1-1-2013

Mobile Learning: The Teacher In Your Pocket

Meredith G. Farkas
Portland State University, meredith.farkas@pcc.edu

Citation Details

Farkas, Meredith G. "Mobile Learning: The Teacher in your Pocket."The Handheld Library: Mobile Technology and the Librarian. Eds. Thomas A. Peters and Lori Bell. Santa Barbara: ABC-CLIO, 2013, 31-45.

Chapter 4
Mobile Learning: The Teacher in Your Pocket

Meredith Farkas
Portland State University Library
Portland, Oregon

Farkas, Meredith, "Mobile Learning: The Teacher in Your Pocket" in The handheld library: mobile technology and the librarian ed. Thomas A. Peters and Lori Bell (Santa Barbara: CA, 2013), 31-45

4

Mobile Learning: The Teacher in Your Pocket

Meredith Farkas

Key Points

- Mobile learning presents pedagogical possibilities for seamless, interactive, contextual, and individualized learning.
- Library applications of mobile technologies for learning cover several areas of need.
  - Orientations and tours become self-guided, engaged learning.
  - Point-of-need instruction is enhanced when delivered to mobile devices.
  - In-class use and classroom response systems are improved by smartphones and tablets.
  - Instructional outreach involves making content accessible where the users are.
- Considerations for the use of mobile devices in library instruction include knowing the mobile habits of your community, their instructional needs, and how to optimize instructional content for mobile use.

Mobile computing has exploded around the world over the past several years. Morgan Stanley suggests that mobile Internet use will exceed the use from fixed devices, and Ericsson projects that 80 percent of people will access the web from a mobile device by 2015 (Ingram 2010; Ericsson Corporate Public & Media Relations 2010). Mobile devices are being used for content creation, communication, information seeking, and so much more. The notion that mobile devices would be used only for quick and simple tasks has been challenged by research showing that a growing portion of the population—especially low-income and minority mobile users—use their phones as the primary means of accessing the web (Smith 2010). This growth in the usage of mobile devices in all aspects of people's lives has led educators to look to it as an ideal mechanism for delivering content and improving interactivity in learning. In 2011, mobile learning was named a top trend with an adoption horizon of less than a year in K–12 and in higher education in the *NMC Horizon Reports* (Johnson et al. 2011;

Johnson, Adams, and Haywood 2011). Mobile phones and other handheld devices have become valuable learning tools that can be capitalized on inside and outside of the classroom.

MOBILE LEARNING

Mobile learning is more than just providing content that is accessible on a mobile device. Just like the social technologies that made the web a more participatory medium, mobile devices and technologies can have a tremendous impact on teaching and learning. The large-scale adoption of mobile devices has opened up new pedagogical possibilities for making learning more seamless, contextual, and individualized.

Many scholars have written about the growing disconnect between how people learn in the classroom and in the world around them (Pence 2011; Squire 2010). The divisions between learning, work, and recreation have become increasingly blurred as seamless, open, networked, web-based learning has become the new norm. In order to prepare students for the world in which they will continue to learn once they are finished with school, it is critical that we build bridges between formal and informal learning activities.

Mobile learning has the potential to transform the experiences of both learning and teaching, merging formal and informal learning seamlessly. Because people can take their mobile devices anywhere, instructors can provide just-in-time information for users in modular pieces rather than providing all of the information students might need from the outset. It gives students more autonomy, enabling them to direct their own learning at their point of need. Increased learner autonomy has been shown to improve student achievement by encouraging students to take responsibility for their own learning (Mcloughlin and Lee 2008).

When information is meant to be accessed at the point of need, according to Traxler, "finding information rather than possessing it or knowing it becomes the defining characteristic of learning" (Traxler 2007, 3). Students can individualize their learning by seeking out the information that meets their unique learning needs. A student who needs additional help in a specific area can spend more time on that topic than one who already feels confident in her or his knowledge of that topic. This shift towards student autonomy is consistent with a constructivist pedagogy, which sees students as active participants in learning. The instructor is more of a facilitator than a "sage on the stage," creating a positive environment for individualized learning (Barnes and Tynan 2007).

Mobile technologies can help to engage students at multiple levels, providing a richer and more contextualized learning experience. Learning does not happen in a vacuum; context and application are critical elements of learning. Building experiences using mobile devices that allow students to apply their learning in real or realistic contexts can lead to better learning outcomes (Liestøl 2011). Mobile technologies can connect users to additional information in a variety of formats, appealing to multiple learning styles and diverse student needs. They are also useful for both gathering data and providing feedback, enabling a more seamless information flow between learner and environment, and learner and instructor.

Tools like QR codes can provide a bridge between the physical and virtual worlds. QR codes tie physical and web-based content together much in the way that hyperlinks connect web pages. The great benefit of electronic content is that users can easily move

from what they are reading to find additional information on a topic they want to know more about. Many e-book readers allow users to easily query Wikipedia or other reference works to get the definition of a term with which they are unfamiliar. Given that interest in the adoption of e-books in education is decidedly mixed, QR codes may be the perfect tool to provide similar functionality for physical books. Rather than reading a book and then walking to one's computer to look something up, QR codes enable professors to provide additional information on a topic that the students can access simply by scanning a QR code with their phones.

