Mobile Learning: The Equalizer in Education

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Abstract

There is no question that we are in the mobile technology generation. This is the opportunity to deliver education for all, which will provide citizens of the world the knowledge and skills to function in society so that they are productive and have a decent quality of life. There are many benefits for using mobile learning in education, but the most important ones include reaching people in remote locations and the disadvantaged, allowing learners to learn in context, and social interactions for learning. At the same time, there are barriers that must be overcome to move mobile learning forward. Common barriers include people’s attitude towards mobile learning, uneasiness of placing mobile technology in students’ hands, and the lack of learning resources and expertise for developing mobile learning. With the increasing use of open education resources and training programs for developing and implementing mobile learning these barriers will be overcome. Also, research on mobiles must be conducted to develop best practices for mobile learning. The implementation of mobile learning and the availability of open education resources will provide equal access to education to citizens of the world and allow education to reach the unreachable (Ally, 2012).
Introduction

The global education system is in crisis today. Students are demonstrating because education is too expensive and the education system does not meet their needs. There is a shortage of teachers, especially in developing countries, resulting in people in developing countries not being educated at a functional level. There are not enough schools in developing countries to educate the growing population. Learning materials are outdated because of the information explosion. There are many illiterate people in the world. Education must look at more effective and efficient ways to deliver education to improve access to all and to make education more affordable. The use of mobile technology will help to move education forward by providing equal access and making education more affordable. People in many countries, especially developing countries, already have mobile technology which they can use to access education. The use of mobile technology has been increasing over the last few years with a rapid increase in developing countries which have the fastest growth rate in the acquisition of mobile technology. People in developing countries are moving directly to wireless mobile technology. This provides an excellent opportunity for educators to reach learners around the world regardless of location. Mobile web usage is expected to double within five years and overtaking the personal computer access to the Web. At the end of 2010, there was an estimated 5.3 billion mobile cellular subscriptions worldwide (ITU, 2010). By 2015, 80 percent of people will be accessing the Internet using mobile devices (Johnston et al., 2011). There is an increasing use of mobile technology for social interaction and learning. The average time spent accessing Facebook via smartphone in the United States was 441 minutes in March 2012, compared with 391 minutes via computer indicating that the smartphone is overtaking the computer for social networking (McBride, 2012). The total number of SMS sent globally tripled between 2007 and 2010, from an estimated 1.8 trillion to an impressive 6.1 trillion (ITU 2010). With mobile learning and the increasing availability of open education resources, such as those available at the Khan Academy (2012), education will reach the unreachable and the disadvantaged.

The education system must cater for the new generations of learners who use mobile technology for a variety of activities including accessing just in time information, interacting with peers, shopping, banking, etc. It is a digital world with digital citizens where many sectors of society are providing services for mobile access. Libraries are being digitized for access by mobile technology – “a library in everyone’s pocket” (Ally & Needham, 2010, 2011). The banking system is allowing access to bank services using mobile technology - “in the pocket banking” (The Economist, 2007, 2009). Mobile technology is also being used in the travel industry to make travel convenient for customers, and governments are providing services for mobile access (Ally, 2006). Individuals are using mobile technology for entertainment – “entertainment in the pocket” and to shop – “in the pocket shopping”. A critical question for education is “What will it take to make education available in the pocket?” Mobile technology is impacting different sectors of society and will have a major role to play in the future of education. Mobile learning will be the future of education whether we like it or not. Future generations of learners will demand that education be delivered on mobile technology. However, to realize the full potential of mobile learning, education must become learner-centered where the learner will access learning materials from any location and at anytime.

This article will describe some mobile learning initiatives and will build the case that mobile learning and open education resources are important to provide education for all. It will describe the benefits of mobile learning
and some of the barriers that must be overcome to make sure mobile learning is implemented successfully. It will conclude by discussing what must be done to make the transition to mobile learning and suggest recommendations for future research on mobile learning and implementing mobile learning.

Examples of mobile learning implementation

A number of mobile learning research projects have been conducted by Athabasca University, a leader in mobile learning research (Woodill, 2011). These studies include a mobile workplace English project which aimed to explore the effectiveness of mobile devices in delivering interactive and multimedia content for the development of English language skills. The project created and tested innovative approaches to mobile-assisted workplace language training. Moreover, the Athabasca University library developed mobile-friendly websites with user interface features enabling access to resources from either a desktop, a laptop, or a mobile device. Other projects resulted in a mobile-friendly Digital Reading Room (DRR) offering course readings, mobile language websites including ESL grammar, and accent reduction instruction. The university created two other mobile web offerings, namely Mobile French and a Nursing and Health Studies web (AU Mobile Strategy Report, 2010). A recent on-going study is on the use of mobile learning and E-learning to expand legal services in the rural areas of Alberta. Another study on the state of mobile learning in Canada, which was recently concluded, found that although mobile learning is a new initiative across Canada, many organizations are interested in implementing mobile learning for education and training. However, organizations said that they do not have the expertise to develop mobile learning materials. They need training programs for developing mobile learning materials and success stories on mobile learning.

