Designing E-Learning Environments for Flexible Activity and Instruction

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The contributions to this issue share a focus on design of e-learning environments. Instructional designers stand at very early stages of knowledge in this area, but with great potential for growth and progress. This commentary offers an activity-based perspective on e-learning environments, resulting in a flexible stance toward instructional strategies, artifact design, emergent activity, and learning outcomes. This same flexibility should be evident as we in the field appropriate theories from other disciplines and develop some of our own. I support the contributors' call for more design research specifically addressing challenging problems of practice encountered by design practitioners.

□ From its inception, instructional design has been about designing stimulus materials to guide learning activities, which in turn leads to attainment of targeted learning outcomes. Of course, instruction is no longer seen in strictly linear, closed-system terms. The environment metaphor has gained prominence, suggesting a comfortable base from which learners can venture forth on various learning journeys. Most instructional designers are now somewhat accommodating of diverse learners and their different learning needs. Instructors and students are encouraged to make use of various learning resources, depending on interest, relevancy, immediate need, and the defined learning objectives. Thus while designers plan and develop resources, participants themselves make a good share of the final decisions about activities and even learning outcomes (Hill & Hannafin, 2001). Even so, designed resources must address valued learning outcomes and properly guide student learning or, as Merrill (1997) has often said, it's not instruction!

In this commentary, I respond to the articles in this two-part special issue by relating them to an activity-based framework for thinking about learning-environment design. My intention is to draw out selected key ideas that are helpful in strengthening a knowledge base in this area, and growing that knowledge base through design research, borrowed knowledge from other fields, and other forms of professional sharing.

The rise of online learning environments has driven home the need to carefully consider all aspects of the learning experience, because learners often encounter the stimulus materials when they are sitting alone at a computer, away from easy coaching or support from an instructor. E-learning environments provide collabora-

tive work spaces that include information resources and tools to do work alone and with others, keep track of assignments, diagnose learning needs, provide feedback, and assess learning outcomes. It makes good sense to talk about design of overall environments for e-learning, because the entire experience is mediated by technology. The interface, the page and screen design, the interaction and navigation, the learning activities, the assessments—all of these features must be designed and developed in some fashion ahead of time, then co-opted and adapted by the participants themselves as they engage in learning activities.

Designers of such environments face a number of pressures and challenges, in particular, to:

- Deliver products efficiently, usually at some sacrifice to quality and creativity.
- Establish a consistent set of self-standing resources so participants know what to expect and do not have to interpret every new resource from scratch.
- Adhere to best practices, known models, and available research on learning and instruction.

Sometimes these pressures work against each other, for example, cranking out a product versus applying the latest instructional theory. Often, though, best practices and research findings are distilled into a model or template. This model then becomes the basis for materials that learners and teachers can predictably use for learning. Designers sometimes wish they could diverge more from the model, or invent new ones, but without models and templates, they would be hard-pressed to deliver sound instruction on time and under budget (e.g., Kirschner, Carr, van Merriënboer, & Sloep, 2002).

So what are those best practices that allegedly guide our designs? What does research on learning and instruction say about e-learning design? Distressingly, but predictably, the answer depends largely on which theorist or body of research you turn to. Merrill's (2002) synthesis belies the fractured nature of ideology and research surrounding these questions. Differing bases for design can be found within the various literatures on behaviorally based instructional theories (e.g., Salisbury, Richards, & Klein, 1985); information-processing theory (e.g., Foshay, Silber, & Stelnicki, 2003; Van Merriënboer, 1997; Van Merriënboer, Kirschner, & Kester, 2003); constructivism (Hannafin, Hannafin, Land, & Oliver, 1997); situated cognition (Wilson & Myers, 2000); and communities of practice (Barab & Duffy, 2000). Beyond these psychology-derived perspectives lie those relying on cultural studies, critical theory, aesthetics, game and systems theory, and practitioner action (e.g., Rose, in press). To do a really good job designing instruction, designers need a broad knowledge base, rich and varied enough to help us see the problem from many points of view. Supporting literature is—and ought to be—diverse in ideology, scale, and method.

LEARNING AND ACTIVITY WITHIN E-LEARNING ENVIRONMENTS

The articles included in this issue draw on a literature base focusing mostly on forms of cognitive learning theory. I offer below several key ideas loosely adapted from the various articles, particularly those of Kirschner, Strijbos, Kreijns, and Beers (2004); and Collis and Margaryan (this issue), because of their reliance on activity theory.

Learning can be seen as change through activity. Activity mediates learning. Designs may apply an instructional strategy or model, which may in turn guide learning activities. But it is the activity of the learners that most directly determines learning. Activity depends partly on the implicit instructional strategy, but also on how that strategy is embodied in the materials, and how users employ and adapt those materials for their purposes. This activity-centered position stands in contrast to the more reductive strategy-determinist view found so often in the literature of instructional design, which imputes primary causality to the instructional strategy being applied.

