

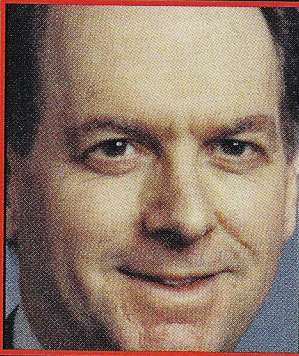
March/April 1997

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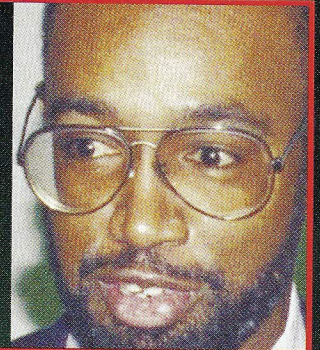
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Jack M. Wilson
Distance Learning
for Continuous
Education



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Technology Wars: Winners and Losers



Distance Learning for Continuous Education

BY JACK M. WILSON



The forces that have caused such upheaval in global industry are also stimulating change in the education of the global workforce. The old paradigm of discrete educational experiences is being replaced by a new paradigm of “Continuous Education.” Christopher Galvin, president of Motorola, made the comment to the American Society of Engineering Education that Motorola no longer wanted to hire engineers with a “four-year degree.” Instead they want employees with a “40-year degree.”

In spite of these (often adverse) global trends, universities and corporations are called upon to make significant increases in the quality of the educational experience without

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additional resources. In many places this has led to re-engineered courses, training and curriculum that incorporate electronic technology, often breaking the constraints of place and time. The old paradigm of on-site versus distant learners is blurring rapidly as the increasing availability of network resources and collaborative software stimulates a convergence. Technologies that were originally designed for meetings and conferences are now being pressed into service to provide the competitive edge for education, training, sales support and customer interaction. Technologies such as desktop videoconferencing promise the ability to reach anybody, anywhere, at nearly any time, and at much reduced cost. Realizing the promise of these technologies will take creativity and courage, as well as a deep understanding of the way we learn and retain information.

Corporations and universities are examining the forces mandating change, exploring the technologies facilitating change, and illuminating the choices and challenges that we will all face in navigating toward the networked collaborative educational environments of "Continuous Education."

Going the Distance: The Virtual Classroom

For "Continuous Education" to be successful, it will have to replace the traditional modes of distance learning such as satellite video, teletraining keypad response systems, and interactive videoconferencing with a much more robust educational model. The goal is to provide the distant learner with as much of the classroom experience as possible. In this model of interactive multimedia distance learning, one creates a virtual classroom with students connected together over a network that carries data, voice and video

to the students' computers. Each student has access to multimedia materials created for the course and delivered via CD-ROM or across the network.

An important element of any virtual classroom will be synchronous activity in which the students and instructors interact through live voice and video while working together with a synchronous collaborative software package. Just as important for any virtual classroom will be asynchronous activity, or activity done at the stu-

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dents' own time and pace. The actual mix of synchronous and asynchronous activities will be adjusted to suit each course and audience. The more of the course that is conducted asynchronously, the more flexible the course can become.

In the tradeoff between synchronous and asynchronous time, we will have to strike a careful balance. Certainly there is a place for asynchronous techniques, but there will also be a need to incorporate a structure of continuous feedback and

interaction that insures a satisfactory success rate. The more we are able to move instruction in the asynchronous direction, the more flexible the environment will be and the greater will be the gains in economic efficiency.

At Rensselaer Polytechnic Institute, the Studio classroom is one in which the emphasis is on the student's activity rather than on the professor's. Studio classes incorporate extensive use of integrated hands-on activities with small group problem-solving and discussion sessions. The instructor takes on the role of a mentor in the Studio classroom, supporting the students as they learn interactively using multimedia modules on PCs.

In our experience an effective interactive multimedia distance learning environment will have the following characteristics:

- Delivery on standards-based multimedia PCs equipped for live video/audio interactions and connected to a robust multicasting network.
- A mix of synchronous and asynchronous activity.
- Compatibility with industry-standard authoring tools for multimedia courseware including audio and video clips, animation and simulation exercises.
- Use of professional quality software tools for CAD, symbolic math, spreadsheets, word processing, etc.
- Small group discussions.
- Question-and-answer tools to verify content retention.
- Collaborative software for application-sharing over the network.
- Floor control to allow classroom coordination for both instructor-led and student-centered learning.

- Course administration tools for scheduling, registration and resource management.

The Distributed Learning Environment

As a result of the Interactive Multimedia Distance Learning project conducted several years ago with AT&T, and the wealth of experience at Rensselaer, LearnLinc—a PC-based distance learning environment—was designed to combine proven interactive learning methodology with the immediacy of video conferencing and the power of multimedia content. The research on synchronous and asynchronous learning, interactive education and multimedia authoring became the building blocks of the system.

