

TEACHING as Coaching

By Newton Smith

1. New Technologies in Teaching and Learning

Colleges and universities today have to constantly scramble to keep up with the latest technology, where the advancements seem to be progressing geometrically in keeping with Moore's law. Every college and university classroom, regardless of the discipline, has been profoundly affected. The Internet, computerization, and the development of information technologies have changed the way we think about knowledge, the way we think about teaching and learning, and perhaps even more important, the way we think about the relationship between economics and education. But the most dramatic change is not even at our doors yet: it is our future students, those elementary and middle-school kids who have always had computers in their lives and who will enter our classrooms with expectations that will dwarf the technological capabilities we have today.

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HELPING
STUDENTS
LEARN
IN A
TECHNOLOGICAL
WORLD



Knowledge

Virtually every academic discipline is perceived differently because of the Internet and the information available through computers. The content, the principles, and even the very facts of what we have traditionally taught are now seen as merely nodes or points in a network of an expanding, interconnected web of information growing at an exponential rate. Keeping up with the burgeoning information is impossible. At a click of a mouse, students can download information that is at the cutting edge of a discipline's research, and they can get the lecture notes or streaming videos of world-class scholars and teachers. They can see inside the caldrons of volcanoes, can gather data of river sedimentation in the Amazon, can listen to the dialects of aborigines, and can view the cleaning process used on the Sistine Chapel, all without leaving campus. The "facts" that most academics learned only a few years

ago while getting Ph.D.'s are already becoming obsolete. A biology student of the 1960s simply would not recognize the biology class of today. This expansion of information has shaken our traditional concepts of knowledge. Everything that is passed to students as knowledge is temporary and subject to revision.

Teaching and Learning

Only a few years ago, educators were saying that students did not respond well to lectures, so faculty incorporated group work and more discussions. In those days, the teacher's job was still primarily a matter of delivering content. The Internet has changed all that. The teacher's job now is to facilitate, to guide students through the process of gathering information, testing its validity or applicability, and creating meaningful conclusions or solutions. The content that used to be found in books or texts is now on the Web or in computer databases. Of course, faculty still provide some of the content and structure, but the focus has shifted—perhaps permanently—from the professor as the expert dishing out information to students at his or her feet. Knowledge now is constructed, teaching is akin to coaching, and learning is active or interactive. The classroom is no longer isolated from the world, nor is the campus. Colleges and universities have always competed for students, but today's students can take courses from Ivy League universities or online institutions while still enrolled in their own institution. Small colleges and universities risk being marginalized or becoming economic backwaters unless they follow or adapt the educational protocols of the large endowed universities and their corporate partners.

The Relationship between Economics and Education

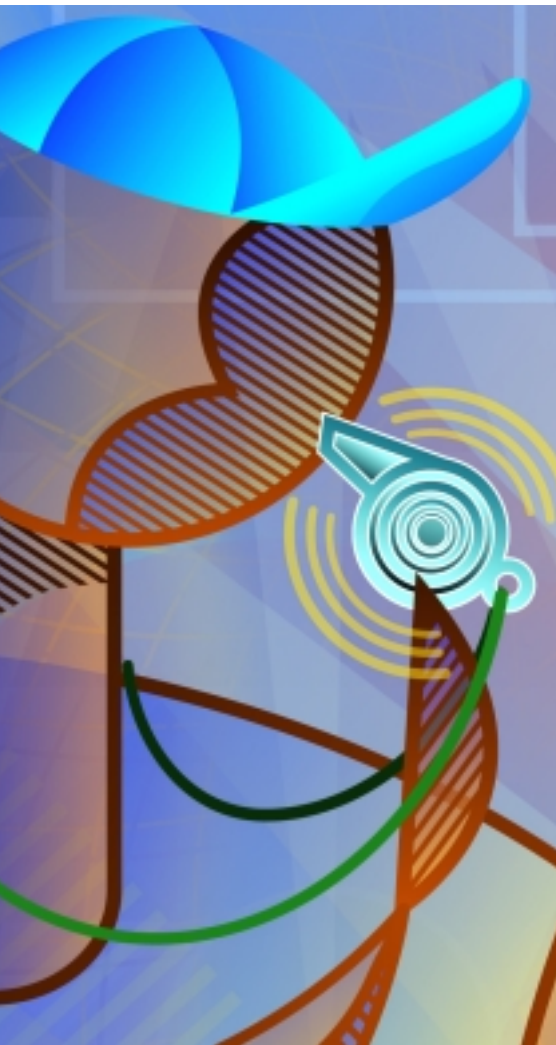
Perhaps the phrase *corporate partners* seems out of place to some. Nonetheless, the impact of economics and the corporate model on higher education will more profoundly affect college and university classrooms than all the new technologies. Education, once considered a necessary function of society, is now viewed as an economic entity, with profitability often determining educational decision-