MacDonald & Chiu (2011) tested the viability of augmenting an e-learning program for the workplace using mobile content delivery; the multimedia mobile content delivered to learners via smartphones included text, audio and video, a multiple-choice quiz website, as well as links to streaming videos. While the mobile delivery of content was found to offer increased convenience and flexibility, video proved to be the most effective format of presenting mobile content, followed by audio and text. Algonquin College has recently opened the Algonquin Mobile Learning Centre, providing a dedicated space to use mobile computing devices in a collaborative learning environment using mobile and cloud computing technology and thus supporting a seamless transition between working on or off campus (Algonquin College, 2011). Students are able to bring their laptop, iPad, netbook, smartphone, or any other mobile devices and connect to the college network to collaborate with their peers. According to a survey conducted at the college, 80 percent of Algonquin College students bring their own mobile devices to the college, and this number has been increasing. “The Algonquin Mobile Learning Centre is about meeting the needs of today’s and tomorrow’s learners, as the college continues to deliver on its commitment to become fully mobile by 2013.” The College is also piloting “myDesktop” service that remotely delivers computer applications (including Microsoft Office, Oracle, AutoCAD, etc.) directly to a student’s personal laptop, netbook, or iPad.

Researchers and practitioners at George Brown College looked into augmenting English as a Second Language (ESL) and Communications classes by providing language practice outside the classroom walls using mobile devices (Palalas, 2010; 2011). Web-based mobile tasks were developed and offered to college students to
support the development of English for Special Purposes listening skills. Students completed those tasks in the real-world environment and created multi-media artefacts using their own mobile devices. The cross-platform mobile learning solution proved to be effective and is being further developed to provide off-line and on-line interactive options and hence accommodate students’ data plans.

The Standards Council of Canada, in collaboration with an international technical committee, has developed a technical report on “Learner Information Model for Mobile Learning” for ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission). The purpose of the report (ISO/IEC 29140-2) is to provide guidance on how to apply a learner information model for mobile learning. This framework can be used as a reference by software developers, implementers, instructional designers, and trainers to ensure that teaching and training environments reflect the specific needs of mobile participants.

Benefits of Mobile Learning

Mobile technology is being used by people, young and old, to conduct everyday business and to complete everyday tasks. There is a technological revolution in the world especially in developing countries where access to education is needed. In developed countries there is a shift from desktop to mobile technology but in developing countries citizens are moving directly to mobile technology rather than acquiring desktop computers and then moving to mobile technology. This is an excellent opportunity for the education system to deliver learning materials to all citizens in developing countries. The technology is impacting the way people work, learn, conduct business, interact with each other, and access information. Mobile technologies allow people who do not have computers to access education.

People in developing countries who cannot afford expensive computers can move directly to mobile technology for formal and informal learning so that they can improve their education and quality of life. The use of mobile learning has been increasing over the last few years with a rapid increase in developing countries which have the fastest growth rate in the acquisition of mobile technology. Mobile technology can be used for both formal and informal learning. In formal learning, students can use their mobile devices to access course materials while they are on the move or anytime they want to learn. Ally and Stauffer (2008) completed a study where students had the option of accessing their course materials from anywhere and at anytime using their mobile devices. Results indicated that the majority of students responded that they either agreed or strongly agreed that the use of the mobile device to access the course materials was useful and provided both flexibility and convenience. They also like the convenience of being able to access the course work on the mobile device from wherever they were, and whenever they had time to learn.

Informal learning is learning that is not tied to a program of study and occurs on an ad hoc basis. Informal learning occurs when individuals want to improve themselves so that they can be productive in society and on the job and to develop themselves personally. Mobile learning which allows individuals to learn anywhere and at anytime has a major role to play in informal learning (Ally, et al., 2008; Clough et al., 2009). For example, completing language training to improve language skills to function on the job is an excellent application of mobile learning. Ally et al., (2008) conducted a study to determine the effectiveness of using mobile phones to
deliver English as a Second Language (ESL) training to new immigrants. Students expressed a positive experience using the mobile phone to learn English grammar. They indicated that the use of mobile technology for ESL would be a good supplementary medium for learning at such times as waiting for a bus or travelling on a train, or whenever there was some spare time available. Using mobile devices to access the online course content increases motivation and opportunity for learning. Having the content online and right at students’ fingertips, just one click away, means they can learn wherever they are, despite the constraints of busy work schedules, commuting, etc.

