Tablet Computers : Changing the Way Teachers Teach, Students Study

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1. Introduction

The prelusion of tablet computers is bringing about a monumental transformation in education methods and programs. Although best known through the marketing of Apple I-pads, many types of tablet computers exist on the market today. These devices are finding their way into classrooms from the youngest ages to those in university graduate and Ph. D programs. Their advancement sees no tempo of slowing down and forecasts envision even greater progress in the field of education. A growing number of education officials expect that the iPad and other eReaders will reshape higher education by making it possible for educators to reach students outside of traditional classrooms. Additionally, the devices allow for greater interactivity between subject material, students, and instructors (Nagrath, 2010). Current developments in mobile and ubiquitous computing, affords us a different way to image how and where learners access people, information and resources (Such, 2010).

Today, technology is essential to the efficient operation of nearly all social institutions, including businesses, community centres, and schools, and the demand for technologically adept employees is currently growing faster than the number of people in the labour market possessing these skills (Goad, 2002). To date the total

number of iPads sold worldwide is over 20 million units sold with an average 1,000 device activation per month in the United States (Etherington, 2011). Pundits are now referring to these devices as post-PC devices (PPDs), a recognition that this type of device perhaps does indeed deserve its own category, possessing significant differences over and above existing desk-bound or mobile technologies such as smart -phones and laptops (Melhuish & Falloon, 2010). While many within the education sector have talked in general terms of the potential of PPDs, the nascent nature of the devices presents some difficulties in determining exactly how they can be used in the tertiary sector (Brand & Kinash, 2010).

> 'M-learner' is the new pseudonym for today's students that possess multiple portable devices for school as well as social activities. Tablet computers are a culmination of all the currently smaller hand held devices. An 'all in one' computing and communication device, with wireless (wifi) capabilities it is also the go anywhere do anything apparatus for the early 21st century (Brand & Kinash, 2010).

This proliferation in tablet computers also goes in tandem with the evolution of computers themselves. The days of having a large boxy screen and hard drive ceased to exist almost ten years ago. Next along came the laptop portable computers and now the tablet pc. After a decade of focus on big screens and HDTV, tablet PCs and Smartphone are all the rage (Smith, 2011). From mainframe computers to minicomputers, to PCs and to the internet; every ten years or so there is a fundamental shift in the way we think about computers (Such, 2010). It is only natural that this new ultra portable do anything anyway type of technology would extend into educational environments. A number of key developments have converged to hasten the movement of computing from fixed to

mobile status. Those developments include : advances in micro- and nano-technology ; universal Internet access ; wireless networking systems on multiple standards ; decreasing costs ; and educational priorities that recognize technology's importance in helping learners adapt 21st century skills. Not only are universities, colleges, and other institutions of higher education initiating mobile computing initiatives, but states and districts are making even bigger investments to make mobile computing environments out of middle and high schools (Moran, Hawkes, & Gayer, 2010).

Tablet PCs are essentially laptop computers that have the added functionality of simulating paper and pencil by allowing the user to use a stylus and write directly on the computer screen to create electronic documents that can be easily edited using traditional computer applications. This functionality makes tablet PCs more suitable than laptop computers in solving and analyzing problems that require sketches, diagrams, and mathematical formulas. Combined with wireless networking technology, tablet PCs have the potential to provide an ideal venue for applying previously proven collaborative teaching and learning techniques commonly used in smaller engineering laboratory and discussion sessions to a larger, more traditional lecture setting (Enriquez, 2010).

Studies have long shown that the traditional instructor centred lecture format is an ineffective learning environment, and that active participation, as well as interactive and collaborative teaching and learning methods, are more effective in various areas of science and engineering education including chemistry (Birk & Foster 1993), physics (Meltzer & Manivannan 1996), engineering (Felder, Felder & Dietz 1998), and computer science (Rodger 1995). Various uses of technology have been found to be effective in enhancing the classroom experience to achieve

more interactive and collaborative environments. These techniques include handheld wireless transmitters in Personal Response Systems（PRS）（Beekes 2006）, various forms of computer-mediated collaborative problem solving（Rummel & Spada 2005）, and the use of wireless tablet PC technology（Koile & Singer 2006 ; Rogers & Cox 2008）.

