COURSE MANAGEMENT SYSTEMS AND LEARNING PRINCIPLES

GETTING TO KNOW EACH OTHER...

Judith V. Boettcher, Designing for Learning

The refrain from this Rogers and Hammerstein song captures part of the dance between course management systems and core learning principles. Because the first set of CMS applications was developed by faculty, it was often assumed that these systems reflected sound teaching and learning principles. But of course, faculty are concerned with more than pedagogy. Also, technology often takes on a life of its own, as was once embodied in HAL and is now present in the often overzealous automated assistants on our desktops! Once coded into an application, pedagogical theories and philosophies often cannot be differentiated from the tools. What is coded is what you get (WICIWYG).

> "It's a very ancient saying,
> But a true and honest thought,
> That if you become a teacher,
> By your pupils, you'll be taught.
> As a teacher I've been learning
> (You'll forgive me if I boast)
> And I've now become an expert,
> On the subject I like most...
> Getting to know you!"
>
> —***"Getting to Know You,"*** *from* ***"The King and I"*** *(Rogers, Hammerstein)*

The Waves of Course Management Systems

We are already in the fourth wave of course management systems. In the first wave we used the technology to do what we always were doing, such as using the Web to organize the elements of a course, and communicate to students. In the second wave we focused on using the technology to make our habitual processes more efficient. This wave saw the rise of the now common hybrid course or Web-enhanced campus courses in which the best of the Web interactions were integrated with the best of the campus interactions. The third wave created new systems that support efficiency in administration and delivery at the infrastructure and enterprise level. These systems are complex and relatively expensive, requiring ongoing support, upgrades, and maintenance for integrating into campus systems. At the same time, they provide features and capabilities that support a totally online "campus."

The enterprise systems of the third wave are now being deployed and a new fourth wave of innovation is well underway. This fourth wave includes the design standards from the Open Knowledge Initiative (OKI) and its spin-off open source products such as Stellar from MIT, CHEF from the University of Michigan, CourseWork from Stanford, and Visual Understanding Environment (VUE) from Tufts. This new wave includes the IMS/SCORM design standards, the APIs of OKI, and related content and learning object initiatives such as MERLOT, OpenCourseWare (OCW) project at MIT, Reusable Learning Objects project at the University of Cambridge, and many more.

Ten Core Learning Principles

Then what is at the heart of this dance between learning systems and pedagogical values? It's helpful to examine

basic learning principles to find out whether they are "… getting to know all about" each other. The following set of ten core learning principles has been culled from ongoing research on learning theory, instructional design, and the diffusion of technology. The most influential theorist for these principles is the Russian psychologist Lev S. Vygotsky (1978).

Core Learning Principle #1: Learners and learning, faculty mentors and teaching, are shaped by available tools and resources.

Our tools are important to our work. The human mind is still more of a mystery than a known entity. Even the language that describes how our brain works is more suited to computers than the biological ecosystem that it is (Ratey, 2001). What we do know is this—that we are "shaped by the tools and instruments that we use and that neither the mind nor the hand alone can amount to much." (J. Bruner in Vygotsky, 1962).

The principle that we are shaped by our tools, referred to by the pessimists and luddites as technological determinism, has the fortunate corollary—promoted by optimists—that users can shape their tools. The implication is that users should be proactive in the design of their tools. Lessig (1999) argues persuasively that "coded" applications embody specific ideas and beliefs, and often it is the ideas and beliefs of the developers, rather than the designers! The inflexibility of applications and even the difficulty of finding where the flexibility is coded, if it is there, is a frequent source of frustration and dissatisfaction with complex tools.

You might be wondering how the fact that "Tools shape us and we shape our tools" is a learning principle. The course management systems and the learning experiences that we design for our students shape our students' learning. A focus on exploration, problem solving, collaboration with other students, challenging ideas, can cause students to engage and develop concepts, or disengage and retreat.

If tools shape us and we shape our tools, what features of a CMS are essential to ensure effective and efficient student learning and faculty teaching?

Communications and Generation Y

A recent study (360 Youth) on Generation Y (young adults 18 to 30) found that this group uses the Web primarily for communications. In this study, 40 percent of the members of this group reported using instant messaging (IM) daily and 82 percent reported using e-mail daily. These new tools are significantly changing the social lives of young adults, just as it is changing their approach to information.

These communication technologies have resulted in new "digital-age teaching and learning environments" and require a fundamental refreshing of instructional design. We must design for multiple environments and one common feature of these designs must be to support learning wherever faculty and students are. These "wherever" environments must include access to communications and content resources.

The good news is that a collection of communication tools was one of the primary features of the second wave of CMSes and the infinite flexibility of e-mail, group chat, bulletin boards, and Web sites is one of the major strengths of these tools. These tools also support efficiency in that the faculty member no longer needs to serve as the hub of the communications wheel.

Core Learning Principle #2: Every structured learning experience is theatre—with four actors (LeMKE).