A number of studies have been conducted on the use of QR codes to connect physical learning materials to virtual ones, and all have found it to be an effective method of providing seamless access (Chen, Teng, and Lee 2011; Ozcelik and Acarturk 2011; Law and So 2010). Professors have provided suggestions of individual readings on topics for years. With QR codes, however, they can provide these materials to students within the required texts, accessible at the click of a button. This is an excellent way both to scaffold learning for students and provide an individualized experience. It can also be helpful in connecting texts to supporting multimedia, such as videos or 3D learning objects. Ozcelik and Acarturk (2011) compared students who read a text and accessed complementary resources from a computer to those who accessed the resources through a mobile device using QR codes embedded in the text. They found that "reducing the spatial distance between disparate sources of information reduces extraneous cognitive load, thus leading to an enhanced learning" (Ozcelik and Acarturk 2011, 2083).

Because most mobile devices contain global positioning systems (GPS), location-aware mobile learning software can be designed to provide information to the user in relevant geographical spaces. This takes point-of-need learning to the next level, providing context-specific information to individuals rather than expecting the user to seek it. In the United Kingdom, Durham University is using location-aware technology to provide campus information to students based on where they are (Walsh 2010a).

In addition to providing location-based information, location-aware learning software could be a powerful tool for authentic learning. Authentic learning is focused on engagement and information seeking in real or realistic settings (Traxler 2007). Connecting digital information to real-world experiences can provide valuable context that is missing when students simply digest information in their dorm rooms. One interesting example of this is the game *Sick at South Beach*, a mobile learning game that requires students to play the roles of chemists, doctors, and ecologists engaged in uncovering the cause of a mysterious illness. Participants in the game go into the field armed with personal digital assistants (PDAs) that provide useful data when the participants reach specific sites (Squire 2010). This closely simulates what experts investigating a real public health crisis would do. Problem-based learning has long been shown to provide a more authentic and lasting learning experience, and marrying problem-based activities with location-aware mobile learning will only make it more authentic.

GreenHat is a mobile learning application developed at the University of California at Berkeley with the goal of helping students to think like experts. Ryokai, Oehlberg, Manoochehri, and Agogino (2011) designed GreenHat to enable "students [to] learn about biodiversity and sustainability issues in their surroundings from experts' points of view, before participating in unfamiliar debates about their familiar surroundings" (Ryokai et al. 2011, 2149). Rather than simply reading expert views on a particular topic, students in the GreenHat research watched videos where experts discussed their

perspectives on a particular ecosystem on the Berkeley campus while the students were touring that ecosystem. When students would come to a particular place in that ecosystem, a relevant video would play on their mobile device, providing additional context to what they were observing. The researchers hoped that students would look at this familiar landscape through new eyes, gaining perspective from the diverse views of the experts.

Ryokai et al. (2011) compared a group accessing this expert content in the field to a group of students accessing the content on a computer inside of a building. Students using mobile devices in the field gave answers to follow-up questions about the ecosystem that melded both their own personal views and those of the experts. The students on the computers tended to simply regurgitate what the experts said. The students using mobile devices also stated that the assignment felt more personal because they were experiencing it as they were learning. Providing students with context-specific information while in the field can be a valuable tool for helping students develop the critical inquiry skills and personal views necessary to think like an expert in their field (Ryokai et al. 2011).

Another way of providing location-based instruction is through augmented reality. Augmented reality overlays content (data, images, and information most commonly) over reality. For example, the Yelp application allows people to view ratings and reviews of the shops, restaurants, and bars in their local area. The Monocle augmented reality part of the application places those ratings in an individual's field of vision as they look through the phone's camera. Augmented reality brings the virtual and physical even closer than QR codes by actually placing both in the same frame of view. Right now, most people access augmented reality applications through a handheld device with GPS and compass and a phone, but in the future, people might use glasses that provide the same functionality but do not require the user to walk around with a device held in front of their face.

When it comes to learning about places and events in history, augmented reality can provide additional context to student learning. Reading about a Greek temple can't compare to actually seeing an image of that Greek temple superimposed over the ruin itself. iTacitus (Intelligent Tourism and Cultural Information through Ubiquitous Services) is an augmented-reality application that overlays images, audio clips, events, and other information over the views at cultural heritage sites in order to provide additional context for tourists (Pence 2011). The Bavarian State Library developed Ludwig II: Walking in the Footsteps of a Fairytale King, an augmented-reality application that layers photographs, audio, and 3D recreations of buildings over locations in modern Bavaria. It allows individuals to see buildings specific to Ludwig II's history that no longer exist and to get a sense of what life was like there while actually in the field (Die Bayerische Staatsbibliothek 2011). Augmented reality can make history come to life, providing additional context that is impossible to gain from reading a book or simply walking around a historical site. This sort of "ambient learning" brings information to users through an exciting visual medium by virtue of their being at a specific location (Fletcher 2010).

One university that has embraced mobile technologies in a big way is Abilene Christian University in Texas. In 2008, the university began offering each incoming student a choice of either an iPhone or iPod Touch (Woodbury 2009). Other universities have experimented with giving students mobile devices, but none have also made

research into mobile technologies for learning such an integral part of the university's mission. The university has aggressively funded research into mobile learning and mobile-learning application development and has pushed faculty in every department to make pedagogical use of mobile technologies in the classroom. From podcast lectures in Chemistry, to augmented-reality apps in Art, to blogging via mobile devices in Musicology, faculty members are truly embracing the challenge of incorporating mobile technologies into their teaching. A fall 2010 faculty survey found that 84 percent of faculty regularly use mobile devices in class (Abilene Christian University 2011).