Learning resources invite or afford certain activities. Learning resources, in particular the stimulus materials presented to students, have certain qualities about them that encourage or inhibit certain actions by individuals and groups (Kirschner et al., 2004). Affordance theory sug-

gests that the relation between stimulus and action is not completely mediated by rational intention. Sometimes there is clear intention and deliberate thinking by the learner; other times learners may not be fully aware of how and why they act in certain environments, they just do. Designers of resources and tools need to count on learner intentions, but also on the powerful qualities of the resources themselves. Scientific principles or model-based specifications can partly account for the affordances of resources, but not fully. Other considerations need also to be considered in the design process, including aesthetic qualities, history of local use, and the immediate look and feel (I am thinking here of phenomenological and existential notions of presence and anxiety; see Saito, 2002).

Action, particularly collaborative action, emerges over time within local settings. Action, or intentional behavior, is done by individuals and groups pursuing goals within constrained environments, making use of tools and resources available to them. Thus a particular student, class, or instructor may walk into an environment, review available tools and resources, and fashion activity out of those resources that are at least somewhat unique to their own selves. Teachers see this emergent phenomenon with every new class exhibiting a somewhat unique feel, often called group chemistry or personality. In systemic terms, the "loose coupling" between designer intent and participant action can be frustrating at times to those responsible for the working of the system, but it is a key to successful learning. Emerging activities allow a custom fit between the static resource and the immediate needs of individuals and groups.

Learning outcomes are codetermined by designers and participants. The instructional value of learning experiences is partly a function of designed resources, and partly a result of participants using existing resources in new, unanticipated ways. Designers and instructors typically control what students initially see in a course, but the students themselves (with the instructor) respond to those resources through collaborative action, individual study, and various meaning-making and inquiry activities. All of us have seen well-designed materials fall flat, or in contrast, meager resources maximally exploited, depending on the purposes, both individual and collective, of the users. Those purposes are not themselves entirely predefined; rather, they take full shape through activity in the system. Thus in the end, learners have some legitimate say in learning outcomes of instruction. *Targeted* learning outcomes are not quite the same as *valued* learning outcomes—some outcomes attain value along the way, and some targeted ones may fade in importance.

Learning environments evolve over time. Learning environments are not static resource repositories. Just as participants interact and change over time, so does the environment. Change is most obvious as a course or module is repeatedly taught. But changes also occur while a course is being taught as instructor and students engage the materials.

This process of adaptation and appropriation leads to development of new learning resources. In simple form, students contributing to a threaded discussion are creating learning artifacts as they leave a residual trail of discussion. Submitted projects and reports, if publicly available, become part of the artifact base. Some of these new resources can then become part of the body of resources available to the next group of learners (Collis & Moonen, 2001; Collis & Strijker, 2000/2001; Schwartz, Lin, Brophy, & Bransford, 1999; The PT3 Group at Vanderbilt, 2003).

The typical e-learning environment, constituting a macro shell with some links to the outside and usually richer resources within, undergoes continuing revision depending on the uses and contributions of various groups and individuals. The seeds of a dynamic microculture are thus sown. Perhaps short of an enduring local culture (because of the short-lived residency within many environments), artifacts are nonetheless left behind for others to appropriate as desired. As in a residency school, entering students inherit certain traditions, stories, roles, rituals, perhaps even dorm-room graffiti, from previous occupiers of the space.

Assessment must also evolve and be sensitive to local conditions. Assessment is usually based on preestablished learning outcomes. *Effective* learning happens when students learn targeted objectives. Learning assessment in organic envi-

ronments, however, cannot be strictly tied to past formulations and predetermined values; rather, these must be open to at least partial redefinition. This approach to assessment goes beyond the usual formulas of effectiveness and efficiency. In some measure, the group of participants—the community itself—takes responsibility for negotiating value and codetermining legitimate learning outcomes (along with authorities and outside designers). For example, an instructor of a technical-writing course may come to realize midterm the particular learning needs of her class, and revise a required activity or assessment to suit the emerging needs. This change may be a response to concerns voiced by students, or observations made by the instructor. Assessment within e-learning environments is best conceived as a combination of established measures and newly evolving outcomes and methods.

ASSESSMENT AND AUTHENTICITY

Consider the uses of assessment in classroom instruction. We assess in order to:

- Diagnose and respond to immediate learning needs.
- Determine learning outcomes for outside purposes such as grading, selecting, and system accountability.
- Inform the learner about progress, needs, and current understanding.
- Adjust and improve resources for current and future users.

Assessment serves the same functions within e-learning environments. No doubt, measures of student learning need to reflect targeted learning outcomes. Students need feedback on their performance, occasional remediation and support, and grades or reports to the outside. Instructors can then make use of this same information to revise and adjust instruction, both to the group and to the individual student.