making. Surprisingly, education is seen as a powerfully attractive economic opportunity—according to some, the next wave of e-commerce. Venture capitalists, corporations, textbook publishers, and higher education institutions themselves are rushing madly to develop online courses, virtual universities, education portals, and courseware. Everybody wants in on the action, hoping to cash in on what used to be the ivory tower of impractical knowledge. Wall Street analysts even have a name for our future: Educational Maintenance Organizations, or EMOs. Some forecasters predict that colleges and universities as residential institutions will become relics in the near future.

A few in higher education claim not to be worried about the economic impact. How can businesses organize generally unmanageable faculty? In his "Digital Diploma Mills" articles, David Noble argues that faculty will organize themselves around intellectual property rights, if nothing else.¹ Others point to the expense of setting up online or distributed learning courses, saying that the retention rate is still a problem, that the number of students an instructor can manage is no more than about twenty, and that students still prefer face-to-face instruction. But anyone who thinks that education is not the next e-commerce or that the corporate model is not now the dominant model for colleges and universities has been ignoring the e-mail and position statements from administration. These messages suggest that course materials be put online, that the college/university-adopted portal and courseware products be used, that distributed education be considered as an option to residential classes, and that class sizes either be maintained or be canceled. Even the vocabulary is changing: students have become "customers," classroom activities have become "delivery techniques," and tenure is now followed by post-tenure review for "accountability" reasons.

Future Students

The biggest impact of technology on classroom instruction, however, will come from the students now in elementary and middle school. Kids who grew up on the images created by Flash, Fireworks,



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streaming video, Shockwave, MP3s, and other multimedia programs will not sit still for a lecture. Students today have a CD collection they burned themselves from music downloaded with Napster and other file-sharing programs. They have computer software that many college and university departments cannot afford. They come to classes with MP3 players, earphones, cell phones, and personal digital assistants (PDAs). They get antsy if they cannot open their e-mail or contact their Instant Messenger cohorts during class. And if an instructor stumbles in his or her thoughts and takes too long to get to the point, students will figuratively click on another “site”—just as they do with Web pages that load too slowly.

Changes and Implications

Campus portals will soon revolutionize the nature of the higher education institution. Traditional residential students experience personal interactions with peers, faculty, and an institution to which they will feel bonded for much of their life: a learning experience ultimately far more important than the knowledge they were taught. The distributed learner claims to seek the knowledge first but then complains because the typical delivery is impersonal and cold. But a portal is a personalized view of the world from within a cohort; it allows the institution to adapt to students’ unique and changing needs. Through a portal, students can apply, enroll, see their transcripts, register for classes, migrate to the library, e-mail their professors, participate in threaded discussion groups, and chat with friends.

Most portals also are integrated or packaged with a courseware product such as Blackboard, WebCT, or eCollege. Campuses have adopted these products because they offer a structural consistency across disciplines, a wide variety of options, a coherent look, and manageable administration and training. These packages allow faculty to mount their syllabi, load their Web pages, create activities, access students’ work, post relevant texts or material, and provide links to additional materials or references. Faculty can then give tests, score and grade classwork, and provide comments on students’ progress. Within the classroom shell, students can participate in discussion groups or chat rooms, receive individual or group critiques, take tests, keep up with their running grade average, and gain access to their e-mail, their favorite Web sites, and the current news.

The classroom implications of these new technologies are dramatic. As a consequence of campus-wide adoption of courseware packages, most courses will become Web-based and Web-supported classes. Indeed, many teachers will be asked to teach distributed learning classes online. The meeting place will become the course Web site rather than the classroom, and much of the classroom activity will be through either synchronous or asynchronous connections outside of the class time. This implies a big change in teaching styles. Few faculty are well prepared to create an effective Web site, much less to create an interactive electronic learning environment. Adapting to the new format will force instructors to become project directors, facilitators,

coaches, and information managers rather than content deliverers. Campuses will need to provide a good deal of faculty development and technical training to utilize these developments.