In Abilene's 2010–2011 Mobile Learning Report (2011), the director of educational innovation, Dr. William Rankin, assesses their progress:

> Our efforts are increasingly breaking down the walls of the classroom, removing barriers so teachers and students can engage more fully with and take their learning more easily into the world around them. We're discovering that the power of mobility comes not only from the ability to access information, but also from the ability to create it, and the creative opportunities during this third year of our initiative have been staggering. (3)

Figure 4.1
Ludwig II: Walking in the Footsteps of a Fairytale King augmented reality app.

In addition to being a model for other universities exploring mobile learning, Abilene is doing a tremendous service to its students by preparing them for an increasingly mobile world where point-of-need inquiry will be the key to success. The vast majority of students at Abilene (approximately 85%) feel that mobile technologies in the academic experience have increased collaboration, improved communication with teachers, and increased their sense of control over their learning environment (Abilene Christian University 2011).

LIBRARY APPLICATIONS OF MOBILE TECHNOLOGIES FOR LEARNING

The majority of libraries are still in the infancy of their efforts to provide services to patrons with mobile devices. In most cases, libraries have, at best, a mobile website that provides access to the library's hours, catalog, reference help, and other basic services. It is not surprising that the examples of libraries providing instructional services for mobile users are not nearly as common as mobile website examples. However, there are plenty of libraries that have developed innovative mobile technologies and services to improve student learning. In addition, there are plenty of possible applications of mobile technologies for instruction that no library has yet attempted. The possibilities discussed in this part of the chapter range from the free and easy-to-implement to projects that require a great deal of time and technical expertise. It's important that librarians consider which applications would be a good fit for their library, given the needs of patrons and the library's technological constraints.

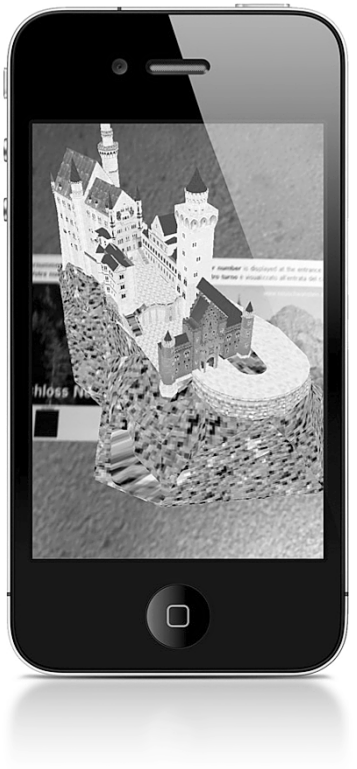

Figure 4.2
Ludwig II: Walking in the Footsteps of a Fairytale King augmented reality app.

Orientations and Tours

Library orientation tours are almost always a source of stress and excitement for instruction and outreach librarians. Some libraries struggle with getting students in the library at all, while others have to find ways to cope with thousands of first-year students descending on the library over the course of a day or two. Whatever the challenge, planning for library orientations is also exciting as there are so many interesting ways libraries can approach this activity. Most libraries have moved away from the typical walking tour guided by a librarian, opting for strategies that require students to be actively engaged in the learning process.

Since iPods became the go-to accessory for most people in their teens and twenties by 2004, libraries have been developing audio-based instructional content. Museums often offer audio tours of their collections. These tours take the visitor through the museum, offering background information on items of interest. This offers visitors the opportunity to learn more about the collection than they would by simply looking at it. It is also meant to replace the traditional group tour, which forces each individual to go at the same pace as everyone else. Some libraries have similarly developed audio tours that introduce patrons to the layout of the library and the library's services and collections. These self-guided introductions to the library allow patrons to learn more about the library on their schedule and at their own pace.

While one might think that an audio tour provides an opportunity to go into greater detail about the collections and services, librarians developing audio tours should strive to provide only the most important information with the greatest relevance to students. The tours must be succinct and engaging in order to keep students interested. Also, because this is a self-guided tour, it is critical to ensure that library terminology users may be unfamiliar with is well-explained. The audio tour for the Bostock Library at Duke University[1] uses terms like "circulation," "open stacks," "reserve," and "inter-library loan," which may not be familiar to first-year students. It may be worthwhile to test the terminology used in the library tour on library novices in order to ensure that the communication is effective. Librarians and even work-study students often have difficulty seeing things from the point-of-view of the novice user.

When the fifth-generation iPod was released with the capacity to play video, librarians not surprisingly started to think about ways to capitalize on this innovation. Many video tours created by libraries are not designed for use by someone simultaneously touring the physical library; these are usually more fast-paced and focused on promoting collections and services than on orienting users to the building. Those video tours that are specifically designed as walking tours are often broken up into sections or contain instructions to pause the video so that users can position themselves at the location relevant to the content being displayed.