Students arrive on campus armed with smart phones and tablet devices that keep them connected. Meanwhile, iPads are flying off Apple's shelves nearly as fast as the iPods are－signalling critical mass and culture's collective early adoption of a major, innovative technology. And there's something special about iPad : use one and you'll soon see why they're so popular. New innovations, such as touch-screen system and application interaction, triple-band communication protocols（Wi-Fi, 3 G/4 G, and Bluetooth）, size, weight, and intuitiveness make this new device an attractive M-Learning tool（McCombs & Liu, 2011）.

As with all computer instruction emphasis needs to authenticate a connection between what is learned in the classroom and what is used in the workplace.

"With more companies moving to Internet-based file sharing and data storage, along with an emphasis on portability and mobile productivity, it's no surprise CIOs anticipate wider use of tablet computers," said John Reed, executive director of Robert Half Technology. "The challenge for IT departments will be providing adequate support and security."

Reed adds that as tablet computers further decentralize the workplace and make it more mobile, companies will seek IT professionals who can assist with mobile applications development and security issues, along with trouble shooting for end

users.

"An increase in tablet use will likely add to the roles of IT professionals," says Reed. "Businesses will need experts who not only are knowledgeable about mobile applications and security, but also can help the company make better strategic use of mobile devices to enhance productivity and customer service." (Reed, 2011)

2. Funding

Technology knows no boundaries these days ; from where it is used to who is using it. So it has become with technology education. Learners as young as 1st grade are now being introduced to tablet computers. School districts in the United States have basically centred on the use of Apple iPads although there are many variations available depending on financial resources.

Naturally funding can be a problem for such large scale projects such as implementing the latest range of computing technology throughout a school or district. In America, instructor, John Kissko offers suggestions for garnering financing ;

Method 1 : Create a Classroom Project at DonorsChoose.org

Public school teachers across America can post classroom requests on DonorsChoose.org. People from all walks of life can browse the directory of projects and may freely determine to fund a project. Typically, the projects that receive the most funding are the ones that are inspirational.

That being considered, you probably won't receive funding for a classroom set of iPads by writing *"I want iPads because they are cool and they can do neat things."* How can you appeal to the hearts of donors ? This isn't encouragement

to be manipulative, but rather to make sure you express your intents with clarity.

Method 2 : Submit Grant Proposals

Grant money is in circulation for projects like these ; unfortunately, that funding is limited. Priorities for submitting grant proposals should be (1) meeting deadlines, (2) meeting grant criteria, and (3) ensuring quality submissions.

Method 3 : Visit with Your Technology Coordinator about Budgeting for iPads

As it is in most facets in life, success hinges on positive relationships. What's the status of the "relationship bank account" you share with your technology coordinator ? Are you continually making deposits, or is the bank account overdrawn ? Certainly, the aforementioned methods aren't just limited to receiving iPads, and there are definitely other options available for receiving technology in your classroom. However, these methods seem to have garnered success for educators seeking to fund technology projects in their classroom (Kissko, 2010).

Decisions should not be based on cost alone, as some free software may outperform expensive software. Although freeware may not be applicable in some cases, however decision must be made based on the functionality of the technology. The technology committee needs to ensure that there are no free alternatives and that the new system will integrate with the old system where available. The committee should use vendors who are willing to give educational discounts. Other important approach is to go with reputable technological company that has a good record of accomplishment in that specific area (Salami, & Omiteru, 2010).

Furthermore as Salami & Omiteru express in their recommendations concerning the decision to allocate funds or when requesting grant monies for technological

tools. Once a committee has been formed to address the issue, many questions need to be queried ;

Once the needs have been identify the committee can now start considering possible technology tools or applications. Important questions that resulted from our study and discussions are as follows ; what are the different technologies available ? Are they secure ? Which vendors are reputable ? Are the students going to incur unnecessary cost to use the application ? Should there be a request for a demonstration, test / trial period from manufacturer before making decisions ? How has this technology been used in a similar capacity at a similar school ? (Salami, & Omiteru, 2010).

