Teaching and Learning with Mobile Devices

Abstract: This paper will discuss using mobile devices in teaching and learning. From smartphones to iPads, mobile devices continue to permeate our society. For today’s students, these devices have become a natural part of their environment and their connected lives. When students enter school on a daily basis, however, we ask them to put away their devices, disconnect and learn in an environment that is unlike their home, or native, environment. Mobile devices and educational applications, however, have potential to be used as an effective tool for teaching and learning. As with many new technologies, the use of mobile devices has some challenges for educators and those who support the use of technology in the classroom. These challenges fall into the following categories: Access, Management, Usability, Inappropriate Use, as well as Policy Issues. This paper will discuss what mobile learning is, types of mobile devices, tools accessible through their use, and educational applications for mobile devices. In particular, challenges to their use in the classroom will be discussed.

Introduction

Mobile Learning is still a fairly young area of research. Mobile devices came into existence in the 1990’s with the first personal digital assistants (PDAs). Technology has changed rapidly since then with new types of devices; therefore, definitions given for mobile learning over the years have been somewhat unstable and are still evolving. Attewell, Savill-Smith, and Couch (2009), define mobile learning as the “exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning” (p.1), while Keegan (2005) defines it as ‘the provision of education and training on PDAs/palmtops/handhelds, smartphones and mobile phones’ (p. 3). Both of these definitions focus on two things: mobility and education. In order to achieve mobility, one of the characteristics of mobile learning is the use of devices. According to Keegan (2005), these are devices which:

- which citizens are used to carrying everywhere with them,
- which they regard as friendly and personal devices,
- which are cheap and easy to use,
- which they use constantly in all walks of life and in a variety of different settings, except education (p. 3).

Mobile learning can also been seen as another form of distance education (Traxler, 2010). However, with the recent developments in mobile devices, mobile learning is now moving toward integration into mainstream education.

According to the 2011 K-12 Horizon Report, mobile devices are “always connected” used not only for text messages and phone conversations, but also allows connections to content and social aspects of the Internet (Johnson, Adams, & Haywood, 2011). The report projects mobile devices to have a large impact on teaching and learning within the next twelve months. This short timeline to impact is due to the latest developments in tablet computing, such as the Apple iPad and Android Galaxy Tablet.

These devices function as e-readers and video repositories, but also allow web browsing and give access to thousands of applications. All of these tools are packaged in a portable and mobile tablet that can fit in a backpack.

“With always-on Internet, mobiles embody the convergence of several technologies that lend themselves to educational use, including electronic book readers, annotation tools, applications for creation and composition, and social networking tools” (Johnson, Adams, & Haywood, 2011, p. 15).

Digital Natives and Mobile Devices

Having grown up with technology all around them, today’s generation of K-12 students have been given several labels, such as the Net Generation, Millenials, or Generation M (for multi-tasking or media). Presky (2001) coined the term digital natives to describe today’s students. Digital natives were born after the introduction of the home computer and grew up in a world dominated by the Internet (Black, 2010). These students are native speakers of technology and grew up surrounded by and using computers, videogames, digital music players, web cams, cell
phones and other digital tools. Digital immigrants are those who were not born in the digital age, but have learned how to use technology. “Digital Immigrant instructors, who speak an outdated language (that of pre-digital age), are struggling to teach a population that speaks and entirely new language” (Prensky, 2001, p. 2).

Digital natives want to be engaged, but not the type of engagement found in traditional schooling. They want to be engaged through similar activities found when using games and other digital devices. According to Prensky (2005), students are fully engaged outside of school in their 21st century digital lives, and in order for teachers to engage them inside of school, they need to do so electronically. The use of mobile devices is one way to engage students electronically with tools they use everyday outside the classroom.

