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International Manuscript ID : ISSN2249054X-V3I1M2-012013

VOLUME 3 ISSUE 1 January 2013

STUDY OF POTENTIAL IMPACT OF USING MOBILE DEVICES IN EDUCATION

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Abstract

Mobile devices are becoming ubiquitous in the world today. With the power of portable computing in the hands of everyone and anyone, the time has come to consider using mobile devices for education. While ICT in education has been trialed, results have been mixed. Mobile devices are also ICT devices, so why should we still consider using mobile devices in education and what is its potential impact on the stakeholders.

The study provides an overview of what is out there and explores the opportunities and issues in regards to using mobile devices in education. Next we look at how the stakeholders in the education system, namely the education providers, the teachers, the students, their parents, and the ministry of education can benefit by successfully deploying classroom curriculum via mobile devices. Many stakeholders in the education system are already struggling to deliver basic education – what is required of them and how they should be supported if we are to convince them to use mobile devices in delivering education.

Keywords: e-Learning, m-Learning Education, mobile devices in education

International Journal of Computing and Corporate Research

Multi Disciplinary Journal for Publication of Review and Research Papers



International Refereed and Indexed Journal for Research Scholars and Practitioners

<http://www.ijccr.com>

International Manuscript ID : ISSN2249054X-V3I1M2-012013

VOLUME 3 ISSUE 1 January 2013

Introduction

We have used computers for some time to do almost everything possible and came up with many innovative ways to use computers for teaching and learning in education. Portable computing power came in the form of laptops and netbooks. They allowed us to take our computing power with us carrying it on our shoulders. However, laptops and netbooks could provide us usage for three to four hours maximum before it required connection to electrical power supply. Mobile devices, once fully charged, can provide the same for 48 to 96 hours. Laptops and netbooks require connection to a network for Internet access, which is available at fixed locations in buildings or wireless access points, again at fixed and confined locations. Mobile devices have a network connection available almost (99.999%) of the time in almost every part of developed countries. Mobile devices network availability and penetration is happening at a dramatic pace in developing countries - already there is 68% penetration with an exponential growth of 10% per annum <Source: ITU, 2010 [17]>. The same should apply to education; learning and teaching should be able to take place anywhere whenever the student and the teacher are ready. With such flexibility in the provision of education, there is a possibility in getting everyone educated once the constraints of attending classes at confined time slots and locations are removed.

Mobile devices offer a number of advantages for education in comparison to laptops or netbooks. First, their lighter weight and orientation flexibility makes them far superior for digital reading or accessing of content. Second, their instant-on capability and fast switching among applications allows learning activities to proceed with less delay. Third, their touch screen interface allows a high degree of user interactivity. Fourth, they are much more mobile than laptops, as students can carry them inside or outside a room without having to close and reopen the screen and store them in the carry case and can also use them for mobile data collection or note taking. Fifth, since it is inexpensive to develop apps for mobile platforms, there is a rapidly growing amount of free or low-cost apps for mobile devices, many of which are suitable for education. And finally, mobile devices' long battery life makes them more suitable for a school day.

International Journal of Computing and Corporate Research

Multi Disciplinary Journal for Publication of Review and Research Papers



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<http://www.ijccr.com>

International Manuscript ID : ISSN2249054X-V3I1M2-012013

VOLUME 3 ISSUE 1 January 2013

Research Objectives

1. To inform as to why we should consider using mobile devices in education and what will its potential impact be on the stakeholders.
2. It provides an overview of what is already happening with mobile devices and explores further opportunities and issues in regards to using mobile devices in education.
3. Questions such as what are the costs and benefits of successfully deploying classroom curriculum via mobile devices are addressed.
4. What type of technology, content, and mobile devices are currently being experimented with is also taken into consideration.
5. All these are being done for one purpose, which is student learning outcomes – are we achieving the desired results in student learning outcomes with mobile devices.

Using Mobile Devices in Education and its Impact on the Stakeholders

There are many stakeholders in the education system, namely the education providers [schools, colleges, teacher training institutions and universities], the teachers [class teachers, subject teachers, heads of departments, and principals], the students [primary, secondary, and tertiary], their parents [as individuals, in school boards, and in school management committees], the ministry of education, the government [politicians and their policies], and funding agencies. All stakeholders need close collaboration if they want to benefit from successfully deploying classroom curriculum via mobile devices. Many stakeholders in the education system are already struggling to deliver education as it is – let us look at what is required of them and how they are to be supported if we are going to use mobile devices in delivering education.

