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Metaphors for Instruction: Why We Talk About Learning Environments

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WHY WE TALK ABOUT LEARNING ENVIRONMENTS

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Welcome to this special section on constructivist learning environments. The four articles included in this section come from an edited book that will be out shortly titled *Constructivist Learning Environments: Case Studies in Instructional Design* (Wilson, 1996). This special section is a "sampler"--We have chosen pieces representative of the topics and agendas of contributors to the book.

In a way, the current interest in learning environments has crept up on us without a full appreciation of its significance. Clearly associated with the constructivist movement, learning environments call to mind a number of images yet to be explored. My purpose in this introduction is to get clear about what we mean by constructivist learning environments and to explain why the idea is worthy of study.

METAPHORS FOR INSTRUCTION

Consider the different assumptions underlying common metaphors for instruction:

--The *classroom* metaphor suggests that instruction is what goes on in classrooms during 50-minute intervals. Following this way of thinking, instruction is what happens in schools. The emphasis is often on the teacher's presentation activities, since so much school-based instruction is teacher-led and teacher-centered. In everyday language, our use of 'instruction' often rests on the classroom metaphor.

--The *product delivery* metaphor conveys an image of instruction as a package to be exported from its production site to its delivery site. This metaphor has had a number of salutary effects on the field, including the notions of "delivery systems", "production methods", and even "media." Some negative influences may also be observed. For example, the product or package metaphor underlies the radio commercials promoting audiotape programs promising to teach you vocabulary, foreign language, assertiveness, or how to lose weight. This extreme form of the product metaphor becomes the "pill" metaphor: Instruction is a pill that you take to address a learning deficit and magically, you learn something! A sure-fire indicator of the pill metaphor is that the program will do all the work for you; as they say, "All you do is listen!"

--*Systems* definitions of instruction emphasize inputs and outputs, interlocking mechanisms, and self-correcting feedback and maintenance. On this view, instructional interventions must take the whole system into account, and not expect linear cause-and-effect consequences. The full effects of adopting an instructional strategy will reverberate throughout the system and will result in targeted as well as unexpected outcomes. Systems views may concentrate on the "macro" level, which includes the surrounding culture, organization, and facilities (Tessmer & Harris, 1992). In contrast, systems analyses of instruction may focus on the individual learner as a system interacting with instruction or with a teacher. The interactive "conversation" between learner and instructional system has been an important influence on the design of computer-based instruction (e.g., Merrill, 1968; Pask, 1976).

--*Process* definitions tend to emphasize the steps or stages of design, or steps or stages of instruction. Process models are often the flip side of systems models--the systems models identifying the structure and the process models identifying the flow through that structure. Systems design models emphasize process in terms of specific analyses and steps of production. Similarly, Gagné's nine events of instruction emphasize process and are often used as a process template for organizing and sequencing instruction.

We recognize that instruction cannot be confined to a specific time and place, and that classroom-based definitions are inadequate. Indeed, instructional design (ID) can be seen as a reaction against the traditional classroom metaphor, and we have exploited other metaphors where they have proved useful. The product metaphor provides a focus and an object for our work. The systems and process metaphors have led to a language for describing the dynamics of instruction and how one designs it.

For a number of reasons, however, our product, systems, and process metaphors are being stretched of late:

--Multimedia programs fit seemingly within the product metaphor, but they violate established conventions (Allen, Chiero, & Hoffman, 1996). Students may use the programs in pursuit of multiple learning goals, and individual learners may take widely divergent paths through the material. In some ways the multimedia program serves as a terrain or environment within which the learner may explore and navigate.

--The performance-support movement relies on help systems, job aids, and other tools to accomplish what training largely is charged to do--effective performance on the job. These tools may be packaged into a system, but the connotation is very different from that of an instructional system in that the context or setting becomes much more important. Hybrid systems that incorporate elements of performance support and training share the focus on performance within an authentic environment.