Technology features that enhance student learning should improve their critical thinking and collaborative skills (Palak & Walls, 2009). Before making any decision, it is important for institutions to form a decision-making committee that comprises of individuals who are familiar with the technology. Institutions must implement strategies and timelines on how to effectively integrate the technology that would help improve services while keeping cost down. Appropriate teaching strategy and improved instruction are factors that need to be considered in the final choice of technology (Hill, 2009). Various researchers have discussed the process of adoption and transitioning into new instructional technology. The success in adopting a new technology typically depends on several factors especially organization culture (Hoffman & Klepper, 2000). It is also important that people who will use the technology are involved during the transition. From these acquisitions schools are then taking the initiative in utilizing these new means to empower students to learn.

3. University Level

There are many universities that are taking the initiative in the implementation of tablet computers. "Native" or pre-loaded software on the iPad such as the e-mail function, notes and calendar are all useful tools that may be used by students to improve their levels of productivity due to improved planning, time management and scheduling (Murphy, 2011).

> The ability of PPDs to effectively connect to "cloud" document repositories such as Dropbox and Google Docs either via web browsers or applications allows students to share and access information in a timely resource efficient fashion. The recent addition of wireless printing to iPad is also an essential element in helping students use a range of digital applications such as Evernote allow students the ability to take note and draw conclusions between multiple documents and course materials, all of which can be synced across multiple devices (Murphy, 2011).

Technology has a ubiquitous presence in educational institutions across the United States. Higher education has been particularly aggressive in acquiring mobile technology, some institutions even adopting computing initiatives that require every student to own their own computing device. Hundreds of higher education and K-12 institutions are involved in various levels of mobile computing implementation (Brown, 2009). Additionally, in an analysis of institutions migrating to the wireless, mobile environment, Penuel (Penuel, 2006) found one or more of four primary motivations driving decisions to integrate mobile computing into the instructional environment :

1. To improve academic success ;
2. To increase equity of access of digital resources ;
3. To increase a region's economic competitiveness by preparing students to effectively use technology in the workplace ; and
4. To effect a transformation in the quality of instruction.

Other research has also suggested the application of computer technology in collegiate classrooms improves teaching when integrated appropriately (Surry & Land, 2000).

As technology is infused into the classroom, mathematics, science and engineering faculty in all levels of education should consider using tablet PCs over laptop and desktop computers in the classroom. Networked tablet PCs enable students and faculty to analyze problems, collect data, take notes, and combine handwritten and other electronic class materials. They also offer the flexibility to write and manipulate mathematical formulas, draw sketches, and add ink annotations when solving and analyzing problems. These benefits should be weighed against the additional cost of a few hundred dollars for a tablet PC compared with a regular laptop computer (Enriquez, 2010).

As mobile computing devices have entered schools, understanding their impact on student learning is an evolving work upon which a body of literature is emerging (Penuel, Kim, Michalchik, Lewis, Means, & Murphy, 2001). The availability of Internet resources, and the application of tools such as online simulations, applets, pod casting, wikis, blogs, and other means of gathering and using information are promoted as ways to allow students to construct and manipulate knowledge while encouraging teachers to modify their instructional methods. However,

understanding the behaviours of students and teachers that lead to improved interactions with each other and with networked resources can be a complex task to undertake（Moran, Hawkes, & Gayer, 2010）.

At Seton Hill University（Greensburg, Pa.）, for instance, entering first-year students will be given both a MacBook and an iPad ; current upperclassmen will be able to choose to have an iPad in addition to their MacBooks, adding $ 200 to their $ 300 per-semester technology fee（Marketer, 2010）. Furthermore, Seton Hill expects the iPad to facilitate use of digital textbooks, allow students to create and share work and take notes in class. “The iPad was chosen by Seton Hill because of its mobility and the ease with which faculty and students, in the future, will have immediate access to e-textbooks and comprehensive and integrated learning,” said Mary Ann Gawelek, provost and dean of the faculty（Marketer, 2010）.