Another consequence of current technology and the pervasiveness of the Internet is the use of multimedia. It is not enough for an instructor to create a PowerPoint presentation. To really make an impression, faculty must have video clips, audio samples, animations, dramatic graphics, and maybe a little bit of virtual reality on top of the usual texts. Faculty will need to know how to use digital video and still cameras, to capture sound and music, and to edit everything together onto a CD-R. Furthermore, students expect access to these same technologies. The implication is clear. Campuses will need to develop supported multimedia labs accessible to faculty and students on a project basis. These labs will require a large amount of memory, bandwidth, and advanced software. But the payoff is that the most talented students and faculty will be able to show their stuff and make a name for their institutions.

A fortunate consequence of the technologies available today and on the horizon is that technology is becoming cheaper (relatively speaking). Ubiquitous computing is becoming more affordable and easier to achieve. With the rapid expansion of wireless capabilities, especially with handheld devices, the cost of outfitting classrooms for computer access is dramatically decreased. With one computer and screen and an antenna-like access point, an ordinary classroom can

be converted into a computer classroom or lab.

Are there technologies that have the potential to change everything? Of course. Wireless technologies and hand-held or laptop devices capable of Web access, cell-phone connection, e-mail, and two-way connections will dramatically alter the nature of the classroom and the learning environment. In addition, the growth of XML and XHTML will lead to a restructuring of information available on the Web. Within the next few years, I anticipate a kind of Web-page cataloging akin to the Library of Congress Classification System or the Dewey Decimal System. A parallel development in the field of data mining should create search and data-recovery systems heretofore unknown. Finally, developments in computer chips could radically change the nature of what we know and do.

2. Return on Investment

Academics were skeptics of the printing press, the typewriter, the telephone, the

television, and the computer. Each of these technologies required enormous capital investments and, according to some critics, did little to enhance knowledge at the time. Faculty are supposed to be skeptical of the value of technology to positively influence teaching and learning. It's their job to question values. But technological changes will be adopted whenever they become economically feasible and culturally acceptable.

To suggest that investing in traditional teaching practices would have produced better results than investing the same amount of money in technology is almost ludicrous. What exactly would the money have been spent on? For decades, money has been poured into education, tuitions have risen, enrollments have gone up, and the education level measured by school years has increased in the population, yet most teachers maintain that classes were better and students learned more in previous decades. The truth is that the traditional approach was running out of steam because the audi-

ence was changing. More money would not have helped.

Colleges and universities cannot cling to the traditional model much longer if they want to continue to be relevant to students and the culture at large. Let us rethink the process of education. Our focus should be learning, not teaching. If students come to us with PDAs and cell phones in their bookbags and spend hours on Instant Messenger, we should use what they know as the starting place for their educational experience: set up subject-specific chat rooms; beam their PDAs with reminders about assignments; make Web sites more navigable and inviting.

The return will come if we adapt new classroom strategies, create active learning situations, and incorporate new information. But we will need to restructure how we conceive the learning environment and the role of faculty in that environment. We should think of learning as a constructed social activity in which students are involved in projects of genuine

research with unknown outcomes. As they explore these projects, faculty should point them to useful resources and should act as coaches, encouraging them and stopping them occasionally to reflect on what they have learned in order to develop principles that can be re-applied based on their experiences and research. True learning, with or without technology, has always been an exploration of the unknown to discover underlying principles.

3. Mobility and Wireless

Wireless computing is a logical step in the development of academic computing. A classroom with a wireless access point nearby becomes essentially a computer classroom with interconnectivity and Web access. Most campuses are beginning with wireless networks designed specifically for use with laptop computers. The benefit is the freedom of not being tied to a desktop and not having to be attached to a cable. Having Web and Internet connection come to students,

wherever they are, encourages group work, research, and communications anytime, anywhere. Early adopters such as Carnegie Mellon, Wake Forest, UNC-Chapel Hill, and Drexel report student reception to be high, particularly in gathering places such as student centers, dorm lounges, and other places outside the classroom.