The University of California–Merced Library developed a video tour[2] for students that introduced them to the physical building as well as the services housed within it. Staff loaded the tour onto 15 iPod Touches that could be checked out but also made

the tour available for download onto the students' own devices. This sort of hardware support is vital when not all students on campus necessarily have the requisite technology. The librarians worked with the freshman writing program to embed the tour into those classes because they were a key place in the curriculum for students to be introduced to the library. For students who took the tour as part of the freshman writing program, they were also required to complete an online assignment tied to what they learned in the tour. This provided both acknowledgment to instructors that students completed the tour and valuable assessment data for the library regarding the efficacy of the tour as an instructional tool (Mikkelsen and Davidson 2011).

One benefit of audio or video tours is that the audio content can be translated into different languages, providing a valuable service for students whose first language may not be English. The Wells Library at Indiana University provides its audio tours[3] in 24 languages, including Korean, Swahili, Mandarin, Italian, and Farsi. Another benefit over a live tour is that students can always come back to parts of the library tour they didn't understand or are most interested in.

Game-based learning has become increasingly popular in libraries because of its huge potential to engage learners. One type of game-based orientation that takes advantage of the near ubiquity of mobile devices is the QR code scavenger hunt. Burns (2011), a librarian at Penn State Wilkes-Barre, developed a QR code hunt for her English 004 classes. She placed QR codes all over the library that linked users to either text or a web page that would help them answer the questions in the hunt. Burns stated that in addition to providing information literacy instruction, the activity "forced the students to pay attention to their surroundings, not only to look for the codes, but to look at the code in the context of the physical space of the library" (Burns 2011, 12). Other QR code scavenger hunts require users to take pictures of specific things, proving that students actually visited each location.

Public libraries have also jumped on the QR code scavenger hunt bandwagon. The Lake Forest Public Library in Illinois and the Contra Costa County Library in California offered scavenger hunts with QR codes scattered around each library. Both libraries

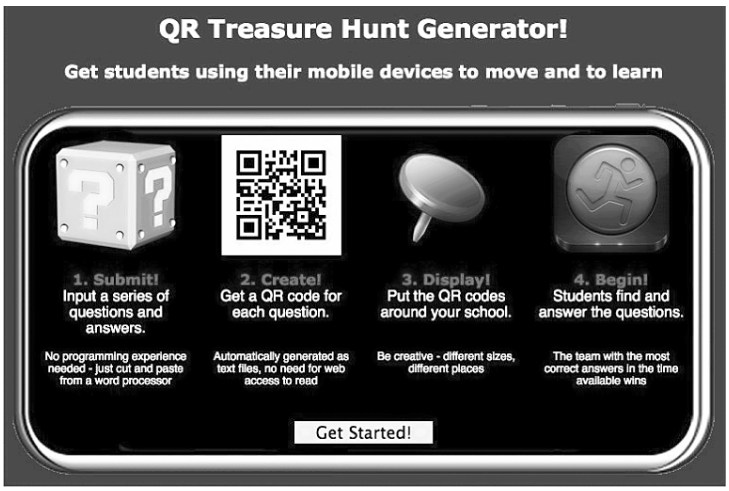

Figure 4.3
QR Code Treasure Hunt Generator from ClassTools.net.

offered incentives to get patrons to participate, ranging from tote bags to money and gift cards. Activities like this are not only useful for orienting users to the library but also can help improve patron awareness of QR codes—critically important if the library plans to use them for other services.

In K–12 libraries, where mobile devices are frequently banned, librarians wanting to do QR code scavenger hunts have either purchased iPod Touches for students to use or developed QR code scanning stations. A scanning station can be created with just a computer, webcam, and a webcam QR code reader such as dansl.[4] Using a system like that, students will need to be able to bring each of the QR codes to the scanning station. ClassTools.net offers a free QR Code Treasure Hunt Generator,[5] which requires teachers only to input their questions and answers, then print out the resulting QR codes.

The library could also use augmented reality for tours, providing video, audio, and information layered over specific, relevant locations in the library. While creating a much more immersive learning experience, this would require significantly more technological expertise and time to implement than any of the other options. It might also be a bit risky to have students rushing around the library with their phones held up to their faces.

Point-of-Need Instruction

Libraries around the world have created online learning objects designed to provide instruction to their patrons. Learning objects take various forms, from HTML content to screencasts—videos that show activity on the narrator's desktop—to pathfinders and research guides, to podcasts and videos. There are learning objects on using the library catalog, searching specific databases, using equipment and technologies around the library, and illustrating various aspects of the research process. Unfortunately, unless those objects are a required part of a specific course, they are infrequently used, as they are rarely provided at the patron's point of need (Hicks and Sinkinson 2011). Having an arsenal of instructional content living under the heading "tutorials" is going to attract only the most motivated library patrons. Mobile devices offer the possibility of providing instruction at the point of need. In addition to the greater likelihood of library learning objects being used, according to Ozcelik and Acarturk (2011, 2083), "prior research has shown that learning is enhanced when relevant information is immediately available."