“We want to explore the use of iPads and other technologies to help students access the enormous amount of medical knowledge that is being produced constantly,” said Dr Charles Prober, the school’s senior Associate Dean for medical education（Nagrath, 2010）.

In Australia the University of Adelaide’s science department is providing iPads for their first-year science students in 2011（Cross, 2010）. This will enable students to access lecture notes, documents and textbooks through tailored web-based apps. This is a long term initiative for the university and it has reported it will take some time to phase out text books and transfer all content to the iPad（Murphy, 2011）.

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4. And the Apps That Go With Them

Since much more has been written and researched on apps (applications) that go in the tablet computers that it seems that is where the emphasis actually is. After all, the entire tablet is nothing more than storage devise for the apps. For educators though the difficulty lies in knowing which apps are educational, entertaining or a combination of the two. Currently the only way for educators to find out which apps actually contribute to the learning process is by word of mouth amongst educators themselves.

Educators are always looking for free resources that help enhance instruction in the classroom. Apple's iTunes has thousands of free educational Apps that are downloadable for use on the iPod touch and the iPad. Teachers may have downloaded any number of Apps only to find they are useless for educational purposes (Watlington, 2011). Much research and amongst trial and error is still needed in this area. Currently there are hundreds if not more, free downloadable apps for instructors to choose from.

Likewise, the business side has approached the publication and presentation of

apps with an eye on profitability.

> There are two ways to charge iPad users : A fee to download the app, or a fee for the content itself. Among news companies that charge for content, most have opted to make the app itself available for free, along with partial content access or a temporary free pass. The Wall Street Journal's app provides free access to many news stories of the day, but requires a monthly subscription to access full content and a downloadable seven day archive. Both the Washington Post and the New York Times iPad apps offered free, full access at the time of this review, but both had announced plans to restrict access for nonsubscribers in early 2011.
>
> By offering the app download for free, these companies have put out the welcome mat for new and curious consumers. There's already a higher barrier to sampling app content than Web content, since the user needs to deliberately seek out and download the app. Charging a fee at the front door could turn away casual testers who might convert to subscribers down the road. Even those who never subscribe can supply valuable behavioural insights and advertising impressions (Palser, 2011).

The downside as many parents have discovered after having been stung with shock bills worth hundreds and even thousands of dollars from children playing games on smart phones and iPads.

The addictive games are free to download, but charge up to $110 on credit cards for extras, such as buying food for virtual pets and brains for zombies. Unwary victims have reported charges of up to $4,000 after children have gone on game frenzies, ignoring messages about charges or confusing real money with play cash. One woman said her daughter, 10, spent more than $1,000 in just one

session while caring for a virtual dog. Another was refunded $ 750 after her son, 6, bought wagons of berries for the Smurfs game (Collier & Hosking, 2011).

For educators the question is "how does this app apply to me ? " the answer is not clear since the introduction of apps is still so new. Regulation and more control over content released seems to be the answer. How soon this will take place is any ones guess. With the freeness and openness of the internet as is, this may never be realized and the adage 'buyer beware' could be an all to overused phrase.

5 . Tablets in Teaching at All Levels

> "Tablets like the iPad will make it second nature to not just facilitate but actually make effective pedagogical use of ubiquitous learning, that is, teaching and learning that can take place any time, in small burst, convenient to all, asynchronously or in real-time, as students and teachers alike immerse themselves in a more engaging and practical learning dialog, seamlessly forming part of the aforementioned digital continuum." (Ed Garay, Assistant Director for Academic Computing at UIC cited fr. Kolowich, 2010).

Much has been written as the new marvel that will get kids learning but what about those that do the teaching ? Technology in language teaching is not new. Indeed, technology has been around in language teaching for decades—one might argue for centuries, if we classify the blackboard (Dudeney & Hockly, 2007). Currently though such as there is a blackboard in almost every classroom worldwide so is the hold of technology taking fashion. Mobile learning systems like the iPad offer students engaged in graduate management education both a customized and an integrated learning experience. Recent data suggests that students using m-learning

technologies perform as well compared to the traditional classroom environment (Hall, 2007).