Since it is predicted that by 2015, 80 percent of people will be accessing the Internet using mobile devices (Johnson, et al. 2011), organizations must take advantage of the increasing use of mobile technology to deliver education. The education system must change to take the education to the learner rather than bringing the learner to a specific location to learn. Requiring learners to go to a specific location to learn does not make sense when we now have information and communication technologies to reach learners wherever they are and whenever they want to learn. Citizens of countries have mobile phones that they can use to access learning materials from anywhere and at anytime. Research has shown that adult learners are motivated to learn using mobile technology so that they can improve themselves to perform on the job or function in society (Ally et al., 2010; Ally, 2009; Kukulska-Hulme, 2010). Learners at any age can be empowered to learn by using mobile technology. As learners, especially adults, use technology to learn, they will become digitally literate which is critical for the 21st century. According to McAnear (2011), we need to use learning strategies to allow learners to acquire digital age skills.

Mobile technology facilitates contextual and problem-based learning by detecting a learner’s presence in a particular place, or in relation to other people and objects nearby, and adapting the learning experience accordingly (Kukulska-Hulme, 2010). In the workplace, people can learn within the context of their work on real-world problems. Learners can access the learning materials and just in time information using mobile technology. Learners can use mobile technology to access the internet to obtain current information and to collaborate with other learners.

Education for all cannot be achieved with the current traditional education system where learners have to go to a specific location to learn. The education system has to reach out to learners with mobiles. Technology can be used to reach the disadvantaged and those with limited mobility so that they can be educated. At the same time, education should be open so that anyone can upgrade their knowledge and skills at anytime. Mobile technology, along with open education resources, provides equal opportunity for access to learning materials. Individuals do not have to leave their communities or families to learn. Employees can access learning materials in the workplace using mobile technology.

Using mobile technology allows learners to use the communication capabilities of the technology to network with people around the world so that they learn from each other and share information. Adults who are experts in their fields will be able to use the technology to tutor, coach, and mentor their peers and younger learners from a distance. The disadvantaged and students in remote locations will feel connected and empowered to learn using the technology. Adult students in some countries are very hesitant to go to school where there are young students. With mobile technology, these adults can access the learning materials from
anywhere and at anytime. Also, adults who are sensitive about getting academic upgrading or improving their language skills will be able to access learning materials using the mobile technology.

Barriers to mobile learning

The biggest barrier to the use of mobile learning in education is people's attitude towards the use of mobile technology in education. Policy makers and educators see mobile technology as being too small to be useful, too much distraction for learners, and an inappropriate behavior (UNESCO, 2012a). Policy makers and educators must be trained on how to effectively implement mobile technology in education. Learners must use the emerging technology so that they can be prepared to work in the 21st Century world. Skills such as collaboration, communication, and digital literacy are required for the 21st century learner and worker (Ally, 2012; UNESCO, 2012a).

It is normal for individuals to have reservations about new technology. When the internet was started, many individuals said that no one would use the internet. Today, we cannot do without the internet. Also, a senior official in an organization said that there is no reason why someone would want a computer in the home. How many computers do people have in their homes? Another statement is that there will be a need for only five computers in the world. How many computers are being used in the world today? With ongoing research in mobile learning and the development of user-friendly mobile technology, mobile learning will expand resulting in increased use.

Common barriers to education in developing countries include remoteness, cost, lack of qualified teachers and education infrastructure. Countries in Latin America are facing the challenges of high drop-out rates, limited access to technology, and lack of teacher training programs which are preventing these countries from educating all citizens to become productive and to improve their quality of life. A common reason why education cannot be provided for more students is because of the lack of teachers and funding to build and maintain schools. Rather than building classrooms and acquiring more teachers, there is the need to deliver education on mobile technology so that learners can learn from anywhere and they can be tutored by experts in their local community. The educational sectors in Latin America are starting to investigate the use of mobile learning to help address these challenges (UNESCO, 2012b). However, in order for mobile learning to be effective, it must be developed and implemented properly. Education must re-think how education is designed and delivered. Current pedagogical approaches are not appropriate for mobile learning and for the new generations of learners. There must be an instructional paradigm shift that promises to fundamentally change the way students learn (UNESCO, 2012a). Developing countries must not copy the traditional education system from other countries since these systems were designed many years ago and do not provide the flexibility for mobile learning. Once the traditional education system is copied, there has to be a paradigm shift to move to mobile learning. It is important that countries in Latin America develop their own infrastructure and pedagogical model for mobile learning.

