



Wireless Instruction: A New Dimension in Course Delivery

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WHEN DISTANCE LEARNING CLASSES GO WIRELESS, THE STUDENTS, FACULTY, AND EDUCATIONAL INSTITUTION CAN BENEFIT. ALONG WITH INCREASED CONTENT, THE FREQUENCY AND QUALITY OF CONTACT BETWEEN THE TWO CAN IMPROVE.

EXECUTIVE SUMMARY: Wireless technology can deliver Internet classes on an anytime, anywhere basis. It has the potential to vastly increase course accessibility, which will become more important as more students seek higher education while education funding declines. This article examines the technical considerations for utilizing wireless technologies in Internet courses, including costs, logistical limitations, technology availability and reliability, and the impact on faculty-student interactions.

Using technology to support higher education has become so commonplace that it is hard to find a course at most universities that does not use some form of technology.

PowerPoint, for example, is replacing the overhead projector, and students may obtain slides, journal articles, and other instructional materials on the Internet rather than receiving them as printed reading packets. E-mail exchanges between instructor and student may replace in-person office hours and phone contacts. Technology used in these ways, however, does not cause fundamental changes in course organization or delivery.

Other support systems can be more significant. One example is Web-enhanced courses. These courses expand the face-to-face paradigm by adding online components that enhance course content and allow some unique course delivery options.¹ Course manage-

ment systems such as Blackboard, Web CT, and Desire2Learn add conveniences and content delivery options by making class notes, quizzes, and course updates available on the Internet. They also may provide hyperlinks to rich information sets, establish forums for online asynchronous class discussions, and allow students to access taped lecture videos and assessments on demand. The traditional time- and place-bound classroom can be enhanced by these anytime, anyplace features.

Additional integration is available when courses are offered via the Internet. These courses are taught in virtual classrooms, with course delivery more similar to what is generally referred to as distance learning. Distance learning can be defined as any approach to education delivery that replaces the same-time, same-place, face-to-face environment of a traditional classroom.²

Internet courses are designed to take advantage of

the virtual classroom setting by integrating traditional course elements, such as reading assignments, with methods and assignments that have no equivalent in the traditional classroom.³ Although Internet courses have some clear advantages over traditional courses, research has not been able to discern whether the Internet has an effect on learning that is separate and apart from the instructional method.⁴ At the very least, Internet courses provide learning experiences that lead to outcomes equivalent to traditional courses.

The addition of wireless technology to Internet courses is the next advancement available in distance education (DE). Wireless technologies provide the ability to offer Internet courses on an anytime, anywhere basis for both instructor and student, overcoming physical separation of the instructor and student while permitting mobility to both. The only restrictions imposed result from the limitations related to access to the technology.

DEMAND FOR FLEXIBILITY IN DISTANCE EDUCATION

Colleges and universities seeking to relieve capacity constraints on enrollment, capitalize on emerging market opportunities, and adapt to limited public education funding may benefit by expanding DE offerings.⁵ DE can expand course access to underserved student populations such as those living in rural areas. Students who want to go home for the summer but still take summer school courses could use DE. Nontraditional students subject to job travel, remote assignments, job transfers, and other reasons to be away from home are also excellent candidates for DE course delivery.

One major problem with distance education is that Internet courses generally tend to be accessed through immobile computers. Home computers, whether laptops or desktops, connect via cable modems or phone lines; there is no Internet connectivity away from home. Similarly, there is no long-distance access to on-campus computer labs and offices. Courses boast about 24/7 access, but the reality is that the course may be available online 24/7 while students' access to it may be significantly less.

Instructors need ways to teach classes that remove the restrictions of time and place in traditional classroom teaching. Flexibility is desirable to free up time

for research, travel to conferences, or to meet personal obligations. The willingness to teach outside the traditional nine-month academic school year increases when the teaching fits in with other plans.

Students also are impacted by these restrictions. Those who want to take classes from home obviously are not able to take Internet classes using on-campus computer labs. In addition, students who travel for work or who want to combine class time with vacation time away from work may lack course access when away from home.

