

Emerging Technologies : Influence on Education

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1 . Introduction

Technology is now entrenched into our daily lives. It is here to stay and we use it every day. Sometimes knowingly (the internet, Smartphone's) sometimes not so obvious (debit cards, ATM's). It is also becoming widely applied in education (online testing, software utilization, internet research capabilities). More importantly, not only has technology become an ever increasingly part of our lives but also the lives of our present and future students. But as educators are we able to assume the task of instructing others in the use of technology in educational settings when we are unsure ourselves ?

“Technology is becoming increasingly important in both our personal and professional lives, and our learners are using technology more and more. Yet teacher training programs often ignore training in the use of Information and Communication Technology (ICT), and teachers are often less skilled and knowledgeable than their own students when it comes to current technology.”
(Dudeney, Hockly, 2007)

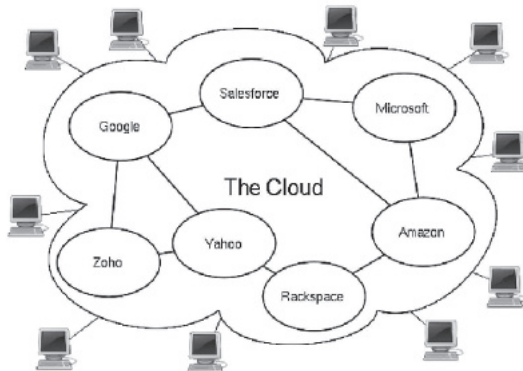
This paper attempts to examine some of the emerging technologies that go beyond I-phones and I-pads. These new technologies are having a far reaching effect on education and the education process. Many of these advancements are

already here, it is just a matter of time (few months, few years) before they reach the general population, our campus, our students.

The following lists some of the more promising and prominent technologies that will likely influence Education. The acceptance of these new technologies will of course determine how fast they spread and their overall impact on the educational process. Each of these has advantages and disadvantages for *Learner* and *Lecturer* alike. Their ultimate inherent characteristics are that they have the capabilities to transform education in ways that we have not known before.

2. Cloud Computing

Of all the emerging technologies ‘*cloud computing*’ could have the greatest impact on society and education as we know it. Basically stated it involves the connection of numerous computers and their service providers (the cloud) to store massive amounts of data while not only sharing data but sharing the costs. Visually explained, the picture below shows how individual computers or organizations can access the cloud and infinite amount of data (and storage).



(Wikipedia-Cloud computing, 2011)

Cloud computing can be further defined as ;

Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks, to provide dynamically scalable infrastructure for application, data and file storage. With the advent of technology, the cost of computation, application hosting, content storage and delivery is reduced significantly. (Harris, 2009)

Additionally, cloud computing is ;

...based on a very fundamental principal of 'reusability of IT capabilities'. The difference that cloud computing brings to traditional concepts of "grid computing", "distributed computing", "utility computing", or "automatic computing" is to broaden horizons across organizational boundaries. (Harris 2009)

The foremost advantage of cloud computing is the wealth of knowledge that can become readily available for students, teachers, and researchers. Currently to construct this paper I am utilizing the separate libraries of Matsuyama University, University of Technology Sydney, and the University of Southern Queensland, Australia and various other online sources. Cloud computing would enable individuals or institutions to combine these resources under one umbrella or as the term states one '*cloud*' of information.

In their article *Cloud Computing in Higher Education* (Katz, Goldstein, Yanosky, 2009) state with regards to cloud computing and that of higher education ;

“In many technology arenas, higher education exhibits two behaviors. As

regards networking and high-performance computing, higher education enjoys a reputation as an innovator. The world's first computers were developed at Harvard, MIT, the University of Manchester, and the University of Pennsylvania, and the first four nodes of the Arpanet were located at UCLA, Stanford Research Institute, UC Santa Barbara, and the University of Utah, Research universities, often in concert with the National Science Foundation, continue to lead the way in networking (NSFnet, Vbns, Internet 2, NLR) and in supercomputing, where 25 of the top 100 supercomputers are operated at universities. On the other hand, higher education is a relative late adopter in the applications and IT support arena. This relates chiefly to the unique policy environment that regulates the acquisition, storage, and dissemination of higher education information (FERPA, HIPAA, GLB, and others) and also to a unique perspective that arises from viewing one's organization as perpetual. On a less noble note, colleges and universities rarely account for the total cost of delivering IT infrastructure, services, and support and rarely pay for key cost drivers such as space and utilities directly and hence have no easy means of comparing the costs of self-operation and sourcing alternatives. Colleges and universities also have legitimate and pressing IT security concerns and a high sensitivity to adverse publicity.”

In academia, Cloud Computing has many benefits for educational institutions.

Four to consider are :

- ① With cloud computing, universities can open their technology infrastructures to businesses and industries for research advancements.
- ② The efficiencies of cloud computing can help universities keep pace with ever-growing resource requirements and energy costs.

- ③ The extended reach of cloud computing enables institutions to teach students in new, different ways and help them manage projects and massive workloads.
- ④ When students enter the global workforce they will better understand the value of new technologies. <https://www.ibm.com/developerworks/university/cloud/>

In summation of the benefits of cloud computing it offers advantages in that :

- Data is readily available from any internet device
- Users can be outfield and need not be tethered to a workstation
- Subscription and licensing costs are easier to resolve
- Small and larger organizations can obtain the benefits of the enormous infrastructure without having to administer and impalement it directly.
