The Effect of the Future Mobile Learning: Current State and Future Opportunities

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Abstract

The aim of this research is seeks a better understanding how mobile technologies can be used to improve educational access, equity and quality around the world. Literature has provided in-depth evidence of the uses, advantages, disadvantages, impact, consequences and concerns about the use of mobile phones. The usage of mobile phones has re-shaped, re-organised and altered several social facets. Examine how mobile technologies can support teachers; improve their practice and how mobile technologies are likely brings impact for the education in the future.

1. Introduction

Nowadays mobile phones of third generation (3G) are dominating the market of cellular communication systems. These phones have been provided with better hardware and are becoming more powerful day by day. Music and video players, in-built GPS receivers, high data rate for Internet connection, short range communication technology, high resolution cameras are just a few examples of what mobile phones can offer.

Technology has changed our world in ways previously unimaginable. Mobile devices permeate our daily lives, providing unparalleled access to communication and information. Looking towards the next decade and beyond, it seems clear that the future of mobile learning lies in a world where technology is more accessible, affordable and connected than it is today. However, technology alone, regardless of its ubiquity and utility, will not determine whether mobile learning benefits large numbers of people. Designing effective mobile learning interventions requires a holistic understanding of how technology intersects with social, cultural and, increasingly, commercial factors. The technology itself is undeniably important, but equally if not more important is how people use and view technology, a point that has been largely overlooked. Just because mobile devices carry a potential to, say, help improve the literacy skills of women in resource-poor communities does not mean that these devices will actually be employed towards this end. Indeed, across the world women are far less likely than men to own and use mobile devices, and in many communities women are discouraged from using mobile technology for any purpose, learning included. Mobile devices are often banned from schools and other centres of education, despite considerable and, in many instances, well-established potential to enhance learning. Such bans project a view that mobile devices are antithetical to learning, and this outlook, regardless of its factual validity, impacts the way people interact with technology. Over the next fifteen years, the implementation of mobile learning projects and the pedagogical models they adopt should be guided not only by the advantages and limitations of mobile technologies but also by an

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awareness of how these technologies fit into the broader social and cultural fabric of communities.

Education and technology can and should co-evolve in mutually supportive ways. While people tend to think of education as perpetually lagging behind technology, there are numerous instances in which education has prompted technical innovation. For example, some historians argue that Alan Kay’s 1968 Dynabook, an early prototype of the laptop computer, came into existence as a means of helping students learn through ‘new media’. Kay drew on the theories of well-known learning specialists to inform the design and functionality of the device (Dalakov, 2013). With the unprecedented rate of technology change, it may seem nearly impossible to imagine what mobile learning will look like a decade from now, let alone two decades. Yet exploring these questions is an important exercise, as the future will be moulded by the decisions made today. With the right social and political supports and, most immediately, mechanisms to train practitioners to design mobile learning interventions, mobile learning has the potential to transform educational opportunities and outcomes. This report helps guide the way by highlighting issues and questions likely to steer mobile learning over the next fifteen years and beyond. It begins by presenting an overview of the current state of mobile learning, describing recent mobile learning developments in formal and informal education, seamless learning and educational technology. Based on current trends, the report then makes predictions for the future of mobile learning, forecasting likely technological advances and mobile learning focus areas. Subsequent sections discuss mobile learning in light of Education for All (EFA) goals, both now and in the future, and identify the primary enablers for mobile learning as well as the main barriers to its development [1]. Finally, the report presents the broad, overarching challenges to be met over the next fifteen years, in order for mobile learning to be integrated into mainstream education and impact teaching and learning on a global scale. Ultimately, the report seeks to provide policy-makers and other education stakeholders with a tool to better leverage mobile technologies in the ongoing effort to improve educational access, equity and quality for all.

2. Related Works

2.1. Game-Based Learning

Young people have played computer and online games with enthusiasm and persistence since the 1960s and 1990s, respectively. Now computer and online games are more prolific and popular than ever before. Educational institutions, as a result of having mobile learning device initiatives and cloud computing, are harnessing the same determination, enthusiasm and persistence that are brought out of students when they play games. Cardiff teacher Gareth Ritter explains how “a lot of the kids in [this] school play Call of Duty. If they fail a level they won’t give up, they’ll keep doing it. We’ve got to bring that into the classroom” (Vasagar, 2012) [3]. Game-based learning seems likely to become the most effective way to teach students fundamental concepts which would have previously been learnt via repetition and written exercises.