The Education Providers

International Journal of Computing and Corporate Research

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International Manuscript ID : ISSN2249054X-V3I1M2-012013

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When stakeholders move from using computers in education to using mobile devices in education, there will be many economic advantages for the education providers. Education providers can also expect improved student learning outcomes, satisfied teachers - with technology for support and assistance, and happy parents. To start of with: there will be no need to have dedicated computer labs, specific computer desks, chairs and computer lab space – which also means no IT support required, no IT staff needed, no servicing, repairs and maintenance of computers required. All other associated costs like networking equipment, ISP connections, air conditioning and huge power bills will be saved. However, subscription will be paid to the mobile phone network provider, which in many cases will be insignificant when compared to computer networks to the internet. In many cases students with mobile devices will already be subscribed to a network service provider, if not, then schools normally get subsidised packages or are totally subsidised by their governments. Mobile devices, now available in abundance, are cheaper and simpler to use. New mobile apps rely on new input and output methods and allow a new population of non-expert users to use the device more cheaply and simply. For those education providers that were constrained by funds and expertise to use computers in education – using mobile devices in education seems like their savior. Nalder, 2011 [25] reasons that education providers using ICT in Education have struggled to:

1. Find the time to provide basic computer technology skills training to staff or
2. Get past the time intensive operating systems and user interface lessons or
3. Keep technology repaired and working so that it's available in the first place.

Nalder, 2011 [25] argues that education providers using mobile devices may now be able to:

1. Spend staff training time on improving pedagogy.
2. Spend valuable student lesson time on using technology instead of wasting time learning to use technology first and then the lessons.
3. Spend less money on supporting existing technology and more on supporting its use in classrooms.

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VOLUME 3 ISSUE 1 January 2013

Mobile devices are on track to become the main technology for use in education in the future. It is going to advance, improve, and become enhanced with each generation of students learning with them. Students who are learning with mobile devices today will become teachers in time to come.

The Teachers

Teachers are probably the most important and critical factor at the moment of the movement towards using mobile devices in education. What is lacking today are the skilled teachers that can take a mobile device and incorporate it from the paper-based or blackboard based classroom lessons, into student-centric learning deployed via mobile devices. But have we included the mobile device teaching into our existing teacher training curriculum. Are our teachers training institutions and universities teaching our future teachers on how to use mobile devices for teaching in the classroom or are we going to burden them after they graduate and start teaching. As suggested by Weinberger, 2011 add no burden - the failure of almost all educational technology initiatives can usually be traced to the additional burden placed on the teacher. Ideally, teachers' burdens should be reduced by technology.

Teachers require training to understand how to teach differently. How methods like student-centric learning can be applied to the classroom, and shown how this learning style will increase educational outcomes. Yet who is investing in teacher training? If you look around, Ministers of Education get excited about shiny, flashy things, not human capacity building. And who can blame them? It's a lot easier to show off a technology implementation than a trained teacher, and children and their voting parents can see a quick difference with a computer that isn't so noticeable with a trained teacher

So regardless of how amazing the mobile device technology is, until we invest in trained teachers who know how to use technology to improve their teaching activities, we are not going to make much difference with the current generation of teachers and learners. We also need parents and politicians who are focused on learning outcomes and not the new mobile device technology and what it can do, because regardless of how many applications or how easy the technology is, I fear that using mobile devices in education initiative will be wasted.

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The Students

Mobile devices are undoubtedly an exciting way to interact with technology, especially, when they are touch screen enabled. The intimacy and immediacy of the personal screen and the ease of use and intuitive design of modern touch screen operating systems greatly eases user fears and facilitates user adoption. This ease of use is exciting technologists and educators, both of whom are thinking of new ways to use technology like the mobile devices in educational systems of the developing world.

In an interview, a teacher at a residential school specifically for the disabled (both mentally and physically) in rural Transkei in South Africa shared an anecdote. She pointed to a crude sketch of an ATM that they used to teach basic life skills to their students and said that it often took years before the children were able to get their numbers right. However ever since they all got mobile phones (they receive special grants from the South African government) they had all figured out their numbers, how to maximize the use of their phones and often showed her how to use hers or top up her airtime or some such assistance. She said she'd been teaching for 35 years and had never seen anything like it, until the mobile phones came (Bhan, 2011 [4]).

Another interesting set of users for mobile devices are the senior citizens. They found using computers very hard as it required them to learn many things and remember them all. For example, if a user wanted to word process a letter, the user first had to learn the operating systems, then the word processing application, and then could do the letter. They didn't find this very productive, and thus shied away from using computers. With mobile devices, they basically have to remember just a few buttons like the call [green] button or the end [red] button to make phone calls or to send and receive text messages. With touch screen mobile devices and user friendly mobile interfaces it is easier for them to interact with.