A LearnLinc classroom is based on

the Studio classroom in which students work at networked multimedia PCs. The workstations have access to the multimedia and other computing resources for the course and also provide multipoint video, audio and collaborative software. Students have a live video window on their screen in which they can see the instructor or other students in any of the linked classrooms on the network. It is this video connection that allows an instructor to mentor the students and facilitate the discussions from a distance, as if they were walking around the room to various student workstations.

Synchronous Interactive Learning

The instructor needs a certain amount of control over the students and the learn-

ing process to ensure that the students are following along with the course content. The distance learning environment was designed with synchronization agents that allow the instructor to be seen and heard through the video connection while sending electronic commands synchronizing the content on all other participants' PCs. The instructor's commands to change pages, launch video clips, or run animations are sent to all student PCs. While students can also self-navigate through the content, the next change made by the instructor re-synchronizes the entire class.

We realized early in our research that an electronic classroom requires all the coordination of a real classroom. At any time during a session, students may "raise their hand" by clicking on an icon, sending a signal to the instructor's PC. The instructor can select any student and give them the floor. Then it is the student's video and audio that is distributed, and the student can ask a question, make a comment, or lead the others through the materials. The student can give the floor back or the instructor can take control and synchronize everyone together again on the same "page" in the course content. The instructor retains complete control over who has the floor.

We know that traditional classroom coordination has worked for hundreds of years. Duplicating that coordination is important because it provides a comfortable paradigm that instructors and students are familiar with. For example, we know from experience that when a number of students raise their hands, it is likely that more than one student has the same question. Therefore, participants can raise and lower their own hands just as they might in a traditional classroom. This same capability allows instructors to take a quick poll by asking a question and having students raise their hands to answer. In this way content retention and student satisfaction can be verified as the course proceeds.

Experience also shows that the electronic classroom can overcome some

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limitations inherent to the traditional classroom. Traditional classroom students are often inhibited from raising their hands to ask questions or as a response to a question, fearing that others in the class will see their response. In the distance learning environment, only the instructor sees a show of hands. The instructor can also launch a QNA (question & answer) application containing pre-loaded questions for students to answer. The percentage of various answers are displayed on the instructor's screen, providing a completely anonymous method to verify student progress.

Current teaching methods indicate the need to include spontaneous material to answer unanticipated questions or display the most up-to-date information in class. LearnLinc incorporates a shared whiteboard to address this issue. The instructor or student with floor control can drop in images from any software running on their computer, edit graphics with annotation tools, or add text.

Asynchronous Interactive Learning

When students log into a session, the software authenticates the enrollment and then loads a student profile. The student can easily browse through the sessions that are being offered and register for them. Students can also preview the multimedia materials available for sessions. This preview capability is an improvement on both traditional classroom and distance learning structures where materials are only seen during the class session.

Students may also gain access to multimedia assignments between class sessions. Since students may review content at any time after a session, instructors can design their courses with a mixture of synchronous and asynchronous

learning. The more difficult content can be utilized while the instructor is leading the class. Less complicated content or homework problems can be completed by students between sessions. Synchronous sessions can also be recorded, allowing students who missed a session to see and hear all the interactions that took place.

Administrative Tools

Because instructors and administrators need to manage many different courses, students and sessions with a variety of multimedia resources, a system manager was designed for course scheduling, registration and resource management. The system manager ensures that managing the multimedia resources (i.e. video and audio clips) is easy to do from a distance. While administrators require these tools, students do not. The software recognizes the authority level of the user and provides only the tools necessary for that user's level of involvement. This ensures a more simple and intuitive interface for students, which is particularly important

to the learning process. Students find that the interface disappears during sessions, allowing them to concentrate on the content. During our research, we observed students after a session, talking about the content and not the technology, strong evidence that the software does not get in the way of the learning.

Communication Technology

Standard multicasting protocols are used for local area networks and expanded to high-speed communication links, such as ISDN or E1 (T1 in U.S.) to support a large number of sites and students. It is this multicasting protocol that allows numerous students to be on the same network without running out of bandwidth.

The Virtual Classroom Today

All of the “virtual classroom tools” in LearnLinc are designed to communicate knowledge or skills to a distributed audience with the highest likelihood that the information will generate the desired results. Participants achieve both higher, verifiable levels of content retention and higher satisfaction with the distance learning process.

The convergence of proven interactive learning methodology with the immediacy of videoconferencing and multimedia content is no longer a futuristic scenario. With installations at universities and Fortune 500 companies such as AT&T, Kent State University, Boeing and GTE, ILINC is proving that “Continuous Education” can be a reality on a distributed basis connecting local area networks worldwide. The “40-year degree” predicted by Mr. Galvin may soon be easier to attain than a traditional degree. □