Are You Ready for Mobile Learning?

Frequent use of mobile devices does not mean that students or instructors are ready for mobile learning and teaching

By **Joseph Rene Corbeil** and **Maria Elena Valdes-Corbeil**

Jason, a 19-year-old college freshman, woke up early Friday morning to download this week's U.S. History podcast to his iPod. As he got into his car for the one-hour commute to campus, he put on his earbuds and began to listen to his professor's test review session. The lecture ended as he entered the student parking lot.

Before exiting the car, Jason received a text message on his smart phone from Paula, his study partner. She had some questions and wanted to meet up with him in the library before the test. He pulled out his laptop and backpack before locking the car door. By the time he reached the library, Paula was already connected and online at her favorite table. She was busily transferring the professor's lecture notes from the course Web site to her pen drive. "What's the answer to question number three?" she asked as Jason sat down.

"I don't know," he answered; "Why don't you Google it to find out?"

"I've got a better idea," she responded. "Why don't you IM the professor? He's online right now."

Professor Davis was on his way back to his office from Media Services when a familiar chime let him know that someone was IMing him. He pulled out his PDA and read the message. With stylus in hand, he typed the response, "Call me." Ten seconds later, his cell phone rang.

"Hello?"

"Hi, Dr. Davis. Jason and I are in the library and we are having a hard time answering question number three."

"Are you in front of your computer?" Dr. Davis asked.

"Yes, we are."

"Go to this week's lecture notes and review the section on Western Expansion. You'll find what you are looking for there."

"Thanks a lot," Paula answered. "We'll see you in class."

Jason, as well as most of today's college-aged students, is a product of immersion in the technological advancements of the past two decades. These students are what Marc Prensky calls "digital natives."[1] Raised in a ubiquitous technology environment, this new generation is accustomed to the "twitch-speed, multitasking, random-access, graphics-first, active, connected, fun, fantasy, quick pay-off world of video games, MTV, and Internet."[2] Today's instructors, if not already familiar with the digital language of their students, must learn it to maximize learning and access to learning.

Ray Schroeder, editor of the *Online Learning Update* blog at the University of Illinois at Springfield, predicts that over the coming year, mobile learning will expand and evolve dramatically. He points to the term "podcasting," the *New Oxford American Dictionary*'s Word of the Year, as evidence of this growth and predicts that new podcasting features will be exploited for e-learning in an expanding array of mobile devices. As a result, Schroeder predicts, e-learners will no longer be chained to their computers

and network connections; they will be learning while hiking in the mountains, strolling on the beach, or jogging along a city street.[3]

Mobile Devices and Their Potential Instructional Uses

Clark Quinn, professor, author, and expert in computer-based education, defined mobile learning as the intersection of mobile computing (the application of small, portable, and wireless computing and communication devices) and e-learning (learning facilitated and supported through the use of information and communications technology).[4] He predicted that mobile learning would one day provide learning that was truly independent of time and place and facilitated by portable computers capable of providing rich interactivity, total connectivity, and powerful processing. In May 2005, Ellen Wagner, senior director of Global Education Solutions at Macromedia, proclaimed that the mobile revolution had finally arrived:

> Wherever one looks, evidence of mobile penetration is irrefutable: cell phones, PDAs, MP3 players, portable game devices, handhelds, tablets, and laptops abound. No demographic is immune from this phenomenon. From toddlers to seniors, people

are increasingly connected and are digitally communicating with each other in ways that would have been impossible only a few years ago.[5]

Consequently, it comes as no surprise that sooner or later people would begin to look for ways to integrate mobile computing into e-learning to make courses more accessible and portable. For example, Duke University made headlines when it provided all incoming freshmen with their own 20-gigabyte iPods. Similarly, the Virginia Tech College of Engineering became the first public institution to require all students to purchase a tablet PC beginning with incoming freshmen in fall 2006.