Implementing a Wireless Local Area Network (WLAN) campus structure is significantly less costly than putting a wired port everywhere that computers or the Internet is needed. A WLAN can expand the ubiquitous concept far beyond where a wire will reach. Industries began moving to wireless communications because their employees were constantly on the move yet needed to stay in contact. Bluetooth, a short-range (approximately thirty feet) technology that communicates at 1–2 Mbps, was the darling of industry for a while. Workers had access to computers, the Internet, printers, and other devices as long as they were within range. Cell-phone manufac-

turers, especially in Europe, saw the potential to make their phones into “smart phones” by adding Bluetooth technology. In the United States, where there is still no standard wireless communications protocol for cell phones, wireless Ethernet using IEEE 802.11b, with its greater range and throughput, has become the preferred model. The newer 802.11a is receiving considerable attention at this point because of its even greater throughput and range.

Another promising development for college campuses is the development of handheld PDAs with wireless Ethernet or cell-phone connections. In fall 2000, Western Carolina University (WCU) began the research-and-development phase of a pilot program using PDAs in the classroom. Four faculty members spent one semester developing course materials and finding out what software was appropriate for their subjects. Students placed in the selected classes were in a learning community. Their classes were paired with a control group of

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students taking the same classes from the same professors but without the PDAs. The pilot program attempted to determine if using wireless PDAs in the classroom would enhance active learning, enable higher levels of intellectual activity, increase students' interest in learning, and/or encourage the integration of academic materials. Additionally, the program designers wanted to determine if a wireless PDA coupled with a desktop computer could provide ubiquitous computing at a lower cost than a notebook computer with a wireless connection. (For two years, WCU has required every student to come to the university with a computer, and most have chosen a desktop.)

Professor Robert Houghton, one of the designers of the pilot program, decided to emulate what elementary and middle-grade teachers find in their schools. Dr. Houghton required students in his graduate "Computers in Education" class to carry the PDAs 24/7 and use the devices to keep real-time journals of their major questions and ideas as they worked through the course material. These notes resulted in frequent e-mails to other students and to Dr. Houghton, who then correlated the frequency and immediacy of communication with the educational outcomes for those graduate students using the PDAs. Dr. Houghton is also working with selected elementary schools that have received Palm handheld devices through a grant from Palm Computing. The students in these schools will be able to use computer resources that would otherwise be completely beyond reach.

Part of the original interest in using

PDAs was for their utility as personal organizers with calendar, datebook, contact database, and note-taking features. These functions are educational assets by themselves, especially since entering students are still learning to manage their time and keep up with important information and contacts. As part of WCU's pilot program, my technical writing class researched wireless handheld computing applications in education and also the educational efforts of the Department of Defense. About half the class remained skeptical of the utility of PDAs until they received trial versions from Palm Computing. By the end of the semester, most students were wondering what they would do without their PDAs. They also found that even though the technology is still in its infancy, the number of K-12 schools, colleges and universities, industries, professional schools, and other training organizations moving to wireless networking is impressive.²

4. The "Information Grid"

The power grid freed us from dependence on the sun for light, and the horsepower of engines freed us from dependence on the horse for transportation. Now the information grid frees us from dependence on the library for research, on the tree-destroying paper and ink for reading and writing, and on the gas-guzzling automobile for transporting letters. When students pull all-nighters to write term papers, they have online information from the library or the Internet at their fingertips. If travelers want to buy an airline ticket to Newark from anywhere, they can log on to one of many

Web sites and comparison-shop. Businesspeople in India can get answers to questions about suppliers' products via e-mail even if there are only a few places with Internet connections in town. Finally, villagers can use Web sites, e-mails, and listservs to alert the entire world about a hostile government.

Yet we are beleaguered by the deluge of information and complain about information overload. Perhaps we need to redefine our terms. In communication theory, information becomes noise when there is too much of it. In fact, a significant part of our nervous system and brainpower is devoted to filtering out information that is useless or superfluous. I sug-



gest that instead of an “information grid,” this might better be called a “data grid.” We have been inundated by data, and we do not know if it is useful or not—if it is indeed information. We need to be able to search through this data to find that which is crucial to the situation at hand. Libraries have cataloging systems that help sort data into cross-referenced categories. But data on the Internet is generally found through search engines, most of which are primarily based on keyword searches, often leading to irrelevant or offensive sites. Furthermore, it is sometimes impossible to return to the same information on the Internet without a bookmark.