Following principles of situated learning, Gulikers, Bastiaens, and Kirschner (2004) recommended the use of authentic assessment tools and methods. They articulated the meaning of authenticity with respect to assessment and illustrated how assessments could be made more authentic in e-learning environments. While acknowledging traditional functions of assessment outlined above, they stressed the value of authentic environments and correspondingly authentic assessments. Rather than relying on forced-choice exams of student knowledge, assessments should resemble out-of-school activities, such as performing a complex task or creating a solution to a realistic problem.

I confess to some remaining ambivalence about the notion of authenticity. On the one hand, it seems that assessments should be as authentic as their counterpart learning experiences. If an environment provides realistic learning resources and tasks similar to those at work, then assessments should parallel those authentic resources, tasks, and experiences. Seen in this way, authenticity in assessment is valued insofar as it reflects the nature of the learning activities. In their article, Gulikers et al. (2004) also touched on this issue of instructional alignment (Biggs, 1996).

Assessment also helps ground students toward targeted learning outcomes. Imagine a fairly open environment for teaching newspaper writing, full of resources and learning choices, useful to different learners with different backgrounds. All learners, however, must pass the benchmark assessment at the end. The exam would ideally be a complex performance assessment requiring complex problem solving of a semirealistic task. From the learner's perspective, any given resource is a tool, and the learner must decide which of these tools will help accomplish the goal of passing the exam. Depending on prior knowledge, preference, and learning style, a student may choose an authentic learning task, such as shadowing a newsroom worker, writing letters to the editor, or starting up a magazine. Another student, or the same student at another time, may pick up a textbook to read on the sofa. A study group may assign a member to complete a writing tutorial and report back for group discussion. In every case, the final assessment must be mastered in the form determined by the curriculum. One hopes that most curriculums include a good dose of authentic tasks and resources, but excep-

tions are common. For example, an exam, such as those for entrance to medical school, may be mandated. Or the next required course may depend on mastery of certain facts and procedures with no obvious out-of-school context. In these cases, the assessment may be limited in its authentic quality, and learning activities and strategies would probably be similarly limited, reflecting practical constraints of the curriculum.

I do see significant room for growth in technologies for authentic assessment of performances and accomplishments, and look forward to tools and supports for developing authentic assessments more routinely and painlessly. Gulikers and colleagues (2004) have contributed to this agenda in an important way.

GROWING THE KNOWLEDGE BASE FOR E-LEARNING DESIGN

Instructional design is an opportunistic, pragmatic professional endeavor. For help in designing environments, we look to a whole array of theories, models, ideologies, and paradigms. Guidelines from human-computer interaction have a place, as do theories of computer-supported collaborative learning, social interaction, individual and social motivation, discourse communities, and so on. Instructional design theorists often follow a time-honored formula of:

- Absorbing original research in a related discipline.
- Developing a heuristic model of practice based on that original research.
- Offering that simplified model of practice to instructional design practitioners.

In a pragmatic, largely "borrowed" field such as instructional design, translators who convert outside theories for internal consumption rise to privileged status. Hence in instructional design, the most respected theorists are often *not* those closest to instructional design practice, but ironically, those closest to coveted theories in *other* fields, for example, educational psychology and the learning sciences. This can lead to tension between instructional design practitioners, who may feel condescended to, and translation theorists, who offer their insights and services. Practitioners and translators can mitigate this tension by better communication and dialogue, and a mutual willingness to change practice through that dialogue. Appropriating, reformulating, and translating knowledge for use in designing instruction is a needed task, but translators need occasional reminders to stay grounded in real-life problems and practices.

Another means of growing our instructional design knowledge base is to elevate the status of practitioner knowledge, and find forums and means for sharing, testing, and validating that kind of knowledge. A methodology to match this alternative approach would be something like this:

- Identify gifted or successful practitioners of instructional design.
- Probe these expert practitioners for model solutions to design problems.
- Elicit or invite further stories, reflections, tools, and methods embodying successful practice.
- Provide forums for sharing and discussing these knowledge artifacts with the aim of reflecting on, challenging, affirming, applying, or extending—making the artifacts more ready for use.

A story, of itself, is not necessarily to be trusted as a reliable source of knowledge, hence the experimental scientist's distrust of the anecdote. If, however, the story comes from the truly wise professional, we can put more stock in it. And how do we identify the real pros? The more public the sharing and discussion, the better chance the true experts will emerge. Over time, through a process of reflection and dialogue, professional expertise should become recognized and made more available for use.

Note that the knowledge containers are different from the models and procedures developed by translator-theorists. Rather than formal terms and models, there would emerge more stories, ad hoc tools, simple strategies, and localized prescriptions. Ideas contained within these artifacts could be used directly by practitioners, or examined more closely by instructional design researchers using more formal research methods.