Personal digital assistants (PDAs) are also seeing more use in the classroom. New educational software programs (such as quizzing and trivia programs, along with grade- and assignment-tracking tools) show great benefits for both students and teachers. The increase in use is attributed to the affordability and portability that PDAs offer, making it possible for each student to have access to a computer at any time and any place. No longer dependent on computer labs for computing capability, students can work on PDAs right at their desks. Students can also take PDAs on field trips to collect, store, and analyze data on site.

As the market for portable computing devices continues to expand, e-books are predicted to grow with them. In response, online bookstores have increased their holdings of e-books, with some publishers now including e-book versions of their printed college textbooks. Currently, companies are working on adding audio, video, and text-to-speech components for e-book software, which might—along with new usability standards—eliminate the barriers to their widespread adoption within the next few years.

The rest of this section lists the most common mobile communication/computing devices, their features and functions, their potential instructional uses, and the pros and cons of using them for mobile learning.
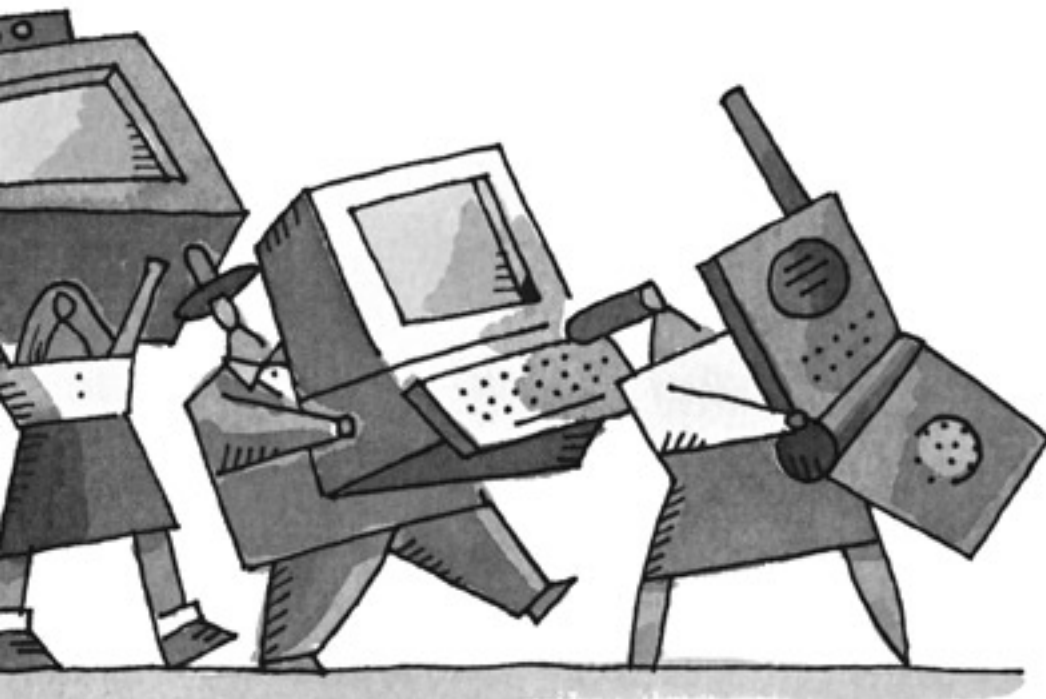
iPod

The iPod portable media player from Apple allows users to download music, audio books, podcasts, photos, and video. It has an address book and calendar that synchronize with Microsoft's Outlook or Outlook Express. It can also serve as a mass-storage device.

Instructional Uses. With the iPod, students can download podcasts of relevant instructional material along with audio and video lectures. Although the early devices have rather small screens, future versions probably will have bigger screens so that users can read e-books on them. The video iPod, for example, takes a step in this direction.

With the iPod, students can exchange information files, collaborate on projects, review coursework and prepare for exams, showcase their work, and share project results. They (or the instructor) can provide visual, step-by-step directions that are difficult to convey with words only. Students or instructors can add a microphone to their iPods to capture material for educational use.