QR codes have the potential for being fantastic tools for providing point-of-need instruction in libraries. A QR code in a specific location could link a user to a web page or a video that provides instruction on some aspect of that location. This would be ideal for equipment that users regularly need help from a librarian to use, such as microfilm scanners, copiers, and self-check machines. In places where people frequently get lost in the building, QR codes that link to maps of that area can be provided. For example, the Syracuse University Library has QR codes in the map room that link to the floor plan of the room and online map resources. QR codes can also link to research guides and pathfinders. At the Half Hollow Hills Community Library in New York, QR codes are placed in the stacks that link users to pathfinders related to the content on specific shelves.[6]

At the University of Colorado at Boulder, Hicks and Sinkinson (2011) looked at issues students commonly have around finding specific things and using specific technologies, and they developed posters with QR codes designed to link students to the answers. Those posters were placed in relevant locations in the library. Early results showed that stacks maps were the things most commonly scanned by their users. Given

that so many patrons will not ask for help even when they need it, the best thing we can do is to make unmediated help available at their point of need.

The biggest barrier to QR code use is the general lack of QR code adoption in the West. In addition to providing the codes themselves, libraries could provide a shortened URL just under the QR code that the patron can easily enter into their mobile device. While it's easier to snap a QR code with a camera, a URL is certainly more recognizable to the general population.

Half Hollow Hills Community Library, 55 Vanderbilt Parkway, Dix hills, New York, 11746, 631/421-4530, hhhlibrary.org

Figure 4.4
QR code on an end stack at the Half Hollow Hills Community Library (design by Dan Epstein).

In-Class Use

Instructors are frequently looking for ways to get students to play an active role during class. Active learning has been shown to have a positive impact on student learning outcomes and can help build a sense of community in the classroom (Markett et al. 2006; Aagard, Bowen, and Olesova 2011). However, incorporating active learning components can be difficult in large lecture classes where there are too many students to do the sort of activities possible with smaller groups. This is why classroom response systems have become a popular way to get students actively engaged in classroom discussions. Classroom response systems allow students to provide feedback via handheld devices. While traditionally this handheld device was a clicker that students or departments had to purchase, more and more often instructors are capitalizing on the handheld device that nearly all students have in their pockets.

There are a variety of ways that classroom response systems have been implemented to allow students to use their mobile phones. The simplest is to use text messaging for students to provide feedback or answer polling questions. Given that a 2011 survey found that 18- to 24-year-olds send, on average, 1,914 text messages per month (Nielsen 2011), it seems like a seamless way to collect information from students during a classroom discussion. Some response systems have been designed to get feedback from students solely via text messaging (Cheung 2008; Markett et al. 2006), but others allow students to provide feedback via multiple modalities. Poll Everywhere[7] is an online polling tool that allows students to use text messaging or a web form to answer questions during class. The answers are then updated in real time on a PowerPoint slide or the website itself. Student responses are reported in aggregate in the class and cannot be attributed to a particular individual. Classroom polling can be useful as formative assessment, to get an idea of where students are pedagogically, so that instructors can tailor their lessons to immediate needs (Mandernach and Hackathorn 2010). Polling can also be useful as summative assessment at the end of class to see whether students have adequately absorbed the information. Librarians use classroom polling tools as icebreakers in one-shot sessions, for pre- and posttests, and to get feedback on the quality of their instruction (Sellar 2011). These tools provide valuable feedback for the instructor and wonderful opportunities for students to be active and share their thoughts during the session.

One potential drawback of using text messaging is that not everyone has unlimited text messaging on their phones and may have to pay for each text message sent

(Cheung 2008). However, it is certainly still cheaper than requiring students to purchase a clicker device. At schools where cell phones are banned, classroom response systems that require students to text their answers are not a viable option. That is why having a system with the flexibility of Poll Everywhere is valuable, because students can provide their feedback through a web browser instead of their phone.

Some instructors are using Twitter[8] as a classroom backchannel where students can comment on the lecture topic, ask questions, answer questions, and provide feedback. With Twitter, students can use a mobile device or a computer to provide their feedback, and the feedback can be easily collected together in one place by asking students to use a class hashtag in their tweets. Some conferences have displayed Twitter and other backchannels behind the instructor, which can be distracting or even offensive depending on the content of the tweets.

Twitter has a few major drawbacks for use as a classroom backchannel. First of all, what students tweet is visible not only to members of the class but to all of their followers and possibly the world if they do not have a private feed. Students who use Twitter in their personal life may not want to also use it academically. Because ach tweet can be traced back to an individual user, students may not feel as comfortable asking questions and providing feedback as they would if they were anonymous. Ebner (2009) has experimented with anonymous microblogging (using a private non-Twitter application) in the classroom to promote more interactivity in lectures and found that students enjoyed the ability to comment and felt more engaged in the classroom.

Wiffiti[9] is another technology for capturing the classroom backchannel. Wiffiti essentially creates a digital pinboard to which people can add comments. People can comment via Twitter with a hashtag, anonymously via a web form, or anonymously via text message. All of the messages show up on the board, which can be embedded on any website or on a digital display. Wiffiti can be used as a backchannel for feedback about the lecture throughout the class, or individual screens can be used for getting feedback on specific discussion questions (Mandernach and Hackathorn 2010). Like displaying a Twitter backchannel, displaying Wiffiti behind the instructor can be a major distraction for students. Therefore, displaying it at key moments—like when a question is being asked—or having the instructor or teaching assistant view it from their own computer makes more sense than having it up throughout the class.