--The authentic-assessment movement has placed student evaluation within everyday performance environments (Reeves & Okey, 1996). Many tools of authentic assessment (e.g., portfolios, journals, logs, etc.) are rich in content but lean in quantifiability, making them less useful for driving performance-based systems and processes.

--The constructivist movement has helped to validate a more open-systems view of instruction that is less defined by prespecified objectives and more open to the initiative of students and teachers. The result is instruction that depends more on context-sensitive decisions and resources.

All of these trends have heightened the need for an environmental metaphor for instruction.

The constructivism movement has also heightened our awareness of how people's underlying views of knowledge influence their everyday practice. Table 1 briefly summarizes the influence of different philosophical conceptions on our views about instruction.

If you think of knowledge as...	Then you may tend to think of instruction as...
--a quantity or packet of content waiting to be transmitted	--a product to be delivered by a vehicle.
--a cognitive state as reflected in a person's schemas and procedural skills	--set of instructional strategies aimed at changing an individual's schemas.
--a person's meanings constructed by interaction with one's environment	--a learner drawing on tools and resources within a rich environment.
--enculteration or adoption of a group's ways of seeing and acting	--participation in a community's everyday activities.

Table 1. How different assumptions about knowledge can influence our views of instruction.

The table suggests that our choice of metaphor is not a neutral decision. Instead, the way we tend to think about instruction says a lot about our underlying beliefs. Viewing instruction as a learning environment will tend to have some connection to a meaning-construction view of knowledge. A learning environment is a place where people can draw upon resources to make sense out of things and solve problems. This metaphor can provide a needed complement to the established metaphors in the field.

THE IDEA OF A LEARNING ENVIRONMENT

Like the classroom metaphor, thinking of instruction as an environment gives emphasis to the "place" or "space" where learning occurs. At a minimum, a learning environment contains:

--the learner;

--a setting or "space" wherein the learner acts--using tools and devices, collecting and interpreting information, interacting perhaps with others, etc.

This metaphor holds considerable potential because instructional designers like to think that effective instruction requires a degree of student initiative and choice. An environment wherein students are given room to explore, and determine goals and learning activities seems an attractive concept. Students who are given generous access to *information resources*--books, print and video materials, etc.--and *tools*--word-processing programs, e-mail, search tools, etc.--are likely to learn something if they are also given proper support and guidance. Under this conception, learning is fostered and supported, but not controlled or dictated in any strict fashion. For this reason, we tend to hear less about "instructional" environments and more about "learning" environments--instruction connoting more control and directiveness, being replaced by the more flexible focus on learning. A learning environment, then, is a place where learning is fostered and supported.

Difficulties remain, however, with the idea of a learning environment. For one thing, learning environments seem intrinsically fuzzy and ill-defined. That is, an environment that is good for learning cannot be fully prepackaged and defined. If students are involved in choosing learning activities and controlling pace and direction, a level of uncertainty and uncontrolledness comes into play. This places the teacher or instructional designer in a condition of continuing tentativeness and guardedness. For all their care and attention, the system will often appear chaotic to outside observers and even participants. In short, there seems to be a tendency toward chaos and entropy in open learning environments that are not well-designed and supported.

ID theorists would maintain that the complexity of a learning environment is no excuse for negligence in planning and design to the full extent possible. Teachers must remain vigilant to ensure that an environment includes proper support, guidance, and rich resources and tools. The focus for designers merely shifts from prespecification of complete strategies to providing tools and resources for participants that can be used in modular and flexible fashion as learning needs arise. The job of ID theory is to articulate a set of principles or conceptual models to aid teachers and designers in creating, nurturing, and maintaining environments where students are successful in attaining learning goals.

