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By Colleen Carmean and Jeremy Haefner

Mind over Matter

Transforming Course Management Systems into Effective Learning Environments

The quick acceptance—indeed, the enthusiastic embrace—of course management systems (CMSs) by college and university faculty and students is leading to numerous questions: What is happening in the generally slow-to-change environment of teaching and learning that is permitting this swift adoption? Why would an often clunky, nothing-new-in-the-software application become so swiftly de rigueur in disciplines across higher education? Why would pedagogy that changes at the pace of a snail on holiday suddenly adopt the CMS for an anytime, all-the-time classroom experience?

The answer to all these questions is threefold, involving (1) the CMS itself; (2) the deeper learning principles addressed by the CMS; and (3) the effective learning environment that is created when these principles are applied to the CMS. The CMS tools, integrated with best practices for deeper learning, allow for a synthesis of appropriate, engaging, and student-centered experiences under a CMS learning environment. The effective use of CMS-bundled technologies thus allows the student to experience "deeper learning"—or what Andrea DiSessa speaks of as the environment in which a student can "learn much more, learn it earlier and more easily, and fundamentally, learn it with a pleasure and commitment that only a privileged few now feel toward school learning."[1]

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The CMS

Perhaps, as critics claim, CMSs are implemented ineffectively more often than not, created for any number of "wrong" reasons: to dump content quickly into an online shell; to provide access to interactive assessment tools and grade-books; to make announcements easily; to respond to student pressure, peer pressure, and/or administrative pressure.[2] Indeed, the concern over poor pedagogical or administrative decisions associated with CMS use is valid. Yet many cynics underestimate the passion of faculty to teach well, to sacrifice time and energy in the redefinition of teaching practices, and to attend to students' growing desire to learn actively and socially at any time.

Students choose a course for its intellectual content ("mind") and not for its classroom or system container ("matter"). CMSs do not provide a pedagogical platform any more than chalk, chairs, and tables provide the classroom learning experience. Students and faculty come to the classroom to learn and to teach, and they expect to find chairs when they arrive. Faculty never protest the pedagogical limitations of using the same chairs that are used in BIO 101. Whether faculty arrange the chairs to face forward or inward, whether they stand behind a podium or sit on a desk, whether they pick up chalk, use overheads, or incorporate flashy PowerPoint slides—these choices come from individual pedagogical styles, personalities, cultures, and character.

A good teacher doesn't worry about loss of pedagogical choice to the chalk, chairs, and tables of the classroom. Neither does a good teacher simply turn pedagogy over to a CMS. Yes, the use of a CMS demands the adaptation of pedagogy. But no, the crucial adaptations are not about the color of the buttons. Critical choices involve which areas of the CMS to enable, which areas to add or relabel, how to set up the course, what to include, when to reveal, what features to disable, and where the faculty's own best practices fall in the balancing act between high-tech and high-touch. The choices belong to the individual faculty, not to the shell of a software application: "mind" over "matter." The value of these choices lies in knowing how a CMS is configured and populated. Without this knowledge, faculty limit the CMS to the one-size-fits-all, straight-out-of-the-box, default choices, many of which may make no sense when used together. For example, there may be no need to have both a "Course Documents" and a "Course Information" button on a site, but the faculty member would need to read the basic instruction manual to know how to turn off one of these buttons.

For many faculty, the look-and-feel consistency is not a distraction from the importance of content. Effective teaching exists not in the setting but in the content, the assignments, and the communication of their passion for the material. For these faculty, the standard CMS container is adequate. For others—those looking for customization and for a reframing of the pedagogical context of the course—unique home-page banners, graphics, new buttons, and navigational links to external sites are available for use with little training or technology focus. In either case, whether a course makes use of only the most popular features of anytime access to the syllabus and assignments or incorporates all the tools and configuration choices into a rich and complex approach to new kinds of learning, it's clear that the CMS experience has captured the interest and imagination of students and faculty alike. For all, the true value of a CMS is in the umbrella access to technology tools and practices that allow effective teaching and engaged learning. As the students might say, "It's about the learning, stupid."

Deeper Learning Principles

Advances in learning research have significantly enhanced the current understanding of learning. In our own effort to understand how today's CMS can be used to create rich learning environments, we focused on the following works: John D. Bransford, Ann L. Brown, and Rodney R. Cocking, eds., *How People Learn;* John Seely Brown, "Growing Up Digital"; Arthur W. Chickering and Stephen C. Ehrmann, "Implementing the Seven Principles"; Theodore J. Marchese, "The New Conversations about Learning"; and W. David Merrill, "First Principles of Instruction."[3] These authors present their own theories for effective learning, but they all touch on several overlapping and important concepts. Using these concepts as a basis,[4] we have developed a core set of deeper learning principles, as presented in Table 1.