The use of computers in preschool has also been found to increase children's interest and engagement in drawing. Trepanier-Street, Hong, and Bauer (2001) reported that children's self-portrait drawings were sometimes more detailed and had a higher level of representation when constructed on the computer. They hypothesized that this may be because the computer requires different fine-motor skills than does drawing freehand. Certainly, the most common forms of computer software involve the use of a mouse and a different set of visual-spatial skills than writing on paper with pencil or markers. They also suggested that, for some children, the computer could be a more interesting tool and therefore might be able to maintain their interest longer and lead to the inclusion of more details in their drawings. However, these studies used mouse-driven programs for drawing, whereas the current interface with technology has evolved to include the use of a stylus, which is more similar to traditional writing and drawing experiences.

An examination of the National Educational Technology Standards (Table 1, ISTE, 2007) reveals that Stylus-interfaced technology holds potential as a learning tool and as a means to implement technology standards in early education (Couse & Chen, 2010). The introduction of tablet computers in educational settings has been primarily limited to middle and senior high school students. Barton and Collura (2003) found that tablets have advantages for improving the writing and organizational skills of high school students, because they are able to type or handwrite stories, and handwritten notes can also be converted to typed text. A case study by Borse and Sloan (2005) focusing on the fourth and eighth graders' use of stylus interfaced technology reported benefits such as high levels of student

engagement, improved writing process, higher rates of homework completion, and fewer absences. Further, Schroeder (2004) found anecdotal support for improved student engagement with high school students due to the highly interactive nature of tablet computers.

Table 1. National Educational Technology Standards for Students (NETS•S)

Creativity and Innovation : Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

Communication and Collaboration : Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

Research and Information Fluency : Students apply digital tools to gather, evaluate, and use information.

Critical Thinking, Problem Solving, and Decision Making : Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

Digital Citizenship : Students understand human, cultural, and societal issues related to technology and practice legal and ethical behaviour.

Technology Operations and Concepts : Students demonstrate a sound understanding of technology concepts, systems, and operations.

Note : From "National Educational Technology Standards for Students : The Next

Generation," by ISTE, 2007. Retrieved January 8, 2008, from http://www.iste.org /inhouse/nets/cnets/students/pdf/NETS_for_Students_2007.pdf

The tablet computer appears to be a viable tool for use with preschool children. It provides early-childhood teachers with another tool for implementing technology standards and curriculum to prepare children to be digital citizens who are technologically literate. As the expectations of formal education and the capability of technology evolve, a careful examination of their interface for very young children is needed. Continued inquiry to advance our knowledge of technology and how it facilitates learning will support increased efficacy of new technology in early education（Couse & Chen, 2010）.

6. Conclusion

Students need to be familiar with technology in the classroom regardless of major area of study. The greater the use of technology in a variety of applications the more confident the learners can become. This assurance that has been achieved through practical application in institutional environments introduces students to future opportunities in the ever changing work world. As the demand for tech. savvy employees continues to escalate universities and other establishments of higher learning need to be ready to fulfill both the learners' needs and employers' expectations of qualified graduates.

All facets of higher education may benefit from the introduction of tablet computer usage. As we have advanced to smaller and mobile forms of computing.

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Although there has been much fanfare and celebration over the arrival and implementation of tablet computers there is not much physical support in the form of research to back up their claims. Searching through library databases gleams little if nothing in the way of solid evidence in academic journals. While the Kindle from Amazon has been around for several years (Taylor, 2010, p.15), it is noted that while the iPad has the early lead Dell, Archos, Samsung, Sony, Toshiba, and RIM have or will release their own versions of tablets computers. Additionally, much has been written about the ease and availability of 'apps' but even then there is an absence of supporting facts. Only time will tell if tablet computers will be the crowning achievement in computing technology.