Another problem lies in the individualist connotation of 'environment.' The metaphor of person-in-environment, at least in psychology, tends to isolate individuals and treat other people as other objects within the environment to be used or manipulated. The picture comes to mind of a nerdy "surfer" of the Internet, exploring all kinds of resources, yet remaining reluctant to relate to a true peer group of learners--electronic or otherwise. The idea of "learning communities" may be more appropriate in this regard. Communities of learners work together on projects and learning agendas, supporting and learning from one another, as well as from the physical environment. Thus in an effective learning environment, an individual's tool-using and information-using activities need to be complemented by the powerful resources presented by other people and by the surrounding culture. In our use of the term, constructivist learning environments are places where groups of learners learn to use tools of their culture--including language and the rules for engaging in dialogue and knowledge generation (*cf*. Morrison & Collins, this issue).

In summary, while a number of metaphors may be appropriate for thinking about instruction, the idea of learning environments is appealing because it reflects values of the constructivist movement in ID, hence the addition of 'constructivist' to the term. One definition of a constructivist learning environment then would be:

a place where learners may work together and support each other
as they use a variety of tools and information resources
in their pursuit of learning goals and problem-solving activities.

This definition can serve as a launching point for this section, but it has no special hold upon the contributing authors. Different views of constructivist learning environments are presented, depending on their focus and the nature of their projects.

OUTCOMES OF LEARNING ENVIRONMENTS

Perkins (1996) reflects on our childhood intimacy with our local neighborhoods, and draws the analogy to learning environments. Growing up in our neighborhood, we "knew our way around"--where to find things, who to ask, what to expect, where to go. Working and solving problems within a learning environment results in similar knowledge. Perkins suggests that we come to "know our way around" more than just neighborhoods:

We can sensibly speak of knowing your way around the stock market, playing baseball, and any discipline, for instance Physics or English literature. To really know any of these domains requires a kind of flexible orientation to what things and places they contain, what resources they afford, and how to get jobs done (see Perkins, 1995, chapter 10).

Cognitive psychologists typically speak about declarative and procedural knowledge, drawing on Ryle's (1949) distinction between knowing-that and knowing-how. Perkins suggests that knowing your way around includes much more:

...having a sense of orientation, recognizing problems and opportunities, perceiving how things work together, possessing a feel for the texture and structure of the domain. It encompasses not just explicit but tacit knowledge, not just focal awareness but peripheral awareness, not just a sense of what's there but what's interesting and valuable, as urged by Michael Polanyi (1958). Better than knowing that, know how, or like names for knowledge, knowing your way around resonates with the notion of a learning environment.

Perkins's point is well taken. As we simplify and package instruction for consumption, the richness of the subject can be bleached away. Learning outside the context of its natural setting can also have this effect. Approaching instruction as a constructivist learning environment is an attempt to preserve the richness and complexity that draws people into a subject in the first place, while providing tools and supports to "learn our way around."

"PARTS" AND "KINDS" ANALYSES

A thing can be analyzed into its constituent "parts" and into its various sub-categories or "kinds" (Reigeluth & Stein, 1983). In an article in *Educational Technology*, Perkins (1991) performs a "parts" analysis of learning environments. He suggests that all learning environments, including traditional classrooms, are made up of the following components or functions:

--*Information banks*. Information banks are sources or repositories of information. Examples would include textbooks, teachers, encyclopedias, videotapes, videodiscs, etc.

--*Symbol pads*. These are surfaces for the construction and manipulation of symbols and language. Examples include student notebooks, index cards, word processors, drawing programs, and database programs.

--*Phenomenaria*. Perkins defines phenomenaria as "areas" for presenting, observing, and manipulating phenomena (aquariums, *SimCity*, physics microworlds, etc.) Of course, *SimCity* is a simulation of real-world cities, and not the thing itself. The key idea is that aspects of the world are brought and made available to student inspection and exploration. To my understanding, phenomenaria are roughly parallel to instructional simulations. I like Perkins's term because it emphasizes the instructional nature of the simulation (contrasted to non-instructional simulations intended for scientific or technical purposes).