Pros. With 87 percent of the market share, the iPod has already proven its popularity with students. Apple's iPod University lets professors make lectures available to students for free download. The iPod's many add-ons increase its

functionality, and it's great for students on the go. It appeals to digital natives' need for immediacy of information.

Cons. First, consider the cost. An iPod may not be affordable for all students, and it requires Apple's iTunes program (which is free) for downloading files. Second, it provides one-way communication, not interactivity, although it can record material. Third, the screens are generally too small to use sophisticated applications or to read quantities of text (although this will probably change in future versions).

MP3 Player

This digital audio player plays music and audio files. Some models have an integrated voice recorder and line-in recording.

Instructional Uses. Students can use an MP3 player to download and listen to podcasts and audio lectures. They can also review course material and study for exams, stay informed about course content, read (listen to) audio books, and, with some devices, record information such as a lecture.

Pros. MP3 players are compact and light. They have no moving parts (unlike hard disks), which increases their battery life. They feature excellent audio quality and are upgradeable and expandable.

Cons. An MP3 player is replaceable by other devices that also play audio files. Encoding files and transferring data can be time-consuming. These players provide one-way communication, not interactivity.

Personal Digital Assistant

The PDA combines computing capability, Internet access, and networking features in one system with a calendar, notepad, address book, and productivity tools. It is a programmable, Bluetooth-enabled, Wi-Fi–equipped device with a pen/stylus input interface.

Instructional Uses. A PDA plays audio, video, and Flash movies; displays and permits editing of text documents; lets

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users access e-mail and Web content; supports IM and text messaging; and can be used for mass storage.

PDAs support interactive, collaborative learning. Students can use them to present projects; conduct research; word process documents (with a peripheral input device); and take notes in class.

Pros. PDAs have a large screen (for a portable device) that makes reading easy. It also combines several computing and communication tools in one device. Text and data entry are possible through the screen keyboard, a stylus, or external peripherals.

Cons. PDAs are bulky compared to other portable devices and won't fit in a standard-sized pocket, although packs, purses, and other carriers will accommodate them. They are not efficient for entering long e-mails or texts without using a peripheral input device.

USB Drive

The USB drive is a mass-storage device that attaches easily to many computers and other devices.

Instructional Uses. A USB drive is great for storing coursework and audio and video files. Students can share files for collaborative projects, transfer work to and from computers at school, save their work, and submit work to the instructor.

Pros. The drive is small and portable, and the USB interface is compatible with all newer computers. It works well for transporting files from home to school and back.

Cons. A USB drive is a single-purpose device. Other devices can also serve for mass storage.

E-Book Reader

E-book readers are used to download text-based materials. They can store hundreds of e-books, newspapers, and magazines. Magnification and high-lighting features facilitate easy reading and marking of texts, and full-text search makes it easy to find specific passages.

Instructional Uses. Students can use an e-book reader to download and store text-based instructional materials and electronic textbooks; read resources on demand; and conduct research.

Pros. E-book readers have large screens for easy reading, while backlighting facilitates reading in dark places. Digital bookmarks and highlighters let users mark their texts, and full-text search capabilities make it easy to find specific passages. An e-book reader can store all the content and textbooks for several courses.

Cons. An e-book reader is a single-purpose device with limited computing capabilities. It may require proprietary text formats. A limited number of e-book titles are currently available.

Smart Phone

A smart phone combines telephone capability with a PDA, camera, video, mass storage, MP3 player, Internet access, and networking features in one compact system.

Instructional Uses. Students can download audio and video lectures and podcasts to their smart phones. They can play audio, video, and Flash movies; display and edit text documents; access e-mail and Web content; send IM and text messages; and use the phone for mass storage.

Smart phones also enable global collaboration and scientific experimentation and research. Users also can access information globally. Smart phones thus support interactive learning.

Pros. A smart phone combines a multitude of communication and computing features in one compact system.