2.2. Virtual and Remote Learning Platforms

New, previously unimaginable possibilities for learning environments are also resulting from the merging of our physical and virtual world. The classroom is no longer restricted to existing inside a physical educational institution; it can be anywhere the student chooses. This is the idea encapsulated by VLEs. At the forefront of this idea are virtual and remote learning platforms. As mentioned above, VLEs are educational electronic learning systems based on
online models that mimic conventional in-person education. VLEs can include most learning environments from virtual learning platforms like those of MOOCs to virtual worlds like those used for game-based learning[3]. Virtual and remote learning platforms are poised to provide any student within or outside of traditional educational infrastructure with an engaging and interactive learning environment.

3. The Current State of Mobile Learning

Today, mobile technologies – originally marketed mainly as communication and entertainment devices – have come to play a significant role in economies and society at large. Mobile devices have impacted nearly every field, from banking to politics, and are currently being used to increase productivity in numerous sectors. As these devices become increasingly prominent worldwide, there is a great deal of excitement building around mobile learning. Students and teachers are already using mobile technologies in diverse contexts for a wide variety of teaching and learning purposes, and key educational players – from national education ministries to local school districts – are experimenting with supportive policies to promote innovative mobile learning in both formal and informal education settings. Many of the experts interviewed for this report feel that mobile learning is now on the threshold of a more systematic integration with education both in and outside of schools. Decisions made today will fundamentally influence the character of mobile learning in years to come. To help set the stage for these decisions, the following sections outline some of the most prevalent trends in mobile learning to date. These include innovations in formal and informal education, seamless learning and educational technology.

3.1. Formal Education

The presence of mobile devices in formal education systems is growing. Globally, two of the most popular models for mobile learning in schools are one-to-one (1:1) programmes, through which all students are supplied with their own device at no cost to the learners or their families; and Bring Your Own Device (BYOD) initiatives, which rely on the prevalence of learner-owned devices, with schools supplying or subsidizing devices for students who cannot afford them. As might be expected, the 1:1 model tends to be more common in poorer countries and regions, while the BYOD strategy is usually implemented in wealthier communities where mobile device ownership among young people is nearly ubiquitous.

3.1.1. Bring Your Own Device (BYOD)

One viable way achieve a 1:1 environment is to have students use the mobile devices they already own. This model, known as BYOD, is already causing a major shift in higher education and distance learning by allowing more students to access course materials via mobile technology. As mobile access and ownership increases, BYOD holds promise for learners around the world, although it may look drastically different across various regions and countries. While the strategy has been most popular in countries and communities where smartphone and tablet ownership is widespread, learners and educators have also found ways to capitalize on less sophisticated student-owned technologies. The Nokia MoMath project in South Africa, for example, uses the SMS (Short Message Service) features on standard mobile phones to provide students with access to mathematics content and support (Isaacs, 2012b).

While BYOD moves the hardware costs from the school to the learner, it places additional pressure on bandwidth – a critical infrastructure consideration for mobile learning initiatives. Schools or governments implementing BYOD programmes must also have a strategy in place
to provide devices to students who cannot afford them, either by buying the devices for the students or subsidizing their purchase. Further issues include security, privacy, adequate professional development for teachers, and a digital divide between students with cutting-edge devices and those with less powerful devices or none at all. For these reasons, examples of successful BYOD initiatives, particularly in primary and secondary institutions, are limited. However, as sophisticated mobile technologies become increasingly accessible and affordable, BYOD may form a central component of mobile learning projects in the future (Norris and Soloway, 2011).

3.2. Informal Education

Mobile learning has developed, to a large extent, outside of formal education contexts, and the vast majority of mobile learning projects are designed for informal learning.

3.3. Seamless Learning

Seamless learning is defined as uninterrupted learning across different environments, including formal and informal settings. In the ideal seamless learning scenario, a learner opportunistically uses various kinds of technologies, capitalizing on the unique affordances of each - the mobility of a smartphone, for example or the superior keyboard on a desktop computer – to maintain continuity of the learning experience across a variety of devices and settings. Historically, there has been a significant divide between the formal learning that happens inside a classroom and the informal learning that occurs at home or in community environments. Numerous experts are investigating how mobile learning might help break down that barrier and bridge the gap between formal and informal learning.

3.4. Educational Technology

Recent innovations in mobile technologies have mostly centred around the creation of digital content, largely in the form of digital textbooks accessed via e-readers, and the development of mobile applications (apps) and software platforms for accessing educational resources via mobile devices.