Potential Problems with Using Mobile Devices in Education

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Nyaggah, 2011 [27] argues that three factors need to be in place for a platform of this nature [using mobile devices in education] to scale in new emerging markets across the developing world:

1). The Infrastructure – all mobile devices need to be powered up. There's little access to grid power and green energy is expensive in many parts of the developing world. That said, a family has to decide whether to use the little money they have for a solar pack to power a (probably donated) mobile devices or buy food. Distributing mobile devices at a huge cost to taxpayers in developed and developing countries is the easy part. Once the device is powered up there's a need to download content onto it. While mobile penetration and coverage is pretty good in some parts of the developing countries, the same isn't true of other parts. The danger of mobile devices in developing countries that can't be powered up and onto which no content can be downloaded would seriously undermine any efforts.

2). The Technology - Mobile devices have come a very long way, very fast. However, I am yet to see one that can take the punishment of a school child's school bag, dust and fluid damage. M-Edge <source: <http://www.medgestore.com/>> has made admirable attempts but theirs is a retrofit solution. I would love to see devices that are built from the ground up to be rugged. Devices that are not designed for the realities of rural developing countries will need to be replaced or repaired extremely often. This is really just a design challenge that can be easily overcome but one that needs research to solve properly.

3) Content & Curators - publishers in developing countries have been characteristically suspicious of digital publishing and content for these platforms are hard to get. However, getting content created or ported to this platform and distributed somehow is probably the easy part. How do the teachers (the curators) use the technology to help children learn better? Not enough attention is being paid to this and yet this seems the only way to keep this kind of technology going. And again teachers become the focal point of this technology. In some countries, it might be mobile devices that become the preferred platform. While exploring the potential to use the technology, we need to ensure teachers can teach best with whatever technology they have to use wherever they are. Who knows what new device or platform will

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evolve into the next pen and paper? Teachers will be still here, invest in technology that helps them become better at teaching.

The advantage of not having to manage mobile devices has its own disadvantages. The technology is not in place, at least not yet to manage mobile devices via a remote network by anyone, so each teacher or student would have to create their own user accounts and manage their own apps. Since mobile devices will be used for anywhere, anytime teaching and learning – there would be a lot of frustrated users when they face the challenge of configuring their mobile devices. That would be a real challenge for teachers and students, but with technology anything is possible.

Though iPads are thus far the most educationally suitable tablet, current models also have disadvantages compared to netbooks and laptops. iPads are more expensive to purchase than netbooks (making them costly even for a US context), and more difficult to write and edit on than netbooks or laptops, unless one gets an external keyboard at extra expense. The lack of a computer-style file structure in iOS can make the organizing and sharing of student work more complicated, at least without establishing new file maintenance systems. And iPads are unable to access websites that use the Adobe Flash multimedia platform, which is still common on many educational sites and on-line university offerings. Of these disadvantages, the most important long-term educational one is in the area of writing. Learning to write well is a critical part of education, and is hindered if students don't have a device optimized for composing and editing. However, this problem can be overcome through use of an external keyboard, and we will likely see a wide variety of mobile tablets in the future with detachable or folding keyboards or other alternative input systems.

Because of the small size of the devices, there are design implications for learning materials. For instance, the size of the screen requires more scrolling if there is too much text. To compensate for their small screen size the tools rely on rich media that combines texts, graphics, audio, and video. The differences are as a result of certain dynamics, which include the following: 1). Devices' hardware and software used affects what content can be delivered. Although mobile technologies are rapidly and increasingly powerful, there are still some data formats and that are best delivered via computers. For

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example: the file formats, size of the files, types of files, memory, navigational issues, and the association with the operating system libraries. 2). The main limitations of WAP today are related to the devices used and the mobile networks. The limiting factors of the device means that large amounts of data, especially graphics and animations are not recommended.

The user interface and the memory and processing power are the main limiting factors of mobile devices. However, Goundar, 2011 [13] argues that with mobile devices connected to computing providers [almost all mobile network providers are utilising the cloud computing service platform], a user can save money by not paying for processing power, intensive memory requirements and storage. Just pay for devices like \$29 mobile phones, \$20 Tablet PCs, and other portable devices and the required subscription to the mobile network provider. They are cheap because they don't have much processing power, internal memory and storage capacity. However, these devices provide connection to cloud service providers. And once connected, the cloud service provider will do all the processing using its own memory and store whatever is required. Time, effort and money are not spent on processing. Processing power and storage capacity of large companies like Google can be utilised for free or by paying an insignificant amount.