Only one-third of students in higher education in 2000 were traditional. Nontraditional students want flexibility in terms of the time and location of instruction.⁶ Incorporating a wireless telecommunication system in an Internet course is one way to accommodate the need for flexibility for both faculty and students. The most common form of wireless technology is cell phones, and advances in technology now permit properly equipped computers to access the Internet via cell phone dial-up service that uses satellite connections. The main benefit of wireless technology over other forms of DE is that course access is available from any location where cell service is available.

TECHNICAL CONSIDERATIONS

The course management system used by an instructor's institution provides the basis for the Internet course. Familiarity with other DE courses will make the transition to a wireless course easier for the instructor. Course design may anticipate access closer to 24/7 than previously available, but the level of service must be weighed against the instructor's need for flexibility in course management.

There are a number of significant technical issues that should be addressed when setting up an Internet course via wireless technology, including (1) costs, (2) logistical limitations, (3) the availability of technology, and (4) the reliability of technology.

Costs: Using wireless technologies can increase the overall cost of delivering a course. At a minimum, there are additional costs associated with equipment and calling-plan charges. A laptop computer with a wireless modem card, adequate RAM, and an advanced operating system (such as Windows XP) is necessary. Calling

plans vary in price and availability based on geographic location, so the type of plan must take into account all locations where access will be desired. More remote locations and more varied locations (Europe, for example) increase the cost of connecting to the course. Students and instructors need not use the same plans or types of equipment.

Logistical Limitations: When the instructor has no office, some course elements that work for a regular DE class may be impossible. Activities that are normal and easy in an instructor's office, such as printing, calling technical assistants about any problems the instructor or students are experiencing, preparing and sending out mailings, and receiving hard copy submissions from students, may become difficult.

Giving up paper copies (such as printing out student papers) may be difficult for some instructors. Course management systems can provide an electronic drop-box system that gives students a place to submit work outside e-mail. These drop boxes can have their own challenges, including capacity limitations and earlier submissions being overwritten by later ones when the submission titles are the same (such as two students uploading a file named "Quiz 1"). Technical assistants can help instructors anticipate and plan to reduce the severity of such problems. For example, students can add their last names to a file's name to prevent overwriting ("Quiz 1—StudentName").

Availability of Technology: The instructor's access to cell phone service and appropriate power to charge batteries or run the laptop are the two key factors affecting availability. Battery life for laptops continues to be extremely short, so frequent access to a power source is essential, even with a backup battery. The power converter for use in cars is one innovation that helps. Cell phone availability over diverse geographic locations also can be problematic. Some telecommunications companies have better coverage than others, and different geographic regions are often better served by different wireless providers. This means the instructor's itinerary often drives the service decision, so the itinerary must be determined in advance.

Reliability of Technology: As happens with a typical DE class taught from an instructor's office or a studio, computer servers hosting the class may have outages. Teach-

ing a wireless course adds the potential outage of cell phone service. Instructors need to be prepared for breakdowns and have a plan to deal with them. If cell phone service does not reach the town where the instructor is staying, for example, he or she may have to move some distance to find service again. Using a satellite-based phone service instead of a tower-based one can reduce the likelihood of not being able to connect, but it does not eliminate the risk of the service being down for periods of time.

FACULTY-STUDENT INTERACTION

Learning in electronic classrooms is heavily influenced both by the technology used and by the instructor.⁷ It is the implementation of the technology that determines its effects on learning, not the technology itself.⁸ If the technology allows students to learn when and where they desire, they may be more engaged in the learning process and may improve their mastery of course content. Wireless technology can help in this area.

The instructor's ability to facilitate the learning environment may be more important than his or her ability to teach in the online setting.⁹ Interaction with students is essential, and teaching styles that encourage student-instructor interactions lead to more positive learning outcomes.¹⁰ Students who have 24/7 access to a course are more likely to participate in electronic discussions with instructors and peers. They may be more motivated and sensitive to meeting deadlines, providing thoughtful discussions, and keeping up with course requirements. Therefore, the instructor must plan to communicate regularly with the students as well as to adjust the teaching plan to fit any special circumstances that arise.

In addition, summer sessions are often intense, have a shorter duration than semester offerings, and require timely instructor interaction and intervention. By using the wireless system, contact can be made every day, no matter what the local facilities, the local Internet access, or the local long distance policies and charges are. When students are made aware that the instructor is on top of their activities and assignments and is available for quick turnaround on questions, positive rapport between the instructor and students will develop quickly.