Cons. The small screen makes Web browsing and reading text difficult. Small keys or a virtual keyboard make text entry inefficient for longer e-mails or texts. Finally, some smart phones cost as much as entry-level PCs while having a fraction of their functionality.

Ultra-Mobile PC (UMPC)

Ultra-mobile PCs have all the major features of a standard tablet PC but in a much smaller package. They support audio, video, and gaming; browsing the Internet; and other communication and networking applications. They come Bluetooth, Wi-Fi, and Ethernet enabled.

Instructional Uses. Students can download audio and video lectures and podcasts to their UMPCs; create and edit course-related assignments; surf the Web; send e-mails, IMs, and text-messages; and log on to course Web sites from a distance.

UMPCs enable global collaboration, scientific experimentation, and research. Users also can access information globally. UMPCs thus enable interactive learning.

Pros. This ultra-small, ultra-portable PC with its 7-inch touch-sensitive screen is great for surfing the Web and viewing multimedia. Its small size makes it ideal for traveling.

Cons. These units are expensive, costing more than a high-powered PC. Due to their small size, most UMPCs do not have a full-size keyboard or keypad.

Laptop/Tablet PC

The most complete and functional system of all the portable devices, laptop/tablet PCs come Bluetooth, Wi-Fi, and Ethernet enabled. They are a robust productivity tool. Tablet PCs offer additional features such as handwriting recognition and voice-to-text conversion as part of their operating systems.

Instructional Uses. Students can download audio and video lectures and podcasts; create and edit course-related assignments; surf the Web; send e-mails, IMs, and text-messages; and log on to the course Web site at home or while on the road. The units provide a high level of interactivity for global collaboration, scientific experimentation, and research.

Pros. Laptop/tablet PCs are great for students who need to take their work with them. They provide the most power and capabilities of all the portable devices.

Cons. Laptop/table PCs are still relatively expensive, and their size makes them cumbersome while traveling. Unlike some smaller devices, they cannot be used while walking.

Benefits and Challenges of Mobile Learning

Portable computing/communication devices such as laptops, PDAs, and smart phones connected to wireless networks enable mobility and facilitate mobile learning. Mobility allows teaching and learning to extend beyond the traditional classroom; in the case of distance learning, users of portable devices can break the tether of the home computer. Within the classroom, portable computing/communication devices give instructors and students increased flexibility and provide new opportunities for interaction.

Mobile technologies also support learning experiences that are collaborative, accessible, and integrated with the world beyond the classroom.[6] The benefits, however, do not come without challenges.

Benefits:
- Great for people on the go.
- Anytime, anywhere access to content.
- Can enhance interaction between and among students and instructors.
- Great for just-in-time training or review of content.
- Can enhance student-centered learning.
- Can appeal to tech-savvy students because of the media-rich environment.
- Support differentiation of student learning needs and personalized learning.[7]
- Reduce cultural and communication barriers between faculty and students by using communication channels that students like.[8]
- Facilitate collaboration through synchronous and asynchronous communication.

Challenges:
- May make it easier to cheat.
- Could give tech-savvy students an advantage over non-technical students.
- Can create a feeling of isolation or of being out-of-the-loop for non-techies.
- May require media to be reformatted or offered in multiple formats.
- Might render some content outdated because of rapid upgrades—here today, outdated tomorrow.
- Could require additional learning curve for non-technical students and faculty.
- May be used as a new high-tech package for the same old dull and boring content.

Pedagogical Implications

Mobile computing/communication devices offer a unique opportunity for teachers and students in different kinds of instructional settings to capitalize on the flexibility and freedom afforded by these devices. However, these benefits demand new pedagogies and new approaches to delivering and facilitating instruction.

