Scenario

Tabitha has been studying the influence of changing climate patterns on animal migrations. As part of her senior project, she has been monitoring hummingbirds, which have been seen in increasing numbers locally in past years. Tabitha is observing two sites in her neighborhood where they have been seen and one where they have not.

She sets up motion-sensitive cameras at each of the three sites—one at the local botanic garden, a second near a honeysuckle bank in an undeveloped wooded area, and a third near heavy perennial plantings on the back side of the community center. The cameras are set to record video of anything that moves, so she aims them high enough to ensure human traffic will not set them off. Whenever video is recorded, a message with a URL to access the video is sent to her smartphone. She consequently spends her free moments during the day—waiting for class to start or standing in line at lunch—viewing video on the screen of her mobile, trying to decide if there has been hummingbird activity. She also visits the camera locations daily, recording information on temperature and humidity. She uses her smartphone to upload these observations to a database and to compare the day's weather data with that of previous years.

Her first sighting comes five days into the study. She is scanning the video on her way to class when she sees a streak across the screen that she is sure is a hummingbird. Excited, she checks the data from the previous four years and notes her sighting is two days earlier than the average.

For her, the most exciting moment of her project comes after hummingbirds have been present for more than a week at two of her sites. A male hummingbird soars right in front of her as she checks temperature readings at the wooded location, her third site. Excited, she pulls out her mobile to check the hummingbird habitat maps. She thinks the bird is a full half-mile northeast of where his species had been spotted previously. Tabitha will need to do further research, but she believes she might have evidence confirming that the migration patterns continue to shift.

1 What is it?

Mobile learning, or m-learning, can be any educational interaction delivered through mobile technology and accessed at a student's convenience from any location. The software that underlies m-learning includes not only mobile applications designed specifically for learning purposes, but also those designed for other uses—such as geolocation, data access, readers, and maps—but that can be adapted for educational purposes. M-learning hardware may include mobile phones, handheld PCs, tablets, the iPad, and netbooks, as well as devices such as the iPod touch that are able to run mobile applications. Because m-learning utilizes a variety of devices, many of which are ubiquitous in the lives of students, it can foster student engagement and offer opportunities to make learning integral to daily life.

2 How does it work?

The applications used in mobile learning generally focus on brief interactions of perhaps five minutes or less, using simple navigation and graphics to accommodate multiple screen sizes. Such applications enable the quick review of information rather than prolonged or deep learning—as such, they are better suited for activities such as a status check, a request for just-in-time information, or as a student response tool in the classroom.

M-learning projects, by contrast, can involve complex tasks that employ multiple applications to track down complex data sets or complete assignments that involve solving multidimensional problems. Some exercises contain collaborative elements or game play, employing a variety of tools like social networking, calendars, customized calculators, simulations, or augmented reality. M-learning endeavors frequently fall into categories like data collection or application of location-based information, such as checking a map to see whether project team members are nearby.

These m-learning activities can be used on a growing list of devices, though the prevalence on campus of smartphones with a data plan—which allow users to run applications on the phone's operating system, browse the web, and send and receive e-mail—makes them attractive options for course projects that are supported with mobile technology. That said, the smartphone category represents a range of devices and software, and new classes of mobile tools are emerging, such as HP's Slate and Apple's iPad, that will likely introduce new options and opportunities.

3 Who's doing it?

As an early m-learning adopter, Abilene Christian University has chosen to focus on Apple devices, distributing either an iPhone or iPod touch to each incoming freshman. Instructors can leverage applications from the Apple iTunes store for learning purposes including field activities, while a dedicated portal offers campus

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news and calendars to keep students engaged in the learning community. Also focusing on the Apple platform, Seton Hill University announced plans to offer an iPad to every full-time student in fall 2010, a technology chosen both for its mobility and the promise of easy future access to e-textbooks. A joint outreach program undertaken by Carnegie Mellon University and the University of California, Berkeley, called Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE) seeks to support a group of English teachers in rural India with m-learning applications designed for grade-school students. The children access these activities via their mobile phones to work on English skills in the classroom as well as in the fields on days when they help with farm work.

4 Why is it significant?

As learning management systems adapt to the mobile platform, m-learning may become a common tool for exploration by tech-savvy faculty. The use of mobile devices seems a natural fit for distributed learning and field activities in that handheld technology can not only accompany the learner almost anywhere but also provide a platform that is rapidly evolving and always connected to data sources. Learning management systems may drive campuses to recognize the potential of this always-on, anyplace technology that lowers the physical boundaries to learning and extends the classroom. Ease of use offered by mobile devices supports lifelong learning, and because the devices themselves are integrated into everyday life, they facilitate authentic learning. Ultimately, it might be the ubiquity of these student-owned devices that ensures their use as teaching and learning tools. The rising popularity of smartphones should promote the development of cloud-based applications that work on multiple devices. While some m-learning applications may be provided by colleges and universities, mobile technology in the main provides an inexpensive layer of functionality to the institution, capitalizing on an infrastructure that is increasingly supported by cloud services and by the technology that students bring to campus.

5 What are the downsides?

Hardware for mobile learning represents a wide range of platforms, screen sizes, and functionality, and no clear standards exist for development that address all of the tools available. As a result, colleges and universities can find infrastructure issues tricky to resolve. The cost of smartphones and data plans is out of reach for some students, and adoption and ownership is uneven. While the screen size on many mobile devices enforces simplicity of design, the small screens and keys are difficult for some to use effectively, and the additional strain on battery life imposed by mobile apps can be frustrating. Because m-learning is an emerging market, there remains a dearth of applications designed specifically for learning, and repurposing existing lesson materials for the mobile platform might add to faculty workload. The eclectic mix of devices and mobile formats, which are generally subject to student and faculty choice, could delay

m-learning development, and standards may be slow to emerge in an environment where manufacturers are often trying to decide whether to merge their mobile devices with slates, tablets, or e-readers. Finally, while the devices can go anywhere with students, they might not engage students for long periods of time, as mobile learning activities are subject to frequent interruptions.

6 Where is it going?

New kinds of devices are emerging, blurring the distinctions between phones, PDAs, e-readers, and other types of hardware. Future mobile technologies will be able to present textbooks, create data visualizations, aid library research, and foster contextual learning.

Regardless of the directions taken by mobile manufacturers, newer incarnations of these devices are sure to provide easier access and better support for multimedia creation and collaborative applications. Field learning from art appreciation to zoology may soon find support from mobile devices pulled from a student pocket and used on the spot to check data, snap a photo, record location data, make a blog entry, or enter a question on the class discussion board. This rapid access to data, available wherever and whenever questions arise, could change our learning landscape, altering the way we solve problems.

7 What are the implications for teaching and learning?

The cell phone is currently the most common platform for m-learning, lending itself to collaborative and project-based efforts that leverage its potential to support the communication requirements of a team. Where wireless networks are available, or where smartphones with data plans have access to cell networks, mobile lessons and exercises can leverage the ability to gather information from a variety of interdisciplinary sources in a wide array of formats while exploiting the value of location-based learning. In developing countries where mobile devices are available at a fraction of the cost of other computing hardware, m-learning has extended the infrastructure of distance education to outlying areas that have previously been poorly served. Regardless of the hardware employed, as demand requires that more applications be re-authored for mobile formats, institutions may find it necessary to overhaul data-sharing and content-delivery techniques to support the mobile platform.

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