Why Use Mobile Devices

Among digital natives, mobile devices are becoming tools they cannot do without. According to Project Tomorrow (2010), the number of high school students owning smartphones has tripled from 9% in 2006 to 31% in 2009. In fact, 2009 data reports widespread access to mobile devices across the K-12 spectrum (Table 1). High school students are not the only ones with cell phones and other digital tools. Students from Kindergarten through 12th grade are reporting having access to cell phones without internet access, smartphones with internet access, laptops or tablet PCs, netbooks or mini-notebook computers, MP3 players, and handheld game players. Interestingly, students also indicated they would rather use their own devices than use the schools’ technology.

Table 1: Student Access to Mobile Devices in 2009 (Project Tomorrow, 2010)

<table>
<thead>
<tr>
<th>Device Type</th>
<th>K-2nd grade</th>
<th>3rd-5th grade</th>
<th>6th-8th grade</th>
<th>9-12th grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Phone (w/o internet access)</td>
<td>18%</td>
<td>29%</td>
<td>59%</td>
<td>67%</td>
</tr>
<tr>
<td>Smartphone (w/ internet access)</td>
<td>14%</td>
<td>17%</td>
<td>24%</td>
<td>31%</td>
</tr>
<tr>
<td>Laptop/tablet PC</td>
<td>27%</td>
<td>32%</td>
<td>53%</td>
<td>60%</td>
</tr>
<tr>
<td>Netbook or mini-notebook computer</td>
<td>n/a</td>
<td>n/a</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>MP3 player</td>
<td>35%</td>
<td>55%</td>
<td>80%</td>
<td>85%</td>
</tr>
<tr>
<td>Hand-held game player</td>
<td>47%</td>
<td>60%</td>
<td>64%</td>
<td>48%</td>
</tr>
</tbody>
</table>

Prensky (2010) says it is important for teachers to consider using mobile devices in education because:

- Cell phones have become so ubiquitous, and they are such an important tool in students’ lives out of school.
- They are an area where there may be a digital divide, which as teacher we need to help overcome.
- Their power and the useful things they can do for education are growing rapidly and enormously as they morph into smartphones and full-fledged computers, which is already happening with the iPhone and other phones like it. (p. 104)

Other benefits to using mobile devices in education include ubiquitous access and support for individualized, multimodal learning (Wallace, 2011). Mobile devices are small and can be carried all the time in pockets, whereas laptops might be difficult to take everywhere. In addition, there may be a personal attachment factor that boost student interest in learning. The size of mobile devices allows learning to occur anywhere outside the classroom as well as inside. Also, since mobile device applications are mostly web-based with camera and GPS features, they can be used for innovative activities addressing auditory, visual, and kinesthetic senses.

Challenges

As with many new technologies, the use of mobile devices has some challenges for educators and those who support the use of technology in the classroom. These challenges fall into the following categories: Access, Management, Usability, Inappropriate Use, as well as Policy Issues. These will be explored later. Ideally, with conflicting cell phone policies in place, students should have access to a class set of similar mobile devices where a cell phone service plan isn’t required for use, such as a class set of iPod Touches or iPads.
Access

As with most technologies, the use of mobile devices in the classroom is dependent on what students have access to. As stated earlier, although students may prefer to use their own devices, many students will not have access to a cell phone or other mobile device that allows for all students to participate fully. Trends indicate there is widespread adoption of mobile devices. This is mostly due to parents wanting their children to have cell phones for safety purposes. However, there will still be students whose parents cannot afford cell phones and/or differences in what service plans students have. The type of service plans will have an impact on what students can do with the cell phones such as text messaging and browsing the Internet. Although there are alternatives to access issues, overcoming them can take some effort and knowledge of mobile devices and using them on wireless and cell phone networks.

Technical Management

Although many of the issues are similar to other technology implementations, Mobile learning has been a challenge to technical support groups because of the number of devices that exist. These challenges can be addressed in terms of hardware and software.

Hardware includes the type of mobile devices and their operating systems. With computer and laptop systems, there are two main operating systems that control the market, Windows and Macintosh. Although there are many vendors for computer systems, most operating systems will either be Windows or Macintosh. The Linux operating system shares a small portion of the market. Mobile devices, however, have considerably more variations in types of hardware and operating systems. These include the Apple, Blackberry, Android, Windows Mobile, and Palm operating systems for smartphone systems. Other cell phone devices may have even more different types of user interfaces developed by companies such as Samsung, T-Mobile, LG, Motorola, and Sanyo. The differences in these operating systems and interfaces could cause issues related to connecting to wireless networks, differing ways to send text messages, and/or varying functions of cameras and other tools. One solution to these hardware incompatibilities is to implement a class set of one type of device.