There must be a sense of urgency in education to start using mobile technology to deliver education. Learners will demand that education be delivered on mobile technology since they are accessing services and products
in other sectors using mobile technology. Hence, the education system must plan to implement mobile learning. Educational organizations' strategic and education plans must include strategies for implementing mobile learning since in the very near future mobile technology will replace desktop and laptop computers. We are already seeing this trend in developing countries where citizens are moving directly to mobile technology skipping the large computer stage.

The internet is revolutionizing education and the education system must take advantage of this revolution (Bonk, 2011). Learning must be learner-centered rather than group-centered or institution-centered and learners must be empowered to learn so that they can use mobile technology to learn when and where they want to learn. With the widespread availability and use of mobile technology, education can be transformed to improve access by everyone regardless of location. As we move further into the 21st century, the amount of information available for access will be unimaginable. It is predicted that in five years information will double every eleven days. Every two days we create as much information as we did from the dawn of civilization up until 2003 (Schmidt, 2010). The only way for individuals to keep up with changes in their fields and to access relevant information is to participate in on-going education.

To help overcome the barriers to mobile learning, teachers must be trained in their new role as mobile learning facilitator. They must have a basic understanding of the technology and their features and how to develop effective learning strategies for mobile learning where learning is learner-centered rather than teacher-centered. Rather than trying to fit the new devices into the same instructional strategies, teachers should be thinking critically about how they will deliver instruction differently using the opportunities afforded by mobile technologies (UNESCO, 2102a).

**Open education resources**

The combination of mobile technology and open education resources is a very powerful combination to revolutionize education so that education can be provided to all. A global initiative that will help make formal education more affordable is the Open Education Resources University (OERu) which is a consortium of accredited universities around the world that is planning to offer formal courses at a significant reduced cost (Attwood, 2011). Yilmaz (2011) surveyed students on the benefits of OERs and reported that students like the 24/7 flexibility of access, the learner-centered approach, and no cost for the OERs. Everyone has a right to obtain at least a basic education level so that they can contribute to society and improve their quality of life.

However, education is more than providing access to content. It should facilitate the formation of learning communities for learners to interact, share experience and learn from each other. The OER initiatives around the world along with the Web 2.0 is moving education into the Learning 2.0 era where content and social interaction will go together to provide global education (Brown & Adler, 2008).

One of the challenges in delivering OERs on mobile technology is how to provide support to learners around the world who are in different time zones. With the rapid development of cloud computing, there will be learning in the cloud where OERs and access to learner support will exist everywhere and anytime. Cloud
applications facilitate sharing, networking, and communication and the production and publishing of artifacts of OERs (Kop & Carroll, 2011). There will be cloud tutoring where tutors will be available anytime and anywhere for learners to receive support as they learn.

There are many benefits of accessing OERs using mobile devices. Learners are given the flexibility of accessing the OERs from anywhere and at anytime and learners can learn in their own context (Ally, 2009). In traditional face to face instruction, learners have to go to a specific location and time to learn which is inconvenient for learners especially those who live in remote locations. With mobile learning, the learning is more learner-centered since the student is the one who has control of the learning. With the communication capabilities of the mobile technology, students can interact with each other at anytime and students can access the tutor from anywhere.

Conclusion

Mobile technology is profoundly changing the way people work, learn, conduct business, interact with each other, and access information. With mobile web usage expected to double within five years and overtaking the PC access to the web, we have entered the mobile era. In the near future we will be moving into the Education 3.0 era where education will make use of semantic web technologies, provide ubiquitous service and access, personalize the information for individual learners, provide virtual services, and deliver learning materials specific to locations resulting in location-based learning. Learning will become more problem-based which will allow learners to learn in context and promote high level learning. Mobile and emerging technologies will allow ubiquitous access of information and learning materials where citizens of the world can access learning materials from anywhere and at anytime. The technology will exist everywhere giving learners' seamless access to learning materials. The learning space is moving away from the classroom at a specific time to anyplace and anytime.

Because of the information explosion, it is difficult for teachers and professors to keep up with the rapid change of information which affects the currency of the learning materials. With mobile technology learners can access up to date information and learning materials at anytime and from anywhere. They can also access experts in the field using mobile social software. Learners will not have to wait for teachers to revise their courses with the current information which could take a long time. This is not acceptable by the current and future generations who want information “now” rather than “later”. The availability of open education resources will allow learners to access learning materials to meet their needs.