If appropriately facilitated, mobile learning can benefit learners by providing instructional materials and interaction through their mobile devices wherever and whenever they need it. Instructors also benefit in that they, too, can access services and interact with students while on the move. To keep up with this changing phenomenon and to effectively facilitate mobile learning, argued Sharma and Kitchens,[9] it is imperative that instructors learn about and adapt to the changing environments, when and where appropriate. Naismith et al.[10] hypothesized that mobile technologies will have a huge impact on learning; they made the fol-

lowing predictions based on emerging trends:

■ Learning will center on the individual learner's environment rather than the classroom.
■ Learning will involve learners making meaningful connections to resources and other people.
■ The ability to instantly publish their observations and reflections as digital media will empower learners to become investigators of their own environments.
■ The ability to easily capture and record life events will assist learners in recall and collaborative reflection.
■ Distributed collaboration and mobile team opportunities will be greatly enhanced.

These predictions, if accurate, have significant pedagogical implications that are both a consequence of, and an opportunity for, mobile learning. Educators will have to shift from being transmitters of knowledge to facilitators of learning in order to create new learning pathways that are more situated, personal, collaborative, and long term. To help educators make the transition, Naismith et al.[11] offered the following suggestions for adapting mobile learning to the six major types of learning:

■ **Behaviorism**: Quick feedback or reinforcement can be facilitated through mobile devices.
■ **Constructivism**: Mobile devices enable immersive experiences such as those provided by simulations or games.
■ **Situated learning**: Learners can take mobile devices into authentic learning environments or "context-aware" environments, such as specially equipped museums.
■ **Collaborative learning**: Mobile devices provide a handy additional means of communication and a portable means of electronic information gathering and sharing.
■ **Informal/lifelong learning**: Mobile devices accompany users in their everyday experiences and become a convenient source of information or means of communication that assists with learning.
■ **Support/coordination**: Mobile

devices provide just-in-time access to learning resources, news, information, planners, address books, calculators, and so forth.

As stakeholders evaluate the potential of mobile learning, several pedagogical issues and questions arise. Paramount are the issues pertaining to how mobile learning will impact teaching and learning. Further research should address the following questions:

■ What is the rationale for implementing mobile learning technologies?
■ Will increased use of shorthand in synchronous and asynchronous communication affect students' writing ability in the long term?
■ Will brevity of expression trump depth of knowledge?[12]
■ Will it become easier for students to cheat during tests? Is this issue relevant to twenty-first-century learning?
■ What course content is suitable for transmission to mobile computing/communication devices?
■ Will the quality of communication and interaction be enhanced or diminished by adopting mobile learning pedagogy?
■ Do mobile devices allow students to interact with peers and instructors at the same level and quality as if they were participating using a PC?
■ Will a shift in emphasis from e-learning to mobile learning increase

the gap between the haves and have-nots?
■ Will the quality of the instructional content be improved, enhanced, or downgraded by transferring to a mobile-compatible format?
■ What types of resistance to change will faculty and students experience?
■ How will the instructor's role change?

Readiness for Mobile Learning

To determine if the distance education students and faculty at The University of Texas at Brownsville were ready for mobile learning, we conducted an informal survey in fall 2006 of student and faculty ownership, use, and readiness for mobile learning. The Survey of Mobile Learning was available through a posting on an educational technology blog site to students enrolled in 12 online courses. Of the population of 191 graduate and undergraduate students, 107 students (56 percent) volunteered to participate in the survey. In addition, 30 faculty (45 percent) from the School of Education also participated.

The survey consisted of three questions:

1. Which of the following mobile computing/communication devices do you currently own? (See the list in Figure 1; students, $N = 107$; faculty, $N = 30$.)