As the author O'Loughlin points out from his current studies into the topic on the usage of tablet computers in education ;

> If previous research is correct, it is hypothesized that, for students, while the experience will initially be seen as exciting (expectations of new technology), as time progresses the iPad will in fact represent little more than a very limited computer (perceptions of the iPads a limited tool), and the students will in fact use the iPad to engage in more mundane activities, such as email, facebook and YouTube, rather than using it to enhance the learning experience (O'Loughlin,

2011).

Likewise for instructors the tablet experience may be more soothing and long lasting. Tools for instructors are always needed and appreciated by those that use those most.

Conversely, it hypothesized that lecturers will initially consider the iPad to be a useful portable tool (expectations of flexibility), which has important limitations (perceptions of what can be achieved) (O'Loughlin, 2011).

Results of student surveys by researchers McCombs & Liu, suggest overall initially there is much student satisfaction with tablet computer usage and acceptance. Another strong point of tablets is there versatility and mobility from the classroom to anywhere else the person might be. As long as there is WiFi capability there is opportunity for interaction with a tablet.

1. Device Interactions and Usage Pattern

The study investigated student feedback on iPad device and their preference between iPad and other portable devices. Ninety-two percent of participants thought that iPad tough screen is both useful and enjoyable. 86% of participants felt that iPad operating system is intuitive and easy to use. Regarding iPad's physical size, 86% of them preferred iPad physical size and weight to that of laptop computer and other similar portable devices. When using iPad to access course material, again, 86% of the participants stated that it was convenient to access the course material via using iPad.

2. Student Attitudes towards using iPad for Mobile Learning

All participants either strongly agreed or agreed that iPad touch-screen makes interacting with electronic learning enjoyable. About 84% of them reported that iPad is suitable for most of their learning-related Internet and media needs. 71% of participants preferred iPad's physical size and weight for learning to that of a laptop or similar mobile devices. 83% of them thought iPad tough-screen behaviours, along with iPad-specific design materials make learning easier. 85% of them reported that they got more done when using iPad for mobile learning. 79% of them found iPad suitable for most of their mobile learning needs.

Student Behaviours and Behavioural Change Associated with Time shifting and iPad Use

Almost 93% of participants reported that iPad allowed them to be engaged in multiple activities while learning. 86% of them considered iPad is conducive to time shifting in learning. 71% of them stated that using iPad while multitasking or time shifting is more convenient and easier than both on laptop computer and on a desktop computer. 72% of participants reported that iPad has changed the way they learn. 71% of them stated that they tend to reach for iPad for studying than using a desktop computer. 92% of them thought iPad is more convenient for studying than a desktop. When compared to a laptop computer, 36% of them preferred using laptop computers to iPad for studying (McCombs, & Liu, 2011).

Age is not a factor when it comes to technology and tablet computers. Similar to Japan many countries are experiencing growth in the older population as they live longer healthier lives. Brazil is one such country, with similar demographics. Among the various claims of the iPad and similar technologies, portability, screen size, small number of external buttons, and the capability of using the touch screen

keyboard, are all suited to the older adult. With the increasing use of mobile devices, technology developers need to keep an eye on Brazil and produce technologies and applications to meet the needs of older adults (Conceição, Borges, & Lima, 2011).

In summation, PPD's such as the iPad are highly portable (between .5－1 kg), are able to connect to the internet via wireless or by 3G/4G network; typically have a viewing surface of 7"－11"; possess extended battery life (10 hrs); a high degree of possible user customisation via multiple applications (apps); a sophisticated high definition touch-screen interface (Meurant, 2010) and "offer all the functionality and connectivity of a laptop with the portability of a smart-phone" (Melhuish & Falloon, 2010). Their uses for the school environment are yet to be fully utilized but the potential for further scholastic development cannot be refuted. As the cost continues to go down and their variety of chooses in makers expands along with viable apps for any situation, it is only a matter of time before they find their way to campuses worldwide. After all, today's students will live and work in tomorrow's world, they will need the tools to navigate in that world; tools such as tablet computers.

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