A robust and exciting classroom response system is HotSeat,[10] a "micro-discussion" tool created by and used at Purdue University. In HotSeat, a faculty member can ask a question or provide a framework for student discussion. Students can then respond in 140 characters or less via a web application, Twitter (using a hashtag), a Facebook application, or their mobile device. Students can vote on the responses from their classmates so that the most interesting or insightful responses float to the top, and they can respond to other individual student questions or responses (Aagard, Bowen, and Olesova 2011). This encourages peer-to-peer learning and engages students in a collaborative discussion much more than if they were only providing their own response. HotSeat could be a useful tool for asking questions, providing feedback, having discussions, or conducting formative or summative assessment. While Hotseat is currently available only at Purdue, it is possible that they will release the source code in the future. Regardless, it is an interesting model for other universities or companies to emulate.

Classroom response systems are not only useful in large lecture classes but also can encourage more discussion in classes of any size. Many students feel uncomfortable asking questions and taking part in classroom discussions. Many classroom response

systems allow students to share their thoughts or questions anonymously. This may be especially useful in classes that discuss sensitive or controversial topics (Ebner 2009; Markett et al. 2006). Classroom response systems also allow students to ask questions throughout the class time, and even after. One instructor at Purdue used HotSeat as a tool for students to ask questions that his graduate assistants would collect for him to periodically answer during the lecture (Aagard, Bowen, and Olesova 2011).

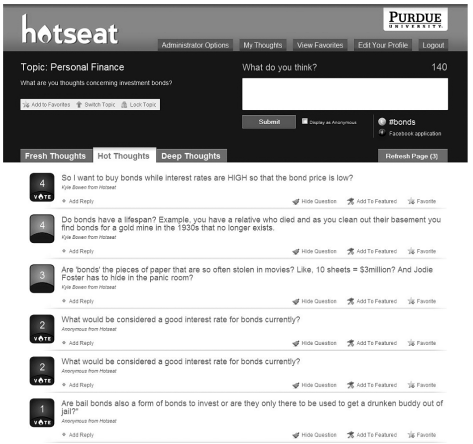

Figure 4.5
With HotSeat, students can add their own thoughts and vote for or reply to those of their classmates.

With all of the potential benefits of mobile classroom response systems, there are also potential drawbacks. Having students use a web-enabled mobile device in class may lead them to also use it for purposes unrelated to class. A quick check of their email or a text message to a friend can become a serious distraction in the classroom. Also, while anonymity can encourage shy students to share their thoughts, it can also encourage people to write things that are offensive and inappropriate (Aagard, Bowen, and Olesova 2011). Even students providing feedback that is critical of the instructor or their lecture can undermine the instructor. Instructors need to consider how they will handle such uses of the classroom response system, much as they need to consider how they would handle any disruptive classroom behavior.

Instructional Outreach

Point-of-need instruction is certainly vital to providing effective instructional outreach, but it's also important to put instructional content where our users are, which is not always in the library. Libraries should consider where in their communities patrons have information needs and how libraries can make their instructional content accessible from there. Libraries could create topical posters with a QR code and/or a shortened URL that takes the user to relevant instructional content. Libraries with guides to finding grants or for small businesses could create posters to place in other local organizations dedicated to supporting businesses. Subject liaison librarians could create posters for academic departmental offices that link users to relevant subject guides. In computer labs across campus, libraries could provide posters that link patrons to information about citing sources or citation management tools like Zotero and Mendeley. Patrons' library-related needs do not end when they leave the library, and neither should our outreach efforts.

There are a variety of additional ways that libraries have been providing instructional outreach to patrons via mobile devices with varying levels of success. Walsh (2010b) describes a service at the University of Huddersfield where students can choose to receive research tips via text message from the library. In the first semester it was offered, 60 students signed up for the weekly SMS tip and link to related instructional content, but on average only two students actually clicked on the provided link each week. Services of this kind must be opt-in, both because of the charges associated with receiving text messages and the potential annoyance factor of receiving unwanted texts from the library.

Another way that libraries have been providing mobile-friendly instructional outreach is through podcasting and vodcasting, episodic audio and video respectively, that users can subscribe to and have downloaded automatically to their mobile device. One excellent example of this approach to instructional outreach is Arizona State University's *Library Minute* series,[11] which provides slick and engaging video instruction on library collections, services, and more, all in around one minute. The videos are uploaded to YouTube, where patrons can easily subscribe to and access them via mobile devices. While the *Library Minute* is an extreme example, audio and video segments should always be short, ideally under three minutes but certainly no more than five.

CONSIDERATIONS FOR THE USE OF MOBILE DEVICES IN LIBRARY INSTRUCTION

For libraries considering providing instruction to mobile users, there are many things to consider before getting started. It helps to know what devices the majority of patrons have and what they use those devices for. While research on mobile trends is valuable, it is not a substitute for getting to know the needs of your unique population. Web analytics tools like Google Analytics and AWStats can give you a sense of what mobile operating systems are accessing your library website, but that will only give you statistics on those that choose to access your website through a mobile device, which is likely a very small subset of your population. Surveys can give you a useful baseline response, but the information will quickly become dated as many individuals update frequently.

It is also important to determine what your patrons' instructional needs are. If your library keeps track of questions asked by patrons at the reference desk, this can be amazing data to mine to determine priorities. Otherwise, librarians who frequently work at the reference desk likely have useful insights regarding the things that patrons have trouble with most often.