Figure 1

Mobile Learning Devices Owned
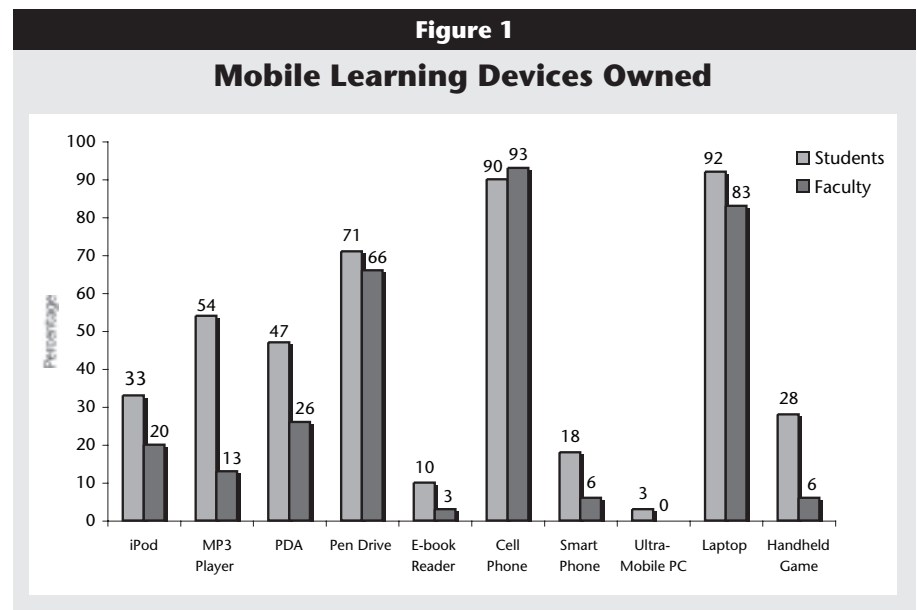
2. Which of the following mobile computing/communication activities do you regularly engage in? (See the options in Figure 2; students, $N = 107$; faculty, $N = 30$.)
3. Are you ready for mobile learning? (See Figure 3; students, $N = 107$; faculty, $N = 30$.)

Results, Conclusions, and Implications

Are distance-education students and faculty ready to make the jump from e-learning to mobile learning? What does it mean to be ready? To answer these questions, we examined the mobile devices that students and faculty were already using, as well as the activities they engaged in while using these devices. In most cases, both students and faculty already participated in a variety of mobile computing and communication activities at work and for recreation. They were not, however, integrating mobile technologies into their teaching and learning activities.

Most distance-education students enrolled in our online programs affirmed that they felt ready for mobile learning and already possessed some of the basic tools needed to facilitate it. Of the 107 student survey respondents, 94 percent ($n = 100$ students) indicated their readiness for mobile learning; all of them owned a cell phone or smart phone, and 92 percent ($n = 98$ students) owned a laptop computer. Similarly, a slight majority (60 percent, $n = 18$) of faculty also affirmed their readiness for mobile learning, with over 93 percent ($n = 28$) owning a cell phone or smart phone and 83 percent ($n = 25$) owning a laptop computer.

Regarding mobile learning activities engaged in by students and faculty, 98 percent ($n = 105$) of students and 100 percent ($n = 30$) of faculty use e-mail; 82 percent ($n = 88$) of students and 77 percent ($n = 23$) of faculty transfer files from one place to another via portable USB devices; 56 percent ($n = 60$) of students and 27 percent ($n = 8$) of faculty send and receive instant messages (IMs); and 45 percent ($n = 48$) of students and 13 percent ($n = 4$) of faculty send and receive short text messages (SMS). When asked if they had ever taught an online or Web-enhanced course, 67 percent ($n = 20$) faculty answered yes.

The implication for faculty who would like to implement mobile learning in their online or traditional courses is that they can begin by making content and information available to students in formats easily accessible by mobile phone or laptop computer. This would be a logical first step, since a majority of students and faculty already use these tools in many of their daily activities. Other tools, such as video iPods and MP3 players, can be phased in gradually. The following ideas could be implemented immediately with little to no additional cost.