The main pedagogical issue to consider is the suitability of a course to the mobile learning environment. Not all courses are suited to the mobile learning environment. Purely technical and very practical courses are not suitable. However, short courses and mainly theory and information type courses are suited to the mobile learning environment. The learning environment can be enhanced by the use of quizzes to test knowledge, summary of main learning points, and interaction with other students and the tutor via telephony integration.

One of the major issues that were faced when using ICT in education was the platform [for example, Windows, Mac, or Linux] on which to create and deliver learning materials. With mobile devices the platform issues are more complex and many. As one might realise that there are hundreds of mobile network providers, each establishing its network infrastructure and service provision structure based on the country in which it operates. Then, there are thousands of mobile device manufacturers, each with its own internal architecture design, functionality and features. Then, there are smart phones and mobile

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devices again based on the Apple iPhone, Windows 7 Phone, and Android Phone platforms. Are we going to go through the same platform issues that we have not been able to resolve with PCs, or are we finally going to come to our senses and decide on a common platform?

In many educational institutions, especially at the primary and secondary school level, institutional culture and regulations may actually prohibit mobile phones and devices on the premises. Debate on the issue is ongoing. In my University, students are not permitted to have mobile phones and devices during tests and final exams. Some of my colleagues complain that a student with a mobile phone in class receiving a text message or a call interrupts the entire class. Others argue that most of the work that students do on their mobile phones and devices are unproductive and not conducive to the learning environment as most of the time they are either playing games or sending text messages to their friends or families. To stop the unproductive use, as alleged, my University has even blocked students and staff access to sites like facebook, and other social web sites to PCs on their network. How are we going to convince such institutions?

Much needs to be done in order to address issues of standards, infrastructure and performance, of access and equity, of content and training but the main hurdle is teachers' and officials' perceptions about loss of control and agency in the class-room. As heard during a recent teachers' conference, if a teacher is just a facilitator, and if any device or technology can do the same, then there is justification to replace the teacher with that device or technology. That is probably the fear that most teachers have and that creates one of major hurdles of using mobile devices in education. Most institutions are at the moment using mobile devices as a supplementary tool to deliver face-to-face education and suddenly there is a drop in student attendance because without physically attending classes, the students are able to get access to the material that was taught.

Discussion and Conclusion

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- Mobile phones are becoming ubiquitous in the world today – almost everyone can get access to simple voice and SMS text messaging phones. With the introduction of \$100 Android Smart Phones <<http://www.ictworks.org/news/2010/09/07/100-huawei-android-mobile-phone-bringing-netbook-revolution-smartphones>>, real computing power is coming to mobile phones at a price point that can be affordable for educational systems. One powerful smart phone per teacher, or a combination of voice/SMS phones and smart phones for teachers and students have the potential to actually achieve the unfulfilled technology saturation promise of OLPC [One Laptop Per Child].
- The cost of mobile devices and its applications will be reducing with volume – it already has decreased dramatically. The services of the mobile network operators combined with cloud computing platforms are expanding all over the world, now reaching the inaccessible. Mobile device manufacturers are loading unlimited applications, functionalities and features to stay competitive. Mobile network providers are offering service packages at negligible costs to its users to match its competitors. The mobile device users are the winners in the end. It is a real choice to PC watt consumed in the developing countries and the energy resources of the World.
- With the number of mobile devices surpassing the number of computers, there is now a real opportunity for innovative teaching and interactive learning with mobile devices. Mobile devices are ICT devices but with greater flexibility and ubiquitous connectivity, combined with the power of desktop computing.
- The availability of easy to access – instant on, user friendly technology like mobile devices is important and the value of having well trained teachers that can use this technology to teach is equally fundamental to use mobile devices in education
- The major challenges observed in are getting teachers to use digital content. Many teachers are not for digital content and technology based teaching and learning. Some teachers argue that they have been teaching for decades and producing excellent results – if it works, they why is there a need to change – —don't fix till it brokenll.

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- Only teachers with adequate technology competency make attempts to integrate technology while teaching.
- In the last decade, mobile learning has been expanding and continues to do so in many countries. Schools, workplaces, higher education are all embracing various aspects of mobile learning.
- Many pilot projects on using mobile devices in education in developing countries are currently donor funded and have created huge impact.

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ISSN (Online) : 2249 - 054X

International Journal of Computing and Corporate Research

Multi Disciplinary Journal for Publication of Review and Research Papers



International Refereed and Indexed Journal for Research Scholars and Practitioners

<http://www.ijccr.com>

International Manuscript ID : ISSN2249054X-V3I1M2-012013

VOLUME 3 ISSUE 1 January 2013

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