3.4.1. Digital Textbooks and E-Readers

In formal education settings in the developed world, the transition to digital textbooks is one of the most established mobile learning trends. As e-readers and e-reading applications continue to improve, the experience of reading electronically is rapidly becoming more pleasurable and conducive to learning. New approaches to textbook conversion and creation are moving away from mere digital reproductions of printed text to visually rich interfaces that can include multimedia, interactive and collaborative elements (GSMA, 2011).

The next generation of e-readers and tablets will offer new possibilities for teaching and learning. For example, e-books could enable a more social form of study, with a group of students collaborating to read, annotate and compare one or more texts on the same topic, each working from their individual mobile device (Sharples et al., 2012). Future e-books could exploit the tools built into mobile devices – such as voice recorder, camera, timer, GPS (Global Positioning System) locator, accelerometer, compass and tilt sensor – for exploratory learning, guiding the reader through experiments like testing the properties of light using the device’s camera or sound using the recorder (Sharples et al., 2012). As tablet and e-reader technologies improve in quality and decrease in price, this movement towards digital
textbooks could increase educational opportunities for learners around the world, particularly those who do not currently have access to high-quality physical materials.

3.4.2. Mobile Apps

Marketplaces for mobile apps have provided an entirely new distribution mechanism for content, stimulating substantial investment in software development for mobile devices. Educational apps are already experiencing significant growth in developed countries. These apps provide new tools for educational activities such as annotation, calculation, composition and content creation. A recent study found that 270 million apps linked to education were downloaded in 2011 – a more than tenfold increase since 2009 (McKinsey & Company and GSMA, 2012).

While a small number of educational apps are mapped to curriculum targets and designed for use in classroom or homework settings, the majority are intended mainly for informal learning (GSMA, 2011). However, as more students use mobile devices in formal education settings, apps will likely become an important part of the mobile learning ecosystem. Not only are developers now able to bypass institutions and sell content directly to learners, but students, teachers and schools alike will be able to make small, incremental investments in micro-sized pieces of content. For example, rather than investing in the same textbook set or software solution for an entire classroom, school, district or country, educators will be able to choose from a variety of apps that are tailored to each individual learner, powering the personalized learning that is expected to characterize formal education in the future.

4. The Future of Mobile Learning

With over 5.9 billion mobile phone subscriptions worldwide, mobile devices have already transformed the way we live. But even though people around the globe rely heavily on mobile technology, educators and policy-makers have yet to tap its full potential to improve learning. The next decade and beyond could be transformational in incorporating mobile technologies in both formal and informal education to better meet the needs of learners and teachers everywhere. The following sections describe some of the technological advances most likely to impact mobile learning in the future, and highlight key focus areas in the development of mobile learning over the next fifteen years.

![Figure 1. Functionality and Mobility in a Definition of Mobile Learning](image)

4.1. Technological Advances

In the next fifteen years, technology will change in numerous ways that can be leveraged for education. It is important that educators understand there innovations so as to influence their development rather than simple react to it. Ideally technology and education will co-evolve, with education needs driving technological progress as well as adapting to it. Outlined below
are some of the technological advances most likely to impact teaching and learning from a global perspective.

4.1.1. Technology will be more accessible, affordable and functional

While unforeseen technological innovation is certain, the advances that will have the greatest impact on education will likely stem from a continuation of the current and most important trends in technology evolution – namely improved functionality, connectivity and memory at lower costs. Increased availability and penetration of ‘smart’ mobile devices and cloud-based services with advanced functionalities will open up a world of new possibilities for mobile learning solutions, allowing the types of initiatives that are currently happening to be replicated on a large scale. Many experts imagine a day where every learner in the world has access to a powerful touch-screen tablet device and can afford both the hardware and the connectivity that enables fast and seamless access to the internet and/or other networks.

4.2. Mobile Learning Focus Areas

In the next fifteen years, mobile learning will undoubtedly become more integrated with mainstream education. Just as computers are now viewed as crucial component to learning in the twenty-first century, mobile technologies will soon become commonplace in both formal and informal education, and gradually even the term ‘mobile learning’ will fall into disuse as it is increasingly associated with learning in a more holistic rather than specialized or peripheral sense. As the links between technical and pedagogical innovations improve, mobile technology will take on a clearly defined but increasingly essential role within the overall education ecosystem. The following sections outline the anticipated focus areas for mobile learning development in the foreseeable future.