When working with existing instructional content, the first major consideration is how that content should be adapted for mobile use. There needs to be recognition that there is more of a difference between mobile devices and desktop or laptop computers than just the smaller screen. Libraries need to design mobile interfaces based on how people actually use those devices rather than just thinking about how to shrink down their existing content to fit the form factor. Educational content needs to be bite-sized and modular, allowing people to easily jump to the information they need rather than forcing them through a specific progression (Motiwalla 2007).

There also needs to be some consideration of the great variety of mobile devices students have, from smartphones to iPads to feature phones. It is critical that applications and interfaces are tested with a wide variety of devices to make sure that students can interact with the content at least on the most common devices (Fox 2010). This becomes even more complicated when developing educational mobile apps because an app is designed for a specific mobile platform. Unless the vast majority of patrons are using one specific platform—which seems unlikely given Android's growth in market share—libraries will need to develop applications for multiple platforms.

In synchronous instruction sessions, whether a tour or a classroom situation, WiFi and cell-phone signals may be a concern. Students will not be able to text their answers if their phone does not get a signal and will not be able to access a web form if the

wireless signal is poor. This is just another reason why it is valuable to offer multiple methods for providing classroom feedback. Even then, it is a good idea to test signal strength throughout the classroom with various devices.

Libraries are developing learning objects with varying levels of mobile-friendliness. Some systems, such as LibGuides,[12] can serve up a mobile-friendly version of each guide and tutorial created. Other tutorials may not render well on a mobile device, requiring horizontal scrolling or resizing of the text. When libraries are creating tutorials, it's important to consider how they will display on mobile devices and to create separate mobile versions or a mobile style sheet if necessary. When designing video tutorials, it is essential they are filmed and exported in such a way that allows for viewing on a mobile device. If a video can be uploaded to YouTube, students should be able to easily view it on their smartphones or tablets.

While they have so many exciting potential uses in education, QR codes suffer from several major flaws. The first is the lack of awareness of QR codes in North America and Europe. While lots of people have seen them around on magazine ads and billboards, the majority of the population has never scanned one and does not really know what they are. After a QR code awareness campaign at the University of Huddersfield, Walsh (2010a) found that awareness increased from 8 percent to 22 percent of survey respondents, but that still is a very small percentage of their population. Currently, QR code readers do not come preinstalled on most mobile phones in the United States, which means that users have to go through the effort of installing a QR code reader app on their phone before they can even start scanning codes. In some cases, this might provide enough of a barrier to use that people will not bother. Burns (2011) found that some students had trouble downloading the QR code reader app before the scavenger hunt she held, perhaps caused by slow WiFi or cell-phone provider network. The final issue is the diversity of cell-phone cameras. High-resolution cameras should have no trouble scanning the codes, but older and lower-resolution cameras sometimes have difficulty reading QR codes, especially if they are too small or do not have sufficient visual contrast.

This is an exciting time for rethinking teaching in light of the growth in mobile-device usage and mobile technologies. The reasons to provide mobile learning platforms go beyond the mere fact that most teens and adults carry a mobile device. Mobile learning provides opportunities for developing immersive, interactive, and individualized forms of instruction. Learners develop more autonomy with modular, on-demand instructional content that they can access at their point of need. Instruction can be tied to specific texts, contexts, and locations, helping students meld their personal observations with expert information. Even in large lecture classes, the "sage on the stage" model can be augmented by increased opportunities for student feedback and collaborative peer-to-peer learning. Libraries can take advantage of mobile learning in the classroom, the orientation tour, and at the user's point of need. Learning can be made more seamlessly available wherever the user happens to be.

NOTES

1. library.duke.edu/support/renovation/tours.html
2. ucmercedlibrary.info/about-the-library/ipod-touch-library-tour
3. podcast.iu.edu/Portal/PodcastPage.aspx?podid=5f1d6a9c-504b-44ba-8b54-bebe9002421d
4. dansl.net
5. classtools.net/QR/

6. hhhl.wordpress.com/tag/qr/
7. polleverywhere.com
8. twitter.com
9. wiffiti.com
10. purdue.edu/hotseat/
11. lib.asu.edu/librarychannel/?cat=87
12. springshare.com/libguides

REFERENCES

Aagard, Hans, Kyle Bowen, and Larisa Olesova. 2011. "Hotseat: Opening the Backchannel in Large Lectures." *EDUCAUSE Quarterly* 33 (3): 1–13.

Abilene Christian University. 2011. *Abilene Christian University 2010–11 Mobile-Learning Report*. http://issuu.com/abilenechristian/docs/acu_ml_report_2010-11.

Barnes, Cameron, and Belinda Tynan. 2007. "The Adventures of Miranda in the Brave New World: Learning in a Web 2.0 Millennium." *ALT-J* 15 (3): 189–200.

Burns, Erin M. 2011. "Remaking the Library Information Hunt Using QR Codes." *Pennsylvania Library Association Bulletin* (Jan/Feb/Mar): 11–13.

Chen, Nian-Shing, Daniel Chia-En Teng, and Cheng-Han Lee. 2011. "Augmenting Paper-Based Reading Activity with Direct Access to Digital Materials and Scaffolded Questioning." *Computers & Education* 57 (2): 1705–1715.

Cheung, Stephen L. 2008. "Using Mobile Phone Messaging as a Response Medium in Classroom Experiments." *Journal of Economic Education* 39 (1): 51–67.

