstract. Reducing Occupational Stress in Employment (ROSE) is an EU funded project which aims to develop a combined person and work directed stress management programme in order to improve the long-term retention of staff in the vocational rehabilitation sector for mental health and intellectual disabilities.

Keywords: Occupational stress; Rehabilitative work settings; European Union.

1 Aim and Objectives

The aim of this paper is to report on the results of stage 1 data amongst five EU countries on organisation and personal factors relating to work place stress.
The objectives are:

1. To present data on organisation and support mechanisms prevalent in rehabilitation settings for mental health and intellectual disability services.
2. 2. Report on the findings of the Job Content Questionnaire (JCQ) as this relates to psychosocial work place stress.

2 Methods

The research design consists of a mixed method approach, utilising a cross sectional survey and focus groups as methods of data collection. Data was collected and analysed from a range of managers and support workers (n=60) from 5 central locations in countries across Europe. Statistical analysis was conducted through entry into SPSS Version 15. Data derived from focus groups was entered into computer aided qualitative data analysis software 'NVivo 8' for analysis.

3 Analysis and Results

Qualitative results indicate variation between managers and support workers in terms of perspectives on stress, its management and prevention.

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Results from the JCQ suggest variation in terms of psychosocial job stressors between countries.

4 Recommendations

Based on these results stress management procedures are notably lacking within this sector across Europe. The results indicate the need for a web based person and work directed stress management intervention in this sector.

Teaching for Multiple Intelligences in Undergraduate Education

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Keywords: Multiple intelligences; Teaching and learning strategies; Brain based learning.

Multiple intelligences theory has only recently entered the teaching and learning dialogue in education and research. It is argued that despite the rhetoric of a student centred approach, nurse education remains wedded to conventional teaching approaches, which fail to engage with the individual and unwittingly silence the student's voice. This study examines the concept of Multiple Intelligences (MI) and outlines Gardner's contention that the brain functions using eight intelligences, which can be employed to improve learning at an individual level. On exploring the Irish literature to date, no data were found ascertaining the potential of MI or the adoption of such teaching approaches in nursing education. The theoretical paradigm underpinning this study is multiple intelligence theory (MI). The philosophical paradigm that guided the study is grounded in positivism. The research paradigm is quasi-experimental pretest posttest non-equivalent control group design. Two groups of second year undergraduate nursing students undertook the study, treatment group (n=26) and control group (n=18). The intervention for the treatment group involved using a five-phase model, developed by Weber (1999), known as a multiple intelligence teaching approach (MITA), while the control group received traditional teaching approaches. The multiple intelligence development assessment scale questionnaire (MIDAS), which includes three intellectual style scales (IS) was used over the three phases of the study to profile participants MIs and to ascertain if MITA affected treatment group scores on MIDAS MI and IS. The independent variable was method of instruction, that is, MITA and traditional teaching approaches. The dependent variable was participants' 'Nursing Practice Studies' exam results, other module exam results and MIDAS MI and IS score results. Data derived from these observations were analysed using various parametric and non-parametric methods, which were deemed appropriate for the study. Significant differences were found between groups with the treatment group outperforming the control group in 'Nursing Practice Studies' exam results. Findings on other module exam results also revealed some significant differences. The MIDAS MI and IS scores for both control and treatment groups revealed significant differences in participants' scores. In addition, significant changes on MIDAS MI and IS scores were observed within groups. The MITA intervention was evaluated using an instrument developed by the researcher (Evaluation of multiple teaching approach- EMITA) and treatment participants related

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very positively about the approach. It is contended that MITA has great potential in nursing education, particularly in terms of reinforcing learning beyond the educational domain and into the individual's professional development and clinical practice. Arguably, this departure from traditional approaches to teaching will contribute to the present post-technocratic model of education and to the conceptual understanding of MI approaches to teaching and learning in third level education.

New Learning – The IPP Programme: Improvements in Learning and Self Esteem by Changing the Organization of Learning

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Abstract. "New learning" is basically an individualized learning style. "New learning" starts by the individual itself. The individual is the basis for conditions, learning contents, rhythm, duration and intensity of the teaching. The appropriate slogan is: fetch the individual at his personal conditions.

Keywords: Quality of the Education- A new vision, Educational Strategies.

1 Methods

A dissolution of the usual class federation makes part of the programme. Modules of individual knowledge are essentially for the teaching basics. In the context of the modular structure there are rather learning fields and subjects. Different fields of learning (choice and obligation ones) form another basis of the programme, flanked by common living rooms and leisure support as well as practical courses. Learning fields are understood as a basis of general culture and subjects as their specializations. The individual programming (IPP) is affected in basis blocks which are constantly adapted. All experiences and goals are described in individual portfolios. Tutorial settings are provides for ted continuously evaluation and support.

2 Results

A total of two classes were enrolled in the programme (27 high school pupils). The programme took place in northern Italy (South Tyrol). Pupil age ranged from 15a +/- 1 SD. After the first academic year pupil satisfaction scores amounted to 75% regarding obtained achievements. 90% of all parents showed a high satisfaction score and wanted a continuation. Teacher agreement for the programme reached up to 76%.

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However, teachers evaluated the work expended as 33% increased. Over 70% of the pupils wished a continuation of the project. Intraindividual achievement increased up to 6%. Study difficulties reduced to approximately 40%.

3 Discussion

New learning offers an optimization of orientation for pupils, a comparability and better self-estimate of the individual effectiveness as well as an appreciation of own individual strengths. Group affiliations should regularly be supported and promoted.

Recruitment and Rotation of the Trainers in the Lifelong Learning Context

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Abstract. The workplace of today is characterized by rapid changes in work processes, in competition, in customer demands, and in work practices. To keep abreast of these rapid changes employers and employees must be committed to lifelong learning in order to keep ahead. One of the most important actors in the lifelong learning development process are the trainers, whose professional characteristics needs meeting new skills and adapting an varied and specific contents of the current labour market. Affected by the discontinuity and a high rate of job rotation, the recognition of it labour status and basic competence and skills, forms part of the Bologna Process recognized as Vocational Education Training (VET). Sixty in-depth interviews realized to managers of the centres of formation, are used as tools to obtain information about following topics: recruitment strategies, conventional and not conventional routes of the recruitment, rate rotation, qualification and training of the Spanish trainers. The transcription of the interviews achieve that not always exist a previous plan of recruitment, except that it is a question as big centers of formation. Also, the obtained information indicates a high rate of rotation that affects the trainers ones as professionals since there exists the discontinuity of the formative offer on the labour market.

Keywords: Job recruitment, job rotation, trainers, lifelong learning.

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