For mobile devices, software applications are also know as “apps.” The diversity of hardware and operating systems may make it difficult for all students to have the same app since apps may not be available across platforms. Another issue is if the app must be purchased, who will pay for them if they are located on individual cell phones or devices. If students have access to a class set of the same type of mobile device, app management is easier, but there is still some organization on how one installs the app and who downloads and pays for it. With computer and laptop systems, schools could purchase site license or bulk license. At the time of writing this book, efficient app management was still being explored.

Usability

Usability refers to the ease of use of a mobile device and how intuitive the interface is. In other words, a user should be able to figure out how to complete basic tasks without having to look at a user manual. Screen size, navigation, opening applications, and entering text are all consider factors of usability. Depending on the device and the user, there may be many usability issues.

One of these issues includes whether or not the device is accessible to students with special needs. Many devices include accessibility options. For example, both the iPad and iPod Touch have functions that can be turned on for users with visual, auditory, and mild physical disabilities. However, with the diversity of devices available, not all devices may have these options.

Inappropriate Use

Many in the educational community are concerned about inappropriate use of mobile devices at school. One of the main safety issues includes cyberbullying. Cyberbullying is a form of bullying which uses technology to tease and taunt others (Burnham, Wright, & Houser, 2011). Students can use mobile devices to take pictures of classmates and post them online. Students can also send each other text messages and/or post messages on social networks to harass classmates. Another concern with the use of mobile devices in schools include cheating. Students can take pictures of a test and send to classmates, or use text messaging to send answers to tests and quizzes.
Other concerns include the ability for mobile devices to be distracting as well as encourage multitasking (Wallace, 2011). Ringing cell phones can distract students from lessons or educational activities. In addition, mobile devices encourage students to multitask. Research studies suggest it is not possible for someone to do multiple activities at once. Rather than multitasking, an individual is dividing his or her attention between multiple things. For example, while driving a car and using a cell phone, people respond much slower to traffic signals (Strayer & Johnston, 2001).

**Policy Issues**

The banning of electronic devices in schools has been a long-standing rule in student conduct codes since the days of walk-mans and pagers. When cell phones began to make their way into schools, schools were quick to include them in their policies on electronic devices. Put them away, or they will be confiscated!

As stated above, there are many issues that support the need for these policies. However, there are also many advantages to using cell phones and other mobile devices. Not only do parents want their children to have cell phones for communicate with them, but their educational applications can be beneficial for instruction. These policies hinder the use of cell phones in the instructional environment. Teachers may need to review these policies before asking students to use their cell phones for educational purposes.

Although there are several challenges to mobile learning, there are many educational benefits. Teachers should keep these challenges in mind when integrating mobile devices into instruction.

**What Do You Need?**

To integrate mobile learning into mainstream education, learning environments should include the following items:

- Mobile Devices with different functionalities such as camera and global positioning system (GPS)
- Wireless and/or mobile phone network
- Software Applications
- Other optional sensors and add-on devices
- Optional cloud computing services

The mobile devices you use in the classroom should have the ability to connect to a wireless or phone network. These can include cell phones such as iPhones or Android Devices, or non-phone devices such as iPod Touches, iPads, or Galaxy Tablets. As stated previously, there are challenges associated to using personal cell phone devices in the classroom; however, if that is all you have access to, there are similar tools and functions across all cell phones that you can use for educational activities. For those teachers dealing with issues related to personal cell phone use, a class set of similar mobile devices would be ideal. Having similar devices allows the instructor to manage the devices and the applications. It also gives students the ability to help each other with the devices when necessary.