AN EXAMPLE OF WIRELESS INSTRUCTION

A faculty member at a large Midwestern university was assigned an MBA summer elective course that would serve MBA students from several universities in the region. The course was to use Blackboard as the class management tool. To allow for travel during the course, the instructor opted to use wireless technology to teach it.

The instructor was experienced in delivering distance education courses through the use of a teaching studio/live presentation to multiple sites and through Internet delivery to individuals. This experience included using courseware software tools such as Blackboard, using electronic class assignment delivery, and managing project teams assembled from several universities. Without these experiences, course delivery and management would have been far more challenging.

The instructor's travel destinations included less populated areas of North Carolina and New England, so access to the Internet was a concern. Even if it were reasonable to pay the long distance charges (which it was not, as three hours of Web time per day were needed to meet class activity requirements), there would still probably be difficulties in making the dial-up access feasible and speedy enough to accommodate the course. Nationwide wireless was the perfect solution because the system was widely available via satellite and offered lots of low-cost use hours during off-peak times.

The instructor selected Sprint PCS as her cell phone provider because of Sprint's coverage in the areas where she was traveling. A laptop computer was connected to her cell phone through a data connection cable, requiring careful attention to the technology to ensure compatibility. The data connection cable allows the Sprint PCS phone to act like a generic modem that connects to the Internet through the Sprint PCS Network. This provides complete freedom to access the course via the Internet. The software to connect to the Sprint PCS Wireless Web came with the data connection cable.

The local Sprint PCS store matched a data connection cable to the cell phone. The cheapest digital plan was \$59.99 per month, which included 600 anytime minutes and 5,400 night and weekend minutes. Additional daytime minutes were 35 cents, and, in the first month, the instructor exceeded her anytime minutes by 42 minutes.

The cell phone was free (a \$100 value), and the data connection cable cost \$40. It was also necessary to purchase a car phone charger for the cell phone. There was also BlueKite software to install, which is data-optimization and wireless-connection software that works in the background to accelerate wireless Web access.

The speed of data transfer was very good when the cell strength was at least 40%-50%. It seemed to be equivalent to a regular dial-up 56K modem. The instructor was accustomed to fast data transfer and was pleasantly surprised by the speed available when accessing the Sprint PCS Wireless Web.

The system worked when traveling by car, although some unanticipated problems arose. There were a few lapses as the signal shifted from cell to cell, and, when the instructor was driving through a tunnel or through the mountains with significant elevation changes, the signal was sometimes lost. The phone antenna was sensitive to placement in order to maintain a strong signal, making the phone connection subject to interruption if the antenna moved when the car hit a bump. Occasionally the cell phone did not operate inside a building but would often work outside the structure (this is also often the case around campuses equipped with wireless networks).

In addition, on-road operating time was limited to cell phone battery life because the cell phone could not be connected to the computer and charger at the same time. One piece of equipment the faculty member forgot to purchase was a car charger for the laptop, so the use of the laptop in the car was also limited by its battery life.

STUDENT OUTCOMES

The students were aware of the instructor's locations during the course. They enjoyed the travelogue she gave, even going as far as giving her their own suggestions and comments about sights to see or places to avoid. The instructor's travel also showed the students that you could take a class even if you travel frequently for your job.

Both course content and the role of the instructor are important and strong predictors of teaching effectiveness.¹¹ In addition, the quality of the technology and the instructor's ability to control the technology may

strongly impact learning outcomes.¹² Due to adequate research and planning, testing of equipment and systems, and the instructor's background in teaching over the Internet, student outcomes in this course were very positive. There were few problems with access, none of which impacted course instruction. Course evaluations were very positive.

Because it was an MBA course, assessment of student learning was based on research projects and collaborative work-group outputs. The quality of work submitted and the quality of participation were consistent with on-campus delivery in the traditional lecture format. Wireless delivery of the course did not appear to enhance or reduce learning.

THE FUTURE

Internet courses require a great deal of planning, and the one-on-one interaction with students through postings, e-mails, and other communications are very time-consuming. But any good learning experience requires a high level of student-faculty interaction. This interaction encourages student participation because students feel they are part of a learning community.¹³ The total time may be similar between the two environments, but wireless courses allow the instructor to determine when the time is spent. The drivers for successful course delivery are no longer limited to the course schedule and office hours.