Our principles are directed at what we call "deeper learning"—an engaged learn-

Table 1. Deeper Learning Principles

LEARNING IS ...	WHEN ...	SUMMARIZED FROM ...
Social	It involves cognitive apprenticeship.	Brown
	It promotes reciprocity and cooperation among students.	Chickering and Ehrmann
	It offers prompt feedback.	Chickering and Ehrmann
	It encourages contact between students and faculty.	Chickering and Ehrmann
	It emphasizes rich, timely feedback.	Marchese
Active	It is engaged in solving real-world problems.	Merrill
	It is intertwined in judgment and exploration.	Brown
	It is situated in action.	Brown
	It uses active learning techniques.	Chickering and Ehrmann
	Practice and reinforcement are emphasized.	Marchese
	Involvement in real-world tasks is emphasized.	Marchese
Contextual	New knowledge builds on the learner's existing knowledge.	Merrill
	New knowledge is integrated into the learner's world.	Merrill
	Knowledge is applied by the learner.	Merrill
	New knowledge is demonstrated to the learner.	Merrill
	Students have a deep foundation of factual knowledge.	Bransford, Brown, and Cocking
	There is awareness that students come to the classroom with preconceptions about how the world works.	Bransford, Brown, and Cocking
	Students understand facts and ideas in the context of a conceptual framework.	Bransford, Brown, and Cocking
	Learning is concrete rather than abstract.	Brown
Engaging	It respects diverse talents and ways of learning.	Chickering and Ehrmann
	It communicates high expectations.	Chickering and Ehrmann
	It is done in high-challenge, low-threat environments.	Marchese
	It emphasizes intrinsic motivators and natural curiosities.	Marchese
Student-Owned	Students organize knowledge in ways that facilitate retrieval and application.	Bransford, Brown, and Cocking
	Students take control of their own learning: noting failures, planning ahead, apportioning time and memory to tasks.	Bransford, Brown, and Cocking
	It emphasizes time on task.	Chickering and Ehrmann
	It emphasizes learner independence and choice.	Marchese
	It allows time for reflection.	Marchese
	It emphasizes higher-order thinking (synthesis and reflection).	Marchese

ing that results in a meaningful understanding of material and content. This deeper learning experience occurs when learning is

- *social;*
- *active;*
- *contextual;*
- *engaging;* and
- *student-owned.*

Although deeper learning occurs with these five principles, they need not be present either all the time or all at once.

The Effective Learning Environment

By its very nature, the use of technology in the course experience allows a student to develop a different set of lifelong learning skills. Many campuses now have technology competencies built into their outcomes assessment, and the use of CMSs across the curriculum allows for the development of these skills from the moment a student learns to log in. File transfer, messaging, asynchronous messaging behavior, and drop-box features all build a student's sense of place in the world of technology. Although these features alone do not guarantee deep learning or technology literacy, how they are used relative to the deeper learning principles mentioned above can make the difference between a course that establishes an effective learning environment and one that does not.

Deeper Learning Is Social.
With a CMS, this category is very easy to quantify in deeper learning outcomes. An online world is social, anytime and all the time. The CMS container provides quick e-mail access to any and all students and the instructor. Announcements keep the students aware and

up-to-date, whenever they entered the CMS and whenever they were ready and able to listen. Non-oral learners have a better chance of absorbing the information that often slips by them in the oral environment. Diverse learners, shy students, and reflective thinkers have new opportunities to post their views in the asynchronous environment of a CMS.

Students that need help at 2 A.M. the night before an exam often find such help online only moments after an e-mail is sent. The discussion board encourages peer-to-peer responses asynchronously and outside the classroom constraints. Discussion easily becomes many-to-many, as opposed to the instructor-led discussions often found in the classroom environment. As adept as faculty have become in facilitating rich classroom discussions, instructors are often surprised to observe the rich, complex, and independently motivated exchanges that happen without the "sage on the stage" leading the experience.

Virtual chat is used by a new generation of learners to communicate directly with their peers. CMS chat archives attest to the frequent and topical use of the space in late-night, peer-to-peer conversations, held within their own cultural framework.

Group functionality within CMSs allows the instructor to set areas for groups to collaborate in their learning experience. Closed discussions, drop box, and chat rooms can be enabled for students to come to the group projects and assignments online, in real time or asynchronously. Another lifelong learning skill—working as a member of a team—becomes available asynchronously in the CMS environment.