Several organizations have responded to the need for cataloging learning material. These groups are working on what are often called “reusable learning objects” (RLOs) or simply “learning objects.” Through XML, the learning material is catalogued using metadata tags that describe the learning objects so that they can be located. Learning objects are entities that can be used, reused, or referenced during technology-supported learning. Examples of learning objects include multimedia content, instructional content, learning objectives, instructional software, and software tools, plus the people, organizations, and events referenced during technology-supported learning. Accompanying these learning objects are questions that determine the level of information needed by the learner and subscriber information.

What is significant about this movement is the reward system. The author, the compiler, the designers, and the technicians involved in creating or assembling the learning object are part of the metadata, and when the user pays for the information, some of the proceeds go to those who created it. As integrators, teachers and support staff will also be rewarded or at least recognized. Consequently, institutions, authors, teachers, technicians, artists, and Web administrators will have to consider issues of ownership. The old rules will no longer apply because under the new concept, anyone who adds value will be compensated.³

5. Leveraging Technology for Teaching

My first piece of advice for leveraging

technology for teaching is to remember that students are the audience. They typically want to be doing something they enjoy. They like music, videos, speed, humor, and anything that entertains. Technology is simply something they use to get online, check e-mails, log on to Instant Messaging, and download their favorite MP3 files. What does this mean for higher education?

- Don't make technology the issue. Let technology be a tool for students to

get to something they enjoy or want, just as they learned to download MP3 files to hear the latest album. Make sure the institution's home page or portal is exciting and easy to maneuver. Some institutions have two Web sites: one for those coming from outside and the other for students. The latter site is full of Flash and Fireworks and the latest information that students want. Let students staff this site and provide most of the content.

Leaving segments of the population in the informational dark will cost much more money in the long run than if we do the right thing.

- Let students help with the introduction of new technology. I recommend assigning a student tech crew to every computer classroom and almost every class early in the term. The job of this crew is to answer questions and serve as one-on-one tutors. Students can be rewarded through work-study funds, hourly wages, residence hall supervision funds, or access to computer hardware and software otherwise off-limits to students. T-shirts, pizza, and jackets help too.
- Put savvy students on technology committees at the department, school, and college/university levels. Let them know what is going on. Ask for and listen to their opinions.

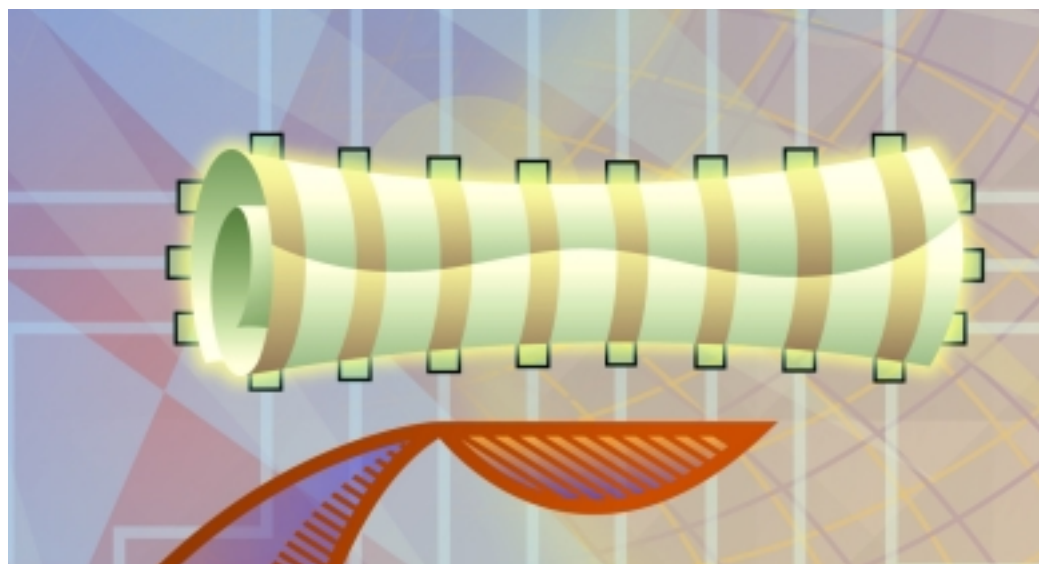
My second piece of advice for leveraging technology concerns the mission of colleges and universities: to provide learning for students. All too often colleges and universities become self-centered and focus on teaching, forgetting that experience is the best teacher. Students learn best when they dig out the information and make sense of it for themselves. Research has shown that memory is a complex of associations ranging from intellectual, to emotional, to sensory impressions: the more associations, the deeper the memory is embedded. Finally, educational theory indicates that knowledge is constructed in a social setting and is developed in a community of peers who share similar perspectives. What does this mean for higher education?