Most basic cell phones today can send and receive text messages, voicemail, and e-mail. E-mail is a convenient way to communicate information to the learning community, so the instructor can begin by sending class-wide "broadcast" e-mails that students can access via a variety of mobile devices.
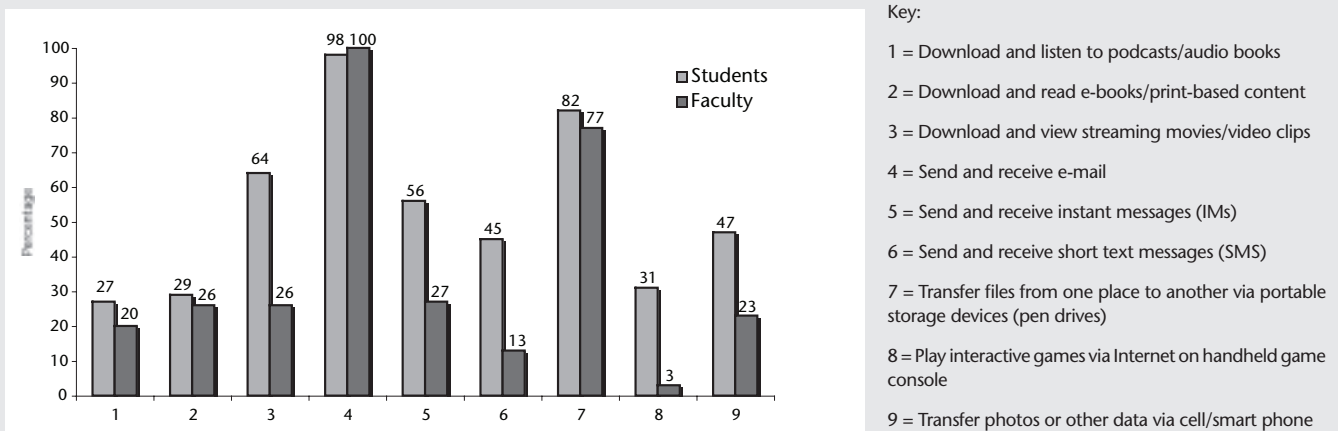
Instructors can also configure their university voicemail systems to deliver important messages or class announcements when students call in. Voice E-mail, a plug-in available through Horizon Wimba that is a compatible with most learning management systems, enables instructors to create one- or two-way recorded audio communications within e-mail messages. Voice e-mails sent to students will contain a link to the recorded message located on a server. Faculty can send a voice e-mail to one student, to a group of students, or to the entire class.
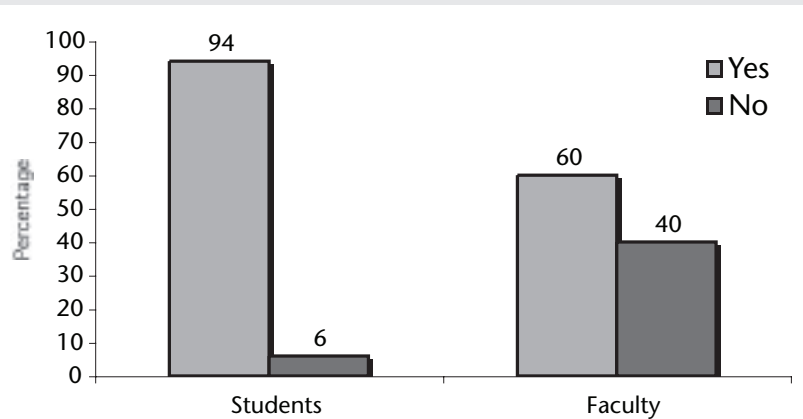
ClearTxt, a new product available in both free and commercial versions, enables users of the Blackboard learning management system to receive notice within minutes of information posted within a course, group, or organization. The technology sends a text message to a student's cell phone as soon as new information is posted. Since virtually all students have and actively use cell phones, faculty could be assured that important notices would be received by the members of a class or group.