Deeper learning is social, and the CMS provides a rich set of tools to accomplish social learning outcomes. Although John Seely Brown and Paul Duguid advocate face-to-face (F2F) activity as the ideal framework for social learning, practitioners like Carol Twigg point out the great social possibilities that online learning offers.[5] Even John Seely Brown notes that the student who grew up "digital" sees technology as a social tool to support relationships and to help us "help each other, which is the very essence of social learning."[6] Social learning can be asynchronous and anywhere, together and alone.

Deeper Learning Is Active.
A powerful example of active learning within the context of a CMS occurs with the use of the interactive assessment modules. Interactive testing allows for quick, meaningful feedback. Answers can be evaluated, responses can be delivered, and students can be directed to outside sources for better understanding. Students can receive immediate response to misconceptions and errors in critical thinking, as well as obtaining new information, evaluation, and understanding. Exams can be set for multiple-attempt allowances, for points or as preassessments of learning, and as tools to send students to outside sources for evaluation and response. Librarians are creating creative formative-assessment tools to provide hands-on information literacy evaluations from what were previously passive demonstrations and tours of online resources. Formative assessment through interactive testing tools allows the creation of an active learning paradigm rarely seen in the physical classroom.

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Deeper Learning Is Contextual.
The principle that learning can be enhanced by having learners integrate new knowledge into their preexisting framework can be brought to life in the CMS. The instructor may use technologies that are already in use, but these technologies are leveraged through their integrated presentation in a CMS. An excellent example is the multimedia-enhanced, case study activity in which the instructor designs a project built around specific content. The use of sound and video clips to interview "players" allows the learner to see case content in a personified manner.

Real-world problem-solving activities are particularly enhanced through the CMS structure. Working from a well-designed Web-based presentation of the problem, the instructor can break the problem apart for the student in a series of multimedia effects. An engine schematic can be "exploded" via a Flash demonstration, for example. Interactively, the student can explore how various components of the engine work separately and in conjunction with one another. The graphical representation builds on the student's preexisting knowledge of basic mechanics.

The use of hyperlinks to carefully chosen Web sites offers an example of an

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interface between contextual and social learning. By pointing to outside "experts" within a particular discipline and by developing the relevance of these sites to the material at hand, the instructor has married preexisting "scaffolding" to another social learning opportunity. Specifically, the instructor can enhance the use of such links by introducing them in the context of what the students have already studied. For example, within a CMS, a course on Chaucer may link to an assertion made by a scholar at another institution; the instructor could build an interesting essay activity for the students by having them defend or critique the assertion using the Chaucer works that they have read so far. In another example of how the use of outside Web links can be a contextual learning experience, the instructor could require students to construct their own annotated bibliography.

A final example of contextual learning in a CMS is a set of practices in which the learner organizes new knowledge. By requiring students to literally construct their own representations of the new knowledge and share those representations with the instructor or the rest of the class via the digital drop box, the instructor is forcing students to build their own scaffolding of understanding. Instructors can develop activities that ask students to design Web pages, for example, around the new information. Even deeper learning can occur when the instructor requires students to construct PowerPoint presentations or concept maps and to upload and share them via the CMS.[7]

Deeper Learning Is Engaging.
The CMS metaphor particularly shines as a way of encouraging student engagement. For example, the CMS can readily accommodate diverse learning styles by allowing students to access the CMS asynchronously (twenty-four hours a day, seven days a week). If the instructor chooses to include synchronous practices (chat rooms, real-time lectures), then yet another learning style is addressed. In addition, some students are visual learners whereas others are more verbally oriented, and the CMS can offer learning opportunities for both kinds of

students through the use of multimedia (text, sound, graphics, video).

Students can also become more engaged simply by having access to a greater volume of diverse course materials, and the CMS is particularly adept at handling a large volume of course materials such as lecture notes, multimedia-enhanced case studies, discussion boards, live chat rooms, shared drop boxes for group projects, links to outside Web sites, formative student-learning assessment quizzes, and interactive computer-based training.

Finally, student engagement is increased when the instructor uses a CMS to promote self-discovery of course material. Via the Web, connected to Google and electronic library resources, students can find other ways of knowing, other resources that address what the student doesn't know and doesn't understand. Students can also see the immediate value to them when they are asked to construct Webliographies or to design their own working electronic circuits. Independent learners are more engaged learners.

Deeper Learning Is Student-Owned. Learning happens when students choose to learn. Neither the instructor nor the tool can make this happen, but the possibility must be nurtured and encouraged.

With more and more students working more hours, raising children, and balancing responsibilities far removed from campus life, anytime-anywhere learning allows them to come to the learning table whenever and wherever they choose instead of only when the class schedule dictates. It extends the possibility of time on task, an important factor in many learning theories, and it increases choice. The richness of the asynchronous discussion boards attests to the desire of many students to engage in thoughtful learning, collaboration, and questioning at all hours of the day and night.