Education has to re-invent itself and it will take “brave and dedicated” leaders to make the shift to deliver education on current innovative technology and emerging technologies. Trends in education include: the role of the teacher will change, learning will occur 24/7, learning materials will be available as open education resources, education will become globalized, learning will be learner-centered, technology will change resulting in ubiquitous access and becoming virtual, the new generations will not be able to function in the current traditional education system and will demand a more flexible and inclusive system, with shrinking budgets educational organizations must look at new ways to conduct business, and the demand to provide
education for all. Yes, education leaders of the future must be “brave and dedicated” to re-invent education to address these trends.

Because of the availability of mobile technology globally, this is the first time in history that we have the opportunity to provide education for all. This is facilitated by many initiatives that are making learning materials available as open education resources. The growing availability of open education resources is making access to learning freely or more affordable for anyone who wants to learn. For example, the Khan Academy has over 3,000 videos and recently reported that over 148 million lessons were delivered globally (Khan Academy, 2012). We will know when the goal of education for all is achieved when all citizens of the world achieve at least a basic education level to function in society. The current education is not designed to provide education for all. It is designed to provide education for a few. This has to be changed. Students are demanding changes to the education system as indicated by on-going student demonstrations in Latin America, North America, and in countries around the world. Mobile learning has a role to play in re-inventing education.

More research is needed to develop best practices and to improve the use of mobile technology in education. Specific areas that need more research include: (1) How to design and deliver multimedia materials for mobile learning? (2) How to deliver learning materials to meet the needs of the nomadic learner who is always on the move? (3) How to make the transition from the traditional education system to mobile delivery (4) How to deliver vocational education in a mobile world? (5) What are the characteristics of the next generation of mobile technology for learning? (6) Delivery of open educational resources on mobile devices.
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Definitions

**Collaborative learning:** The grouping and pairing of students for the purposes of achieving an academic outcome.

**Constructivism:** The focus of this learning theory is on placing the learner at the centre and designing for learning rather than planning for teaching. The underlying philosophical framework is that humans construct meaning from current knowledge structures.

**Constructivist:** Pertaining to the learning theory of constructivism. The central tenet is that knowledge of the world is constructed by the individual. The person, through interacting with the world, constructs, tests and refines cognitive representations to make sense of the world. Learning rather than instruction becomes the focal issue.

**Education for all:** Providing at least a basic education level (Grade 6) to all citizens of the world.

**ICT:** Information and Communication Technology.

**Formal learning:** Learning that is usually delivered by an accredited educational organization and learners are given credit upon successful completion of the courses or modules.

**Informal learning:** Learning that is not organized and structured by an organization. It may take place in environments that already have some connections with learning, e.g. museums and art galleries, or anywhere the learner chooses, including at work.

**Interaction:** In instructional contexts, interaction can be seen as communication of any sort, e.g., two or more people talking to each other or communication among groups and organizations. Interaction in teaching and
learning is typically thought of as a sustained, two-way communication among two or more persons for purposes of explaining and challenging perspectives. If done in a formal, educational environment, then, interaction is usually between a student(s) and teacher, or among students.

**Interface:** The components of the mobile technology that allow the user to interact with the information.

**Learning object:** A self-contained digital learning resource that focuses on a single topic and can be re-used.

Mobile learning: Using a mobile device to access and study learning materials and for communicating with the organization, tutors and fellow students.

**Mobile device:** A portable device that can be used to access information and learning materials from anywhere and at anytime. The device consists of an input mechanism, processing capability, a storage medium, and a display mechanism.

**Multimedia:** A combination of two or more media to present learning materials to users.

Open Education Resource: Digital learning materials that are available to learners and education organizations as open licenses for use and re-use.

**Situated learning:** Learning that draws on an understanding of the relevance of the learner’s context, in the way the learning activities and resources are designed.

**Smartphone:** A mobile phone with some advanced features, such as a web browser.

SMS (Short Messaging Service): Allows text messages to be sent between mobile phones, also known as “texting.”

**Social computing:** Social computing has to do with supporting any sort of social behavior in or through the use of computers and computer software. It is based on creating or recreating social conventions and social contexts otherwise only possible in face-to-face interaction.

**Ubiquitous computing:** Computing technology that is invisible to the user because of wireless connectivity and transparent user interface.

**Ubiquitous:** Existing or being everywhere at the same time, constantly encountered or widespread.

Usability: Ease and efficiency in the use of a mobile device. In a learning situation, the device should not get in the way of the learning task. The design of the user interface is very important but contextual factors also have an impact on user experience.

**User:** An individual who interacts with a computer system to complete a task, learn specific knowledge or skills, or access information.

**User Interface:** The “bridge” through which a human interacts with a device. In mobile learning, it refers to the software and navigational features that permit a learner to complete learning tasks.