- Start with easy projects. David Brown, at Wake Forest University, says to pick

the low-hanging fruit first: e-mail, word-processing, syllabi with URL links, e-mail lists, discussion groups.⁴

- Create (or have created) a portal.
- Consider adopting course-management products such as Blackboard, WebCT, eWebClassroom, CyberClass, or Education to Go. These products make movement to Web-enhanced instruction much easier.
- Establish a center that can assist faculty in moving from traditional teaching to the active, technology-supported coaching model of teaching required with ubiquitous learning.
- Change to primarily project-based courses, with the project outcomes genuinely unknown. Assign projects that need research. Make the outcome be a report to an outside audience that expects accuracy and a measure of professionalism.

- Design classes so that students have a variety of activities—from group work, to individual work, to research, to reflection, to movement around the classroom. Let students design their own multimedia.
- Use group projects, chat rooms, and asynchronous discussion groups to create a peer community, essential to the construction of knowledge. For example, have students create a collaborative Web site that the next-semester students can use.
- Bring in experts or send select faculty and students to workshops. Have those faculty and students train at least two peers in the same technology; have each of those peers train two more, and so on.
- Emphasize academic computing as a primary focus of the institutional mission.



6. The Digital Divide

I come from the mountainous part of North Carolina, often described as Appalachia. T1, cable, and ISDN lines are not a possibility for many in these counties. The mountain terrain makes even cell-phone coverage very sketchy. As rural as we are, we are better off than other parts of the state, where the poverty rate is higher and the school systems are more strapped for money. When my students were demonstrating the Palm handheld devices to a group of elementary and middle-school teachers, they were astonished at the poor resources in some of the schools. One teacher had a ten-year-old Apple computer that was her only resource. Others complained about having almost no access to the Internet because of budget restrictions.

Busing students to wealthier schools is not the answer. Access to computers and to the information available through them is crucial to the health of the nation. I suggest that campuses collect all those computers lying around waiting for recycling and establish service projects for

students. Let students rebuild the computers and install them in the schools that need them most. Let other students serve as technical assistants to answer questions or get the answers for the students and teachers in these schools. Establish partnerships with schools, buying and sharing software site licenses. Finally, explore the use of handheld devices such as the Handspring Visor, the Compaq iPAQ, or the Palm Pilot. For the same price as two conventional laptops, twenty PDAs can provide much of the same technology. Students can take them home and come back to synchronize them with the computer classroom.

If you wonder about a digital divide in this country, simply drive around rural areas or the ghettos or migrant labor camps. The digital divide is indeed a civil rights issue. We are still paying for depriving many in previous generations of literacy, and we will pay perhaps even more if we deprive parts of this generation of computer literacy. Leaving segments of the population in the informational dark will cost much more money in

the long run than if we do the right thing. The more informed every part of our culture becomes, the more demand there will be for our institutions of higher education to provide lifelong learning. *e*

Notes

1. For David Noble's articles, see <<http://communication.ucsd.edu/dl/>> (accessed March 5, 2002).
2. For more complete information on the WCU project, see the project Web site: <<http://www.wcu.edu/facctr/tltweb/index.html>>, and see also "Will Handheld Computers Work in the Classroom?" *Syllabus*, November 2001, <<http://www.syllabus.com/syllabusmagazine/article.asp?ID=5673>> (accessed March 11, 2002).
3. For more information about learning objects and metadata tagging, see the following Web sites:
 - <<http://www.imsproject.org/feature/kb/knowledgebits.html>>
 - <<http://www.learningcircuits.org/mar2000/primer.html>>
 - <http://www.atl.ualberta.ca/downes/naweb/column000523_1.htm>
 - <<http://ltsc.ieee.org/wg12/>>
 - <<http://www.adlnet.org/Scorm/scorm.cfm>>
4. See David G. Brown's interactive session: "The International Center for Computer Enhanced Learning and Wake Forest University," <<http://iccl.wfu.edu/publications/presentations/stut1098.ppt>> (accessed March 11, 2002).