Ownership can also be fostered through increased access to independent learning resources. Hyperlinks, search engines, online library resources, and extended course-content resource sites make the vast array of related learning resources available to students in moments. Ownership is fostered by a student's ability to seek answers quickly. Online resources encourage resourcefulness and independent learning.

Deeper learning requires student ownership, which can be fostered through access to online resources and through the anywhere-anytime focus on content, discussion, reading, reflecting, and learning.

Summary

We have synthesized various theories on learning into five core deeper learning principles: deeper learning is *social, active, contextual, engaging,* and *student-owned*. When well-constructed practices around these deeper learning principles are used within a CMS, incredibly robust and effective learning environments are created. For instance, the use of a discussion board in an asynchronous CMS is a combination of both the social and the engaging learning principles, and the result is a powerful opportunity not only to engage the student with the social

nature of learning but also to encourage the student to take ownership in the learning process. Likewise, the use of multimedia-rich case studies not only is engaging and encourages ownership but also develops a contextual learning approach. These are only two examples of how a few well-crafted instructional activities can lead to a very rich, student-centered learning experience.

The combination of learning principles and CMS tools thus results in a learning environment that is greater than simply the sum of its parts. This potential, often strived for but much less often realized, continues to bring faculty and students to the CMS with an excitement and determination that rests on the hope of deeper, more meaningful, engaged learning. Yet the quick and enthusiastic embrace of these commercial products will be wasted if an understanding of best practice is not realized. Some faculty will always use CMSs as simply quick navigational resources to the syllabus. The possibility of deeper learning lies with both students and instructors: when they understand their diverse needs and requirements and bring these to the CMS, they can create their own effective learning environment.

Notes

1. Andrea A. DiSessa, *Changing Minds: Computers, Learning, and Literacy* (Cambridge: MIT Press, 2000), p. ix.
2. Gary Brown, "Where Do We Go from Here?" *Technology Source*, January/February 2000 <http://ts.mivu.org/default.asp?show=article&id=667> (accessed September 10, 2002); Peshe C. Kuriloff, "One Size Will Not Fit All," *Technology Source*, July/August 2001 <http://ts.mivu.org/default.asp?show=article&id=899> (accessed September 10, 2002); Lucio Teles, "The Use of Web Instructional Tools by Online Instructors," *Technology Source*, May/June 2002 <http://ts.mivu.org/default.asp?show=article&id=966> (accessed September 10, 2002).
3. John D. Bransford, Ann L. Brown, and Rodney R. Cocking, eds., *How People Learn: Brain, Mind, Experience, and School* (Washington, D.C.: National Academy Press, 1999); John Seely Brown, "Growing Up Digital: How the Web Changes Work, Education, and the Ways People Learn," *Change*, March/April 2000 <http://www.aahe.org/change/digital.pdf> (accessed September 10, 2002); Arthur W. Chickering and Stephen C. Ehrmann, "Implementing the Seven Principles: Technology as Lever," *AAHE Bulletin*, October 1996 <http://www.tltgroup.org/programs/seven.html> (accessed September 10, 2002); Theodore J. Marchese, "The New Conversations about Learning: Insights from Neuroscience and Anthropology, Cognitive Science and Work-Place Studies," in AAHE Conference on Assessment and Quality, *Assessing Impact: Evidence and Action* (Washington, D.C.: American Association for Higher Education, 1997) <http://www.aahe.org/pubs/TM-essay.htm> (accessed September 10, 2002); W. David Merrill, "First Principles of Instruction" (submitted for publication to Educational Technology Research & Development, 2001, available online at <http://id2.usu.edu/Papers/5FirstPrinciples.PDF>) (accessed September 10, 2002).
4. We participated in lively discussions at the National Learning Infrastructure Initiative (NLII) May 2002 focus session on Learning Environment Design in Vancouver, B.C. (see <http://www.educause.edu/nlii/meetings/nliii022/>), and arrived at a set of core principles that encompass the concepts of the authors noted. The five principles were put forth for further development through a Web site and live discussion board set up for the session participants at our NLII research Web site: <http://www.west.asu .edu/nlii>.
5. John Seely Brown and Paul Duguid, *The Social Life of Information* (Boston: Harvard Business School Press, 2000); Carol Twigg, "Distance Education: An Oxymoron?" *Learning MarketSpace*, July 1, 2000 <http://www.center.rpi.edu/LForum/lm/july00.html> (accessed September 10, 2002).
6. Brown, "Growing Up Digital," p. 20.
7. These constructional practices are best seen in the mind-tool approach favored in David H. Jonassen, *Computers in the Classroom: Mindtools for Critical Thinking* (Englewood Cliffs, N.J.: Merrill, 1996).