Access to a wireless or cell phone network is not required; however, without this connectivity, the functionality of mobile devices decreases dramatically. Without access to the Internet, students do not have the immediate ability to look up information when it is necessary. In addition, many applications require network connectivity in order to work. For example, a newspaper application may not be able to update articles and will not work offline. Other examples include location dependent applications such as maps and astronomy applications.

**Basic Capabilities Mobile Devices**

Most mobile devices used in education have similar capabilities. Outside of the phone function, most devices allow short messaging service (SMS), a camera for still images as well as video, and a global positioning system (GPS). Other capabilities include the use of a microphone to record or make voice commands, the ability to listen to audio or watch video, as well as the ability to connect to a cell phone or wireless network for internet access.

Short message service (SMS), or text messaging, is fast becoming the preferred method of communication among digital natives. Text messaging can also be combined with pictures and video. For devices without a cell phone service, free text messaging applications can be downloaded and installed on the mobile device.
Cameras are now a basic feature on mobile devices. The latest iPad2 now has a front and rear view camera to allow for video conference calling as well as recording of video. Prior to mobile devices, classrooms had to have digital cameras or camcorders to use for class activities. The cameras on mobile devices have made it possible for each student to have access to a camera and digital camcorder to use in innovative activities or make creative projects.

Global positioning systems (GPS) are also now a basic feature on mobile devices. Until recently this feature was only available on cell phones with a true GPS chip. However, wireless devices can now detect location with the use of cell phone towers and wireless networks. There are three types of methods of detecting locations: 1) GPS chip and the use of satellite signal triangulation, 2) cell tower triangulation, and 3) Wireless Fidelity (WiFi) triangulation. Triangulation is “a technique for establishing the distance between any two points, or the relative position of two or more points, by using such points as vertices of a triangle or series of triangles” (Dictionary.com, 2011). The GPS function on mobile devices allows users to integrate location into activities. This can include simple navigation, learning how to use latitude and longitude, as well as collecting location data.

**Applications for Mobile Devices**

Software applications for mobile devices have been nicknamed “Apps.” Each type of mobile device (e.g. iOS for the iPad or iPod or Android OS), will have a different way of downloading applications. Each device will have to have an account with the “App Store” in order to download and install the software applications. Many applications are free to download and install, but may have advertisements embedded in the interface. Most other applications will be fairly inexpensive and range in price from $.99 - $9.99. Usually paid for applications will not include advertisements. This section will highlight some applications that can be used in the classroom.

*PollEverywhere*

PollEverywhere is an online polling system that allows instructors or presenters to deploy polls or quizzes to mobile devices (PollEverywhere, 2011). Users can create accounts for free and poll up to 30 audience members per question. Once questions are created through an online website, the teacher can deploy the question through text messaging, through web-enabled devices, Twitter, and a private web page link. More features are available with the paid plans.

*Mobl21*

Mobl21 is an application that is used to display educational content to students on mobile devices (Mobl21, 2011). Teachers create learning assets and deploy them to student email addresses with information on how to access the content. Students will set up a username and password then look at the learning assets through the mobile device. With Mobl21, teachers can create flashcards, quizzes, and study guides. These materials can be downloaded and viewed offline if necessary. In addition, if students do not have a mobile device, they can also view the content on a desktop or laptop computer.

*Virtual Frog Dissection*

The Virtual Frog Dissection application allows students to dissect and learn about the frogs and their biological functions without the mess and cost of a real dissection (mLab Emantras, 2011). The application features 3-D organ views, dissection tools such as pins, markers, scissors, and scalpels, as well as labels and information on organs and other functions. The application is available for the iPad, desktop and laptops, as well as a format for the interactive whiteboard.

**Conclusion**

While mobile devices have great potential as an effective tool for teaching and learning, there are many challenges educators must overcome as they implement their use. Challenges include issues related to access, technical management, usability, inappropriate use, and policy. More research on trends and issues related to the use of mobile devices is necessary. This research will help to establish guidelines to help with implementation as well as guide future research.
References


Traxler, J. (2010). Distance Education and mobile learning: Catching up, taking stock, Distance Education, 31(2), p. 129-138.