Die Bayerische Staatsbibliothek. 2011. "Ludwig II—Walking in the Footsteps of a Fairytale King." http://www.bsb-muenchen.de/Ludwig-II-Auf-den-Spuren-des-Maerchenkoenigs.ludwig-app.0.html?L=3.

Ebner, Martin. 2009. "Interactive Lecturing by Integrating Mobile Devices and Microblogging in Higher Education." *Journal of Computing and Information Technology* 4: 371–381.

Ericsson Corporate Public & Media Relations. 2010. "Mobile Subscriptions Hit 5 Billion Mark." http://hugin.info/1061/R/1430616/377332.pdf.

Fletcher, Jon. 2010. "Mobile Learning: What Exactly Is It? *Multimedia Information & Teachnology* 36 (1): 22–24.

Fox, Robert. 2010. "Library to Go." *OCLC Systems & Services* 26 (1): 8–13.

Hicks, Alison, and Caroline Sinkinson. 2011. "Situated Questions and Answers." *Reference & User Services Quarterly* 51 (1): 60–69.

Ingram, Matthew. 2010. "Mary Meeker: Mobile Internet Will Soon Overtake Fixed Internet." *GigaOM*. http://gigaom.com/2010/04/12/mary-meeker-mobile-internet-will-soon-overtake-fixed-internet/.

Johnson, Larry, Samantha Adams, and Keene Haywood. 2011. *The NMC Horizon Report: 2011 K–12 Edition*. Austin, TX: The New Media Consortium.

Johnson, Larry, Rachel S. Smith, Holly Willis, Alan Levine, and Keene Haywood. 2011. *The 2011 Horizon Report*. Austin, TX: The New Media Consortium.

Law, Ching-yin, and Simon So. 2010. "QR Codes in Education." *Journal of Educational Technology Development and Exchange* 3 (1): 85–100.

Liestøl, Gunnar. 2011. "Learning through Situated Simulations: Exploring Mobile Augmented Reality." *ECAR Research Bulletin* 1: 1–14.

Mandernach, B. Jean, and Jana Hackathorn. 2010. "Embracing Texting during Class." *Teaching Professor* 24 (10): 1–7.

Markett, C., I. Arnedillo Sánchez, S. Weber, and B. Tangney. 2006. "Using Short Message Service to Encourage Interactivity in the Classroom." *Computers & Education* 46 (3): 280–293.

Mcloughlin, Catherine, and Mark J. W. Lee. 2008. "The Three P's of Pedagogy for the Networked Society: Personalization, Participation, and Productivity." *International Journal of Teaching and Learning in Higher Education* 20 (1): 10–27.

Mikkelsen, Susan, and Sara Davidson. 2011. "Inside the iPod, Outside the Classroom." *Reference Services Review* 39 (1): 66–80.

Motiwalla, Luvai F. 2007. "Mobile Learning: A Framework and Evaluation." *Computers & Education* 49 (3): 581–596.

Nielsen Company. 2011. "New Mobile Obsession: U.S. Teens Triple Data Usage." *Nielsenwire* (December 15). http://blog.nielsen.com/nielsenwire/online_mobile/new-mobile-obsession-u-s-teens-triple-data-usage/.

Ozcelik, Erol, and Cengiz Acarturk. 2011. "Reducing the Spatial Distance between Printed and Online Information Sources by Means of Mobile Technology Enhances Learning: Using 2D Barcodes." *Computers & Education* 57 (3): 2077–2085.

Pence, Harry. 2011. "Smartphones, Smart Objects, and Augmented Reality." *The Reference Librarian* 52 (1): 136–145.

Ryokai, Kimiko, Lora Oehlberg, Michael Manoochehri, and Alice Agogino. 2011. "GreenHat: Exploring the Natural Environment through Experts' Perspectives." *Proceedings of the 29th international Conference on Human Factors in Computing Systems*, Vancouver, Canada, May 7–12: 2149–2152.

Sellar, Melanie. 2011. "Poll Everywhere." *Charleston Advisor* 12 (3): 57–60.

Smith, Aaron. 2010. "Mobile Access 2010." *Pew Internet and American Life Project*. http://www.pewinternet.org/~/media//Files/Reports/2010/PIP_Mobile_Access_2010.pdf.

Squire, Kurt. 2010. "From Information to Experience: Place-based Augmented Reality Games as a Model for Learning in a Globally Networked Society." *Teachers College Record* 112 (10): 9–10.

Traxler, John. 2007. "Defining, Discussing and Evaluating Mobile Learning: The Moving Finger Writes and Having Writ. . . ." *International Review of Research in Open and Distance Learning* 8 (2). http://www.irrodl.org/index.php/irrodl/article/viewArticle/346.

Walsh, Andrew. 2010a. "QR Codes—Using Mobile Phones to Deliver Library Instruction and Help at the Point of Need." *Journal of Information Literacy* 4 (1): 55–63.

Walsh, Andrew. 2010b. "Supplementing Inductions with Text Messages, an SMS 'Tips and Tricks' Service." *ALISS Quarterly* 5 (3): 23–25.

Woodbury, David N. 2009. "A Survey of Undergraduates' Use and Attitudes of Cell Phones for Instruction, Learning, and Collaboration." Master's Thesis, University of North Carolina, Chapel Hill.