Horizon Wimba's Live Classroom

Figure 2

Mobile Activities

Key:

1 = Download and listen to podcasts/audio books

2 = Download and read e-books/print-based content

3 = Download and view streaming movies/video clips

4 = Send and receive e-mail

5 = Send and receive instant messages (IMs)

6 = Send and receive short text messages (SMS)

7 = Transfer files from one place to another via portable storage devices (pen drives)

8 = Play interactive games via Internet on handheld game console

9 = Transfer photos or other data via cell/smart phone

Figure 3

Readiness for Mobile Learning

allows students and instructors to log in to an audio chat via computer or telephone.

Since laptops and tablet PCs allow people to access the Web and e-mail from virtually any location that provides Internet access, these devices can play an important role in mobile learning. To make instructional content more portable, instructors can begin to convert their lectures to podcasts or streaming media files and post them on their course Web sites, or on free online resources such as Apple's iPod University or YouTube, for convenient download. Students can play the files on their laptops or transfer them to other mobile devices.

Podcasting enables faculty to incorporate on-demand audio recordings into their curriculum. While it is relatively easy to produce a podcast, instructors will have to rethink their approach to packaging instructional content so that students are eager to listen to it. "The droning voice of a professor reading from yellowed lecture notes will not be so affecting," according to Gardner Campbell, "…but a voice that creates a theater of the mind…can connect with the listener on a profound level."[13] The Division of Information Technology at the University of Wisconsin–Madison offers the following guidelines for creating podcasts[14]:

■ Avoid overly complex material that includes lots of facts and figures. Complex subject matter is often more effectively conveyed through handouts and readings than through a podcast. This is because most students will listen to podcasts as they perform other tasks (i.e., riding a bus, driving, exercising, walking to class, etc.). In most cases they won't be taking notes as they listen. Always keep in mind the learner's context when selecting content for a podcast.

■ Recordings of classroom lectures may not be the best use of podcasting. Podcasts of entire lectures often come across as overly formal and boring. Important visuals are excluded. Only use lectures as podcasts when you have a strong pedagogical rationale for doing so.

■ Narrow the focus of a podcast. Limit the scope of the content to only a few main themes. Don't try to communicate too much material in a single podcast. Instead, identify important concepts or issues students tend to struggle with and develop a podcast that addresses each one.

By convention, most of the just-in-time podcasts (such as CNN news and NPR news) last about three to five minutes. Perhaps instructors can make better use of the limited time and only provide the information that provokes students' thoughts. Instructors are also advised to focus on one theme, topic, or issue in each podcast so that learners have options to download the needed ones. Also, information about each podcast event's file size or time duration should be provided.

With the challenge of new mobile technologies for podcasting comes a great opportunity for providing new types of services for traditional and distant learners. Meng believes "the greatest opportunities for these technologies are in the ways they will be used that have not yet been imagined."[15] The potential offered by podcasting makes it worth the effort of learning and using.

Looking Ahead

The implications of mobile learning are far-reaching, and its potential effect on education profound.[16] The next few years will see a period of rapid growth for mobile learning, with evolutionary rather than revolutionary changes. Mobile learning capabilities will continue to expand with the introduction of smaller, more sophisticated and powerful gadgets capable of delivering data in a variety of formats anywhere, at any time. Today's mobile computing devices have more computational power than the largest computers of a generation ago, and this trend continues.

Whether mobile learning will be adopted by faculty and students will depend to a great extent on how efficient and necessary they consider the services and features. For example, if students like to be informed via SMS every time a new message is posted on the announcements pages of their online courses, they would likely subscribe to such a service if it were offered as an option. By the same token, if faculty could easily facilitate their online courses and respond to individual student queries while traveling, many would gladly take advantage of it.

Students and faculty who already use mobile computing/communication devices will find ways to integrate them into all aspects of their lives—including the tasks of teaching and learning. Educators can assist students by making content more readily available and in formats that are eas-

ily accessible through popular mobile devices. As these devices become more powerful, they may coexist with or supplant other technologies to make learning more portable. We should prepare to take advantage of their benefits in higher education by planning how best to employ mobile devices in online and traditional classes. *e*

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