4.2.1. Authentic and Personalized Learning

The current trend towards authentic and personalized learning will continue over the next fifteen years with the aid of mobile devices. Mobile technology can support learners in exploring the world around them and developing their own solutions to complex problems while working in collaboration with peers under the guidance of skilled teachers. New sensor technologies on mobile phones, coupled with new visualization technologies in the classroom, will open up insights into physical phenomena that will be particularly useful for science learning. Already there are a number of applications that use the image-capturing capabilities of smartphones and other mobile devices to, for example, help students studying botany identify different types of trees and plants they encounter in their day-to-day lives (Leafsnap, 2011). In recent years, much research has focused on the use of mobile data collection tools in epidemiology – such as Imperial College London’s (2013) EpiCollect application and Nokia’s (2012) Nokia Data Gathering project – which allow for the collection and real-time analysis of new kinds of data sets.

The personalization features of mobile technologies will allow learners of differing abilities and at different stages of development to progress at their own pace. Learning technologies that use artificial intelligence (AI) will become more widespread in education and will be increasingly available on mobile devices. As this is an emerging field, initial uses of AI in mobile learning in the coming years may focus on relatively simple or straightforward activities. Educators will need to ensure that this is balanced by personalized interventions that support more complex and multidimensional opportunities for learning. This will enable the development of new forms of personalized support for mobile learners. The effective design, development and implementation of personalized learning strategies
require vast resources and massive investments from national education ministries. Yet this investment is likely to be worthwhile, as personalized learning holds the potential to fundamentally transform models of teaching and learning and make education more relevant, engaging, authentic and effective for students everywhere.

4.2.2. Mobile Programming

Over the next fifteen years, students will not just use mobile devices to assist their education but will learn to program the devices themselves, developing, building and tailoring mobile applications to suit their individual desires and needs. In the process they will learn about computational thinking – the key concepts underlying approaches to programming and problem-solving – and gain vital skills for participating in the twenty-first century global economy. Indications of this trend can be seen through the emergence of mobile development labs (or tech hubs) across Sub-Saharan Africa (BongoHive, n.d.), and a recent focus on increasing the number of female software developers through coding communities such as AkiraChix (2011) in Kenya. In Europe, the rise of mobile programming in education is evidenced by the growing popularity of mobile applications for social change, such as Apps for Good (2012); projects that support young people’s coding skills, including CoderDojo (2012); and cheap computing alternatives, like Raspberry Pi (n.d.). The challenge for policymakers is to maintain the current level of excitement around new programming opportunities, and to encourage the integration of mobile programming with formal education, not only in the field of computer science but also in the wide range of disciplines in which computational thinking plays a role.

5. The Future of Higher Ed and its Impact on E-learning

5.1. Trends Currently Affecting Teaching, Learning, and Creative Inquiry in Higher Education:

1. People expect to be able to work, learn, and study whenever and wherever they want to.
2. The technologies we use are increasingly cloud-based, and our notions of IT support are decentralized.
3. The world of work is increasingly collaborative, driving changes in the way student projects are structured.
4. The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators.
5. Education paradigms are shifting to include online learning, hybrid learning and collaborative models.
6. There is a new emphasis in the classroom on more challenge-based and active learning.

5.2. Important Constraints and Challenges:

1. Economic pressures and new models of education are bringing unprecedented competition to the traditional models of higher education.
2. Appropriate metrics of evaluation lag the emergence of new scholarly forms of authoring, publishing, and researching.
3. Digital media literacy continues its rise in importance as a key skill in every discipline and profession.
It is not surprising, therefore, that trainers, lecturers, distance education providers and teaching institutions at all levels are increasingly using the Web as a medium for delivery. Specifically and practically this study will map the evolution from the wired virtual learning environment of today, to the wireless learning environment of tomorrow.

6. Conclusion

There’s no doubt about the fact that the realm of higher education worldwide is going to undergo a vast transformation. With newer and better technology becoming increasingly affordable, classrooms the world over are evolving. Through better understanding and utilization of these incredibly powerful new revelations in educational technology, we can prepare future generations for whatever may lie ahead. This shift is placing students as independent learners, rather than teachers as instructors, at the forefront of delivering education. Teachers are increasingly becoming information guides rather than educational instructors. Consequently students are being encouraged, by these technological advancements in education, to take a more active role in their own education.

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References

[1] Ahonen Mikko Project Manager, Hypermedia Laboratory, University of Tampere, Finland Mobility, Accessibility and Learning, Mlearn 2003 conference on Learning with mobile devices.