Reeves and colleagues (this issue) present an impassioned plea for more "development" or design research in the study of learning-environment design. Design research of the sort described above fits practitioner inquiry very well. Design research could also be less about the practitioner and more about the products and processes of design. I see design research as similar to action research in a number of ways, all valuable to inquiry in instructional design. For example, design research:

- Is locally situated within a professional work or learning context.
- Responds to difficult or "wicked" problems encountered in practice rather than seeking to validate theory.
- Typically, examines whole systems rather than narrow slices of concern.
- Is eclectic in research method.
- Is more concerned with external use and relevance rather than control of internal sources of error.
- Is respectful of practitioner expertise and practices.
- Is somewhat grounded in theory, with theory exploration perhaps a part of the research questions (i.e., theory may be used in framing the study, but will also be a research finding).
- Is aimed to yield knowledge that can be appropriated by practitioners, for example, local, practical understanding and guidance for action over abstract theoretical knowledge.
- Is concerned about values, equity, and justice, not just technical efficiency.

I support emphatically Reeves et al.'s critique of current research and their suggestions for improving research practice (this issue). Again, rather than reflexively borrowing attitudes wholesale from related disciplines, designers need to articulate their own values and stance toward expanding a professional knowledge base in instructional design. Of course, this will only happen by having a continuing dialogue about these issues.

INHABITING LEARNING ENVIRONMENTS

The learning-environment metaphor is vulnerable to critique because of its apparent inside-outside, person-artifact dualism. I suggest that the environment, its resources, tools, artifacts, and participants, all form a single complex system. Interactions are systemic, that is, change in any part may reverberate through the whole system. Participants in the system, in particular, can dramatically change the environment. The group of learners (and teacher) inhabiting the environment is sometimes considered separately when discussing learning communities (Cognition and Technology Group at Vanderbilt, 1994; Palloff & Pratt, 1999; Riel & Fulton, 2001; Wilson & Ryder, 1996). Either emphasis, on environment or the inhabiting community, suggests an open-systems way of thinking about resources, choices, and collaboration.

The contribution of Collis and Margaryan (this issue) gives emphasis to the working groups that inhabit e-learning environments. I was impressed on a number of levels with this article, including its grounding in a practical setting, its eclectic yet well-integrated use of diverse sources of ideas, and its unwavering focus on practical design concerns. I consider this report a good example of the kind of research Reeves and colleagues (this issue) are hoping to see more of.

I believe we have only begun the process of envisioning how online environments can foster learning. A recent report on online gaming environments (National Public Radio, 2004) told of a Sims Online community whose members used the environment in very different ways than those anticipated by designers, developing scandal-rag newspapers, brothels, and other parallels to adult society. Similar interactive environments at some point will be developed in ways that have significant learning potential—and they will surely surprise their designers! Wiley and Edwards (2002) discussed possible instructional uses for large-scale discussion and news forums such as SlashDot.Org, an online community for technology enthusiasts. SlashDot is largely self-organizing and self-administering, with an ingenious system of collaborative filtering and allocation of "karma" points. Innovations along the lines of Sims Onl-

ine and SlashDot are tremendously promising, but better tools and overlays are needed to harness their instructional potential, bringing them into line with valued learning outcomes that can be assessed and accounted for.

In the midst of these exciting prospects, I keep in the back of my mind the critique of the continental philosophers concerning technology (e.g., Malpas, 2003). When resources are ubiquitous, there can be a flattening of experience that reduces difference and leads to a hazy, dreary homogeneity. As online experiences become more commonplace and more real in people's lives, we need to work to make sure they are contributing to our quality of life, and not detracting from it.

CONCLUSION

This is an exciting time to be involved in creating e-learning environments, in spite of the serious constraints that exist. While the articles included in this and the previous issue are noteworthy for their contributions, we designers are at very early stages of the effort, with so much more to be done conceptually and technically. I believe we can make the best progress in this effort by weaning ourselves from over-reliance on any narrow ideology (e.g., psychological science or instructional design methods). Each e-learning experiment is in some way a practical laboratory for learning. Attentive instructors and designers will create room for innovation, then notice positive changes based on those innovations. We need to pay attention to both the design of physical artifacts and the human interaction afforded by those artifacts. At the same time, we cannot surrender the core obligations of instruction, to guide and account for valued learning.

More than ever, instructional design has become a global endeavor. The World Wide Web has helped bring practitioners together in many ways, including our shared interests in designing e-learning environments. In coming years, I look forward to our continued collaboration on these critical issues, using a variety of indigenous and borrowed ideas, focusing on challenging problems of practice, emergent activity, and decision making, and adopting a research attitude well attuned to our design challenges. □

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