--*Construction kits*. These are similar to phenomenaria, except they are less tied to natural phenomena. Construction kits are packaged collections of content components for assembly and manipulation. They may have no clear counterpart in the "real" world. Examples include *Legos*, learning logs, math-manipulation software such as the *Geometric Supposer*, or authoring tools such as *HyperStudio*.

--*Task managers*. In any learning environment, a function of control and supervision exists. Task managers are those elements of the environment that set tasks, provide guidance, feedback, and changes in direction. Task management is often assumed by the teacher, but in constructivist environments, students themselves assume much of this role. A variety of tools and documents support teachers and students in the management of tasks, including assignments within consultations, advisement sessions, strategic planning tools, textbooks, grading programs, assessment devices, devices for conveying rules and expectations, and computer-based instruction programs. Realistically, students and teachers need to negotiate the details of task management, with students assuming greater levels of independence wherever possible. In such cases, the teacher becomes a coach, advisor, and mentor to support student activities.

With these identified components, Perkins distinguishes between "minimalist" and "rich" learning environments:

--*minimalist* learning environments emphasize information banks, symbol pads, and task managers. A traditional classroom would be a lean learning environment with relatively few tools for manipulating and observing content, making exploration and problem solving difficult.

--*richer* environments contain more construction kits and phenomenaria, and place more control of the environment in the hands of the learners themselves. Students are typically engaged in multiple activities in pursuit of multiple learning goals, with the teacher serving the role of coach and facilitator. Rich learning environments could more easily be called "constructivist" learning environments, where as learner environments may be thought of as "traditional" learning environments.

Perkins also notes differences in the amount of guidance or direct instruction found in learning environments. Varying degrees of guidance pose different instructional challenges for the learning environment. As the teacher relinquishes control over content, pacing, and specific activities, students need corresponding increases in decision and performance support. Poorly planned learning environments are vulnerable to failure due to lack of support, leaving students feeling stranded and faced with unreasonable performance expectations. This problem is complicated by the fact that learners differ dramatically in their need for support. Managing the support and advisement function within learning environments is one of the challenges addressed repeatedly by articles in the book.

Wilson (1996) groups chapters into the three categories of learning environments presented below. In truth, most of the projects reported by authors fit more than one category. The simple typology is not definitive, but instead is designed to elucidate differences in emphasis among different learning environments.

--*Computer microworlds*. Students "enter" a self-contained computer-based environment to learn. These microworlds may be supported by a larger classroom environment, but may also stand alone. Examples include the *Sherlock* project reported by Gott, Lesgold, and Kane (1996), and the case-based teaching programs reported by Riesbeck (1996).

Principles for the design constructivist learning environments that are especially relevant to microworlds are offered by Honebein (1996) and Black & McClintock (1996).

--*Classroom-based learning environments*. In many settings, the classroom is thought of as the primary learning environment. Various technologies may function as tools to support classroom learning activities. Examples of classroom-based environments include Dunlap and Grabinger's (1996) Rich Environments for Active Learning (REALs) and Vanderbilt's anchored instruction modules taught in regular classrooms (reported in Young, Nastasi, & Braunhardt, 1996). Osana, Derry, and Levin (1996) report an interesting study of middle-school "Vitamin Wars" where students learn concepts of health and nutrition through a simulation. Using an even more expansive notion of learning via construction, Jonassen, Myers, and McKillop (1996) report on the design of hypermedia projects as classroom learning activities.

We have included two chapters from this section for inclusion here. Savery and Duffy describe the model of problem-based learning (PBL), used in medical schools and other settings. PBL is being adopted by a growing number of schools and programs, particularly in higher education. The second selection relates to "structural knowledge" (Jonassen, Bessner, & Yacci, 1993) and how we talk about it. Morrison and Collins provide an analysis of knowledge-generating cultural forms they call "epistemic games." Epistemic games provide a language for classroom teachers and instructional designers to use in describing knowledge-generating processes. In this sense their work is reminiscent of the early work of Gagné and Merrill, who each contributed to the field by providing a language for describing key instructional components and processes.