Vygotsky suggests that every structured learning experience is composed of four variables. I've devised my own labels for them: the learner (Le), the faculty mentor (M), the knowledge/skill (K) or attitude to be learned, and the environment (E) in which the learning is to take place (LeMKE). In designing courses it can be useful to envision these four variables as actors on a stage, with the faculty member either on-stage or off-stage directing, planning, coaching, and assessing the learners.

Effective CMSes address the actions and responsibilities associated with each of the roles played by these four variables or actors.

Core Learning Principle #3: Learners (Le) bring personalized and customized knowledge to the learning experience, and develop personalized and customized knowledge.

This principle highlights the fact that all learners start with a unique knowledge representation and end with a unique knowledge representation, often much to the dismay of their faculty mentors! The ideal CMS supports customized learning for students. In our current wave of CMSes, discussion boards, postings, and other communication tools provide multiple channels for exploring and expressing ideas and issues. These tools can support experiences that challenge students to accomplish complex, contextual learning.

A futuristic CMS will be able to easily diagnose and assess a student's zone of proximal development. Perhaps the futuristic CMS begins to look like a combination holodeck from the Starship Enterprise linked to real-time events, combining current knowledge with emerging knowledge.

Core Learning Principle #4: Faculty mentors (M) have the responsibility of designing and structuring the course experience.

The faculty mentor defines the structure and content of a course and determines "what is to be learned." Faculty write, select, and assemble materials and design, select, and present learning experiences. The faculty mentor also manages the delivery of the course, including the daily interactions and assessing of students.

Effective CMSes support the interaction of a specific learner with specific environments ...

CMSes can help faculty be efficient in these tasks by providing support for teaching strategies, content management tools, and assessment tools. Also, as time is a real cost for faculty and students, CMSes might find a way to support the use of simulated faculty mentors.

Core Learning Principle #5: All learners do not need to learn all course content/knowledge (K). All learners do need to learn the core or base concepts and to develop useful knowledge.

In all learning theories, the task of learners is to acquire the knowledge, skill, and attitudes that are needed or desired. Vygotsky's theory leans toward the use of problem-based learning (PBL) to do this learning. In contrast, many courses are still structured with the goal of ensuring that knowledge is "delivered." The new course management systems will want to structure tools for knowledge manipulation and experimentation that supports problem solving in context.

Core Learning Principle #6: Every learning experience has a context or an environment (E) in which the learner interacts.

This principle reminds us that learning is rooted in time and place. In Vygotsky's theories, the environment for learning is a fundamental "actor" in the process of learning. We want to design for the "where, when, with whom and with what resources" of a learning experience. Effective CMSes support the interaction of a specific learner with specific environments so that the learning of both core concepts and practical concepts can be customized.

Core Learning Principle #7: Every learner has a zone of proximal development that defines the "space" that a learner is ready to develop into useful knowledge.

Vygotsky describes the Zone of Proximal Development (ZPD) as the "distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under the adult guidance or in collaboration with more capable peers" (Vygotsky, 1986). This zone concept is similar to the general educational principle of readiness, but is very learner-specific.

Another implication is that collaborative and peer learning activities fit well within this theory. Is it possible for CMSes to include support for experiences in which more capable peers support the ZPDs of their peers—while not neglecting the ZPDs of the more capable peers and support the creation of new ZPDs for all learners?

Core Learning Principle #8: Concepts are not words. Concept formation occurs as a series of intellectual operations between the general and the particular with ever-increasing differentiation.

One of the basic insights from Vygotsky's work is that words are not equivalent to concepts. When Hamlet says, "Words, words, words," he is likely bemoaning the use of words as symbols only, without the meaning behind them. As concepts are developed initially, they resemble mere seeds of more mature thought and understanding. Thus the practice of "making a learner's thinking visible" is a powerful practice in revealing the stage of maturity of a learner's concepts. Interactive media involving learners graphically and dynamically clearly plays a role in the concept formation process.

Core Learning Principle #9: Different instruction is required for different learning outcomes.

This design principle (Gagne, 1965) reminds us of the interdependency of outcomes/assessment and the instructional experiences we design for learners. Outcomes are dependent on the specific conditions of the learning experiences and the cognitive and physical readiness and abilities of learners. Tools for customization that would help link experiences to outcomes could enhance this relationship.

Core Learning Principle #10: Everything else being equal, more time on task generally equates to more learning.

This is the most durable learning principle and argues persuasively for the design of engaging, efficient learning resources and experiences. If learning can be as engaging as games and socially rewarding as well, students will choose to be learners more of the time. As learning is intrinsically rewarding, our students will soon outgrow the need for faculty mentors, and hopefully, focus on solving the pressing problems of our complex society.

Future CMSes

The new generation of open source CMSes are responding to the complexity of the learning experience and the teaching and mentoring role. Remembering that we shape our tools and our tools shape us underscores the need for being proactive and thoughtful about the design of these tools.

[Editor's note: An expanded version of this article, with longer descriptions of the Ten Core Learning Principles is available online at www.syllabus.com.]

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