The instructor's decision to use wireless Web technology to deliver a summer graduate course provided the opportunity to leave campus for a prescheduled vacation, meet a revised teaching schedule, serve the students with effective instructor interaction and access, and maintain course quality. There were some additional costs for the wireless service and specialized components, but these were modest. Although technology is not perfect, in this case it was a great solution to a potential conflict between teaching and traveling in the summer.

While it was the instructor in this example who benefited from the enhanced flexibility of wireless technology, the same flexibility could easily be available for students. The challenge is to coordinate the various technologies so they function as a unit. Students may not have the experience to successfully put a wireless

package together or the same level of tech support available to faculty, but, as the technologies mature, the links will become more transparent, and many of the coordination problems will be addressed by technology vendors. The net result will be systems that provide enhanced processing opportunities and more seamless integration as well as more-user-friendly technologies.

Along with tremendous potential for new and exciting applications, wireless technologies carry the uncertainties found with most new technologies. Hardware advances occur almost daily, standards are still in a state of flux, bandwidth limitations can impede applications, and service areas are spotty.¹⁴ Security issues are also a concern. Ensuring that access points are protected is probably the number one security concern, along with controlling who has access to the wireless network.¹⁵ In our example, the university took care of security.

Expect wireless Internet course delivery to become increasingly prevalent. The roaming classroom seems to be at the first highway marker—with a long road stretching out before it. ■

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- 1 John Budd, "Teaching Labor Relations: Opportunities and Challenges of Using Technology," *Journal of Labor Research*, vol. 23, no. 3, 2002, pp. 355-374.
- 2 Thierry Volery and Deborah Lord, "Critical Success Factors in Online Education," *The International Journal of Educational Management*, vol. 14, no. 5, 2000, pp. 216-225.
- 3 Holly Brower, "On Emulating Classroom Discussion in a Distance-Delivered OBHR Course: Creating an On-Line Learning Community," *Academy of Management Learning and Education*, vol. 2, no. 1, 2003, pp. 22-36.
- 4 Katrina Meyer, "The Web's Impact on Student Learning," *T.H.E. Journal*, October 2003. Available at <http://www.thejournal.com/magazine/vault/A4401A.cfm>.
- 5 Volery and Lord, 2000.
- 6 Jacqueline Eastman and Cathy Owens Swift, "New Horizons in Distance Education: The Online Learner-Centered Marketing Class," *Journal of Marketing Education*, vol. 23, no. 1, 2001, pp. 25-34.
- 7 Jane Webster and Peter Hackley, "Teaching Effectiveness in Technology-Mediated Distance Learning," *Academy of Manage-*

- ment Journal*, vol. 40, no. 6, December 1997, pp. 1282-1309.
- 8 Betty Collis, "Anticipating the Impact of Multimedia in Education: Lessons from the Literature," *Computers in Adult Education and Training*, vol. 2, no. 2, 1995, pp. 136-149.
 - 9 William Drago, Jimmy Peltier, and Donald Sorensen, "Course Content or the Instructor: Which is More Important in Online Teaching?" *Management Research News*, vol. 25, no. 6/7, June 1, 2002, pp. 69-83.
 - 10 Webster and Hackley, 1997.
 - 11 Drago, et al., 2002.
 - 12 Webster and Hackley, 1997.
 - 13 Brower, 2003.
 - 14 Steve Towns, "Wireless Enters the Mainstream," *Mobile Government*, May 2001, pp. 6-7.
 - 15 Shane Peterson, "Security Complex," *Mobile Government*, January 2002, pp. 14-15.

FURTHER READING

- Mahesh Bhav, "Classrooms with Wi-Fi," *T.H.E. Journal*, November 2002, pp. 17-23.
- Ian Hayes, "Upwardly Mobile: A Wireless Primer," *Software Magazine*, August 2001, pp. 40-47.
- Angus King, "Computers are Key to Student's Education," *USA Today*, September 2002, p. 12. (Available at http://www.usatoday.com/news/opinion/editorials/2002-09-12-oppose_x.htm.)
- William Steele, "Wireless Browsing in Classes has Mixed Benefits," *Chronicles*, Spring 2002. (Available at http://www.news.cornell.edu/Chronicles/3.8.01/wireless_eval.html.)