--*Virtual environments*. Some computer-based learning environments are relatively open systems, allowing interactions and encounters with other participants, resources, and representations. These "virtual" environments are contrasted with the more closed, self-contained microworld environments. Students interact primarily with the computer in a microworld; in a virtual environment, they interact primarily with other networked participants, and with widely disseminated information tools (see, e.g., Edelson, Pea, and Gomez, 1996). Open, virtual environments have tremendous potential for learning, but they carry their own set of design challenges and concerns. Here Dede presents a vision of the potential for such environments as technology and design models continue to evolve.

We conclude with an article drawn from the last section of the book, which focuses on design methods and assessment. Lin and colleagues from the Cognition and Technology Group at Vanderbilt argue for an approach to the design of learning environments that draws on both ID and cognitive-psychology traditions. Their chapter serves as a proper commentary on learning-environment design, as they urge continued cooperation among the ID and cognitive-psychology communities.

I would like to thank each contributor--both to this section and to the book--for their insights and willingness to report their work to a larger audience. Collectively, their work constitutes a considerable advancement of our understanding. In future issues of this and other journals, I look forward the continued conversation addressing specific methods for designing and supporting constructivist learning environments.

REFERENCES

Allen, B. S., Chiero, R. T., & Hoffman, R. P. (1996). Mapping more authentic multimedia learning environments. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Black, J. B., & McClintock, R. O. (1996). An interpretation-construction approach to constructivist design. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Dunlap, J. C., & Grabinger, R. S. (1996). Rich Environments for Active Learning in the higher education classroom. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Edelson, D. C., Pea, R. D., & Gomez, L. (1996). Constructivism in the collaboratory. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Gott, S. P., Lesgold, A., & Kane, R. S. (1996). Tutoring for transfer of technical competence. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Honebein, P. C. (1996). Seven goals for the design of constructivist learning environments. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Jonassen, D. H., Bessner, K., & Yacci, M. (1993). *Structural knowledge: Techniques for representing, conveying, and acquiring structural knowledge*. Hillsdale NJ: Erlbaum.

Jonassen, D. H., Myers, J. M., & McKillop, A. M. (1996). From constructivism to constructionism: Learning with hypermedia/multimedia rather than from it. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Merrill, M. D. (1968, April). Components of a cybernetic instructional system. *Educational Technology*, 5-10.

Morrison, D., & Collins, A. (this issue). Epistemic fluency and constructivist learning environments. *Educational Technology*.

Osana, H. P., Derry, S., & Levin, J. R. (1996). Developing statistical reasoning through simulation gaming in middle school: The case of "The Vitamin Wars." In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Pask, G. (1976). *Conversation theory: Applications in education and epistemology*. New York: Elsevier Scientific Publishing.

Perkins, D. N. (1991, May). Technology meets constructivism: Do they make a marriage? *Educational Technology*, 18-23.

Perkins, D. N. (1995). *Outsmarting IQ: The emerging science of learnable intelligence*. New York: The Free Press.

Perkins, D. N. (1996). Preface: Minds in the 'Hood. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publication.

Polanyi, M. (1958). *Tacit knowledge: Toward a post-critical philosophy*. Chicago: The University of Chicago Press.

Reigeluth, C. M., & Stein, R. (1983). Elaboration theory. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: An overview of their current status*. Hillsdale, NJ: Erlbaum.

Reeves, T. C., & Okey, J. R. (1996). Alternative assessment for constructivist learning environments. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Riesbeck, C. K. (1996). Case-based teaching and constructivism: Carpenters and tools. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Ryle, G. (1949). *The concept of mind*. London: Hutchinson House.

Tessmer, M., & Harris, D. (1992). *Analysing the instructional setting: Environmental analysis*. London: Kogan Page.

Wilson, B. G. (1996). *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.

Young, M. F., Nastasi, B. K., & Braunhardt, L. (1996). Implementing Jasper Immersion: A case of conceptual change. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs NJ: Educational Technology Publications.