This paper has three aims; first, to briefly describe the aspirations of commercial Web course management systems (WCMS's) in education. The second aim is to examine the applicability of familiar instructional design models and theories to the requirements of Web course management systems (WCMS's). Finally, this article presents principles of Web course management systems in a three phases that describes how educators' intuitions, personal preferences and prior educational experiences shape the management of their Web courses.

Web Course Management Systems (WCMS's)

Several Web-based products offer educators information and design tools for managing their Web courses. Since these tools are customarily grouped together under a course name and protected by a password, they can be considered a system; a Web course management system (WCMS). According to systems theory, systems can be open or closed (Principia Cybernetica Web, 1998). Since Web courses interact with systems outside of the course, they are considered to be open systems. Open systems in fact, cannot survive without continuously exchanging information with systems outside of itself, in the environment. Similarly, an open system like a WCMS must interact with other systems outside of itself to thrive. The figure below shows an interaction between two components of a system: the input, that which enters the system from the environment, and the output, that which leaves the system for the environment. In order to speak about the inside and the outside of a system, we need to be able to distinguish between the system itself and its environment.

In a Web course management system (WCMS), the password protection acts as a boundary. The output of the WCMS is either a direct or indirect result from the input. The transformation of input into output by the system is usually called throughput, also known as processing.

Interface design

The interface designs of these Web course management systems (WCMS's) are remarkably similar, with many of the same features offered to instructors and students. Most systems present clickable icons spread out in rows on a graphical interface, much like Web Course in a Box shown in Figure 2.

Examples of tools provided in most comprehensive WCMS's include: online chat, student progress tracking, group project organization, student self-evaluation, grade maintenance and distribution, access control, navigation tools, auto-marked quizzes, electronic mail, automatic index generation, course calendar, student homepages, and course content searches.

Comprehensive WCMS's in education

These are a sample of comprehensive WCMS's, and the some of the claims they’ve been making for their use in education.

- **WebCT** (Goldberg, 1997) was developed in 1996 at the University of British Columbia, Canada. WebCT purports to facilitate the creation of Web-based educational environments, presumably by non-technical users. WebCT is supposed to enable the development of entire online courses, or to simply publish materials that will supplement existing courses. Results of a recent study (Mann, 1998) however, showed that educators with knowledge of instructional design but limited technical knowledge of WebCT needed more technical and design assistance than currently offered in their Web tools and contextualized help.

- **LearningSpace** from the Lotus Corporation (1998) was developed for creating and delivering education and training. LearningSpace purports to combine "total solution" distance learning with a collaborative, educator-facilitated environment to match the...
benefits of face-to-face classroom discussion. The developers aspire to provide course creation and management tools to create a place where people can train and learn together.

- The developers of TopClass at WBT Systems (1997) in San Francisco, California believe that their product can manage course delivery and support training and education over the Internet and campus intranets. TopClass utilizes templates and built-in threaded discussion capabilities that apparently will permit educators with little programming expertise the ability to create online courses. Like the other programs of this type, TopClass claims to be able to support collaboration, and to manage all students and educators and assigned course material on the server.

- Virtual-U was developed by Harasim and Calvert (1997) at Simon Fraser University, Canada. The developers suggest that their system will inspire educators to customize their Web course design, delivery, and enhancement. Virtual-U is described as a user friendly, flexible, dynamic learning environment that also purports to require no programming knowledge to operate. Learners electronically submit their assignments, and educators organize and comment on submissions. The components of Virtual-U include: a group conferencing system, a course structuring tool, a grade book, and system administration tools.

Smaller WCMS's in education

Not all Web course management systems are so large and inclusive. The following list outlines systems with fewer features. Notably however, the number of educational claims remain the same, if not more than their larger competitors.

- WebFuse (Jones, 1999) is an Australian Web publishing tool, originally designed to help build Web sites at Central Queensland University. WebFuse claims to help authors create effective Web sites with a minimum of technical knowledge.

- WebTeach (Hughes, 1995) is another Australian product that purports to facilitate discussions and the use of familiar classroom teaching strategies within their virtual classroom. WebTeach does not focus on supporting the development and uploading of web pages, nor on student administration.

- Zebu is designed by MC2 Learning Systems (1998) in Canada. Zebu is supposed to arm teachers with the tools necessary to help students create dynamic online collaborative products, whether among students in-class or with a class in another part of the world.

- eWeb (ECT Inc, 1995) is an American product for delivering training, test preparation, and pre-certification evaluation. Apparently using eWeb, learners can study and practice until they know the material they need to learn. eWeb can be used on the job, or within any organization that places a value on knowledge and competence. Apparently, the collaborative features of eWeb make it the ultimate tool for Home School educators and students.

- Web Course in a Box by MadDuck Technologies (1996) in Richmond, Virginia even claims to have been “the first web course management system”; a curious assumption given the relative infancy of Web browsers and the much longer history of command-line Internet systems, such as PARTICipate (see CoNet, 1998) introduced in 1981, and CoSy (see Softwords, 1995) initiated in 1985.

Whereas Web course management systems like these can offer instructors of higher education a new means of self-expression and exciting new opportunities for student interaction, most experienced educators are not fooled by the assumptions and claims of the developers. We know that there is no “total solution”; that their current status of online collaborative environments in no way matches the variety of classroom interactions and discussion. We also know that the provision of software management tools in no way guarantees continuous student collaboration. And we know that self-paced learning has had a long history of student attrition due to the huge motivational investment required on the part of the student.

A personal WCMS

One instructor even developed his own Web course management system. Disillusioned by the pedagogical awkwardness apparent in commercial systems, Dr Ron Oliver at Edith Cowan University in Western Australia created one to his own liking. Rather than waste time exploring rows of icons, Oliver’s students are assigned to groups to read a problem, reach a consensus, and enter text directly into the Web form provided-all on one web page. In this way, the students work on one web page and deal with the content on that one page, instead of flipping forward and back between web pages, like other systems tend to do. Moreover, Oliver responds to only one summary posting to every 4 or 5 students, instead of dozens of postings from...
individual students. The key to his solution was not the features in his software, but rather Dr. Oliver's decision to design the instruction in a problem-based learning method that could be interpreted in a Web browser. Could he have applied problem-based learning methods to any of the WCMS's described above? Probably, yes. However, it was not exactly evident in the tools, help menu, nor of instructional design literature how to accomplish it. In fact, in an arena in which it could, and should provide a beacon for educators, instructional design hasn't actually provided much assistance at all.

**Instructional design**

Familiar models and theories of instructional design (e.g., Dick & Carey, 1996; Gagne, 1985) have been found to be too static (Boshier, Mohapi, Moulton, Qayyum, Sadownik, & Wilson, 1997; Mann, 1998), inert (Yang, Moore & Burton, 1995), or unusable (Wild & Quinn, 1998) for prescribing the conditions of interactive learning for all learners in all settings. Some (Tergan, 1998) believe that instructional design models and theories are based on psychological and educational theories that are simply too broad in scope and too rigid for delivering instruction on hypermedia systems like the Web. For this reason, models and theories of instructional design are hardly ever used with contemporary authoring, multimedia and hypermedia systems, and when they are, are regularly misapplied (Gros, Elen, Kerres, Merrienboer & Spector, 1997).

For these reasons, a few principles of Web course management systems in higher education are presented next in a theoretical framework to augment or even replace instructional design methods. "Principles" in this sense, differ from criteria or "standards" on the one hand, and "guidelines" on the other, as suggested by Hammond, Gardiner, Christie and Marshall (1987). "Principles" are generally taken to be more abstract recommendations posed in conceptual or abstract terms rather than as design action, while "standards", like the quality criteria for Internet resources (Wilkinson, Bennett and Oliver, 1997), are intended to be unambiguous as possible and are stated as requirements. The rationale for proceeding with "principles" instead of ready-made "guidelines" is a consequence of the apparent shortcomings of guidelines cited in the literature (Hammond, Gardiner, Christie & Marshall, 1987). Principles are used here then, to better understand how specific instructional methods support student learning, particularly when instructional design procedures cannot be applied directly. For these reasons, research-based principles of Web course management within a theoretical framework are presented next.

**Phase theory**

Central to phase theory is the view that educators learn to manage their Web courses in phases. This principle was derived from an observation by Schrum and Berenfeld (1997); that educators gradually implement educational telecommunications in stages: first, as an extracurricular activity; then, for uploading resources to be used by students, and; third, for tutoring students in discrete computer-mediated communication modules. In this paper, the term "Web course management system" replaces the more general term "educational telecommunications" to reflect the current trend toward inclusive educational database retrieval and textual communications services offered together on a graphical interface behind a single password. And "phases" replaces the term "stages" to reduce the focus on what teachers should know, and emphasize what teachers already know about lesson enhancement, resource-based teaching and learning environments.

Furthermore, the "phasing" term was derived from the Merriam Webster Dictionary (1998), which defines a "phase" as a distinguishable part in a course, development, or cycle (e.g., still in the early phases of her career). The phasing method itself was derived from the emergent philosophy of Julnes and Mark (1998), which involves inquiry, personal preference, intuition and hands on experience with Web course management tools. Notably, only the phases are distinctive, the tasks are not. So educators working in different phases of Web course management can be doing similar tasks for different purposes. For example, "uploading files" is common to all phases, but describes nothing about phasing per se.

In a WCMS then, concepts such as "collaborative environments", and "teaching resources" are clustered together into distinctive "phases" to constitute phase theory of Web course management - as well as the professional development of educators.

A theory is a cluster of concepts organized together to form a whole. The concepts in the cluster maintain a flexibility and fluidity so they can be used in a variety of ways in addressing different problems (Wilson, 1997, p. 22).

Together, the cluster of concepts constitute a theory of Web course management- and of professional development of educators, and is meant to explain something or to help us understand the way things are within a certain domain (Wilson, 1997). There are three "phases", namely: 1) lesson enhancement; 2) resource-based teaching, and; 3) online learning environment.

**Phase 1: lesson enhancement**

Lesson enhancement is the initial phase of Web course management and is
often introduced to students as an extracurricular activity. Usually with help from the resident technologist, the educator will decide to introduce the Internet or Web-supported material as extra-curricular activities to enhance the curriculum. Three types of lesson enhancement are classified for this phase, as follows: 1) immersive collaborative environment; 2) online self-expression; 3) online lesson assessment.

**Immersive collaborative environment.** The goal of an immersive collaborative environment (ICE) is to “significantly enhance the instructional capability of a Web course from a mere text and resource delivery to a dynamic, evolving interaction concerning instructional content” (Bannan-Ritland, Harvey & Milhelm, 1998). An ICE can be any combination of threaded, electronic bulletin boards, newsgroups, and chat rooms supported by the WCMS. Most of the Web course management packages listed above can provide these capabilities.

**Online self-expression.** Like creative writing, Web course management can be a medium of self-expression and of public scrutiny. One way that a educator can initiate Internet experiences with her students is to design single web pages that integrate graphics, text, a sound prompt and video clips as an extra-curricular activity to enhance her instruction.

**Online lesson assessment.** An educator can choose to enhance a lesson with a lesson assessment feature. Lesson assessment can be group or individual. Setting-up and maintaining discussion topics in a Computer Conference or Chat Room, and monitor student participation throughout the conference around current issues (Boshier, Mohapi, Moulton, Qayyum, Sadownik, & Wilson, 1997), and assigning grades on an analysis of the textual output (Gunawardena, Lowe & Anderson, 1997).

Lesson enhancement describes the educator’s initiation into Web course management. Educators after working in lesson enhancement said they should not have used so many features; the process was overbearing and at times difficult to manage- with many students and too many student postings, there can be too much variety to handle for one educator. Terms such as “sharing opinions”, “interacting with students”, “socializing”, “socialization”, and perhaps even “social online resource pack);

- **Resources that support a learning activity** (i.e., online manual, online lab guide, a seminar guide, a fieldwork guide; online projects facts guide, or an online work placement guide);
- **Resources that support a learning process** (i.e., online skills guide, skills profile, or an online student log); and,
- **Resources that build on other resources** (i.e., online textbook study guide, online readings guide, or an online lesson outline).

Resource-based teaching may require a re-definition of pedagogical goals, restructuring of curricular offerings, provision for educator training and support material, and sufficient online tools for the collection of student data. Terms like “stockpiling”, “massing”, “stacking”, “accessing”, “accumulating” might well define the linguistic framework of the resource-based teaching phase.

**Phase 3: Online learning environment**

An “online learning environment” is the third phase of Web course management. A learning environment is a place where learners work together and support one another as they use a variety of tools and information resources in their pursuit of learning goals and problem solving activities (Wilson, 1995). The focus is on meaningful learning that is active and involves the students in learning by discovery. Five components comprise the learning environment, adapted from Perkins (1991), namely:

- **Information banks** (e.g., an encyclopaedia);
- **Symbols pads** (e.g., a note pad area);
- **Construction kits** (e.g., DreamWeaver and Flash-It, Netbook and SpeakEasy);
- **Phenomenaria** (e.g., Science Space);
- **Online microworlds** (e.g., Biology-Guided Inquiry Learning Environment, Collaborative Notebooks);

"Lesson enhancement is the initial phase of Web course management and is often introduced to students as an extracurricular activity. Usually with help from the resident technologist..."
Virtual environments (e.g., SIBLE & SSciVEE).

A number of Web sites characterize meaningful learning by the design of the subject matter. "Living History" projects for example, teach history through student's re-enactment of historical events (Bissell, Manning, & Rowland, 1999); through role-playing, simulation and re-enactment. A good annotated listing examples are provided at the School of Education web site at the University of Saskatchewan. Learning environments apply principles of cognitive psychology to the Web course. This is particularly true of learning projects characterized by an active or collaborative learning approach (Bissell, Manning, & Rowland, 1999). Terms such as "exploring", "experimenting", "constructing", and "knowledge transforming" adequately defines the linguistic framework of the learning environment phase.

Summary

Web course management systems have become ubiquitous in online education. The first aim of this paper was to present and briefly describe a few contemporary WCMSs. Developers of these systems claim to offer online tools that require minimal technical skill and assume a cursory knowledge of instructional design. They normally do not recommend instructional design models and theories of any kind. Rather, developers assume that educators will employ the most appropriate stochastic methods necessary and sufficient to manage their own Web courses. "Stochastic methods are at least partially random or uncertain, not continuous" (Heylighen, 1999). Stochastic methods employ a hit-and-miss approach to Web course management that describe human interactions in terms of system tools as a function of system performance. These claims, as well as the stochastic methods associated with them therefore, should be considered suspect under certain conditions (Mann, 1998). Perhaps over time, we will learn to temper our enthusiasm to upload files and associate icons. Perhaps in future it won't require so much strength of human will- to remain close to what we already know to be pedagogically appropriate.

The second aim of this paper was to examine the applicability of familiar instructional design models and theories to the requirements of Web course management. There is a consensus in the educational literature about difficulties in adapting familiar instructional design models and theories to the requirements of Web course management.

Finally, phase theory was proposed as a framework of principles by which educators might discuss their ideas about controlling technology and organizing learning materials within relative to one's own intuitions, personal preferences and prior educational experiences. Phase theory is a descriptive theory of professional development within the domain of Web course management, not a decision theory of instructional development per se. And this theory was deemed to be timely, as "there is a need for more new instructional theories...to offer guidance on how distance learning technologies can be used effectively" (Reigeluth & Squire, 1998, p. 46) to reflect the current increased emphasis on alternative perspectives in the field (Richey, 1997).

A crucially important and challenging next step is to develop in greater detail the theoretical bases, research agenda, and methodological approaches for evaluating the phases of Web course management. As described in this paper, the three-concept cluster of phase theory is both teleological and taxonomic. The taxonomic classifications of phase theory are divided into groups based on shared characteristics, as suggested in Seels (1997). The shared characteristics are teleological; that is, based on shared adaptation or purpose. The taxonomy "consists of systems of categories constructed to fit empirical observations so that relationships among categories can be described" (Seels, 1997, p. 15). It seems likely for example, that empirical observations about phasing might best be assessed by collecting and analyzing think-aloud protocols. These issues constitute new avenues of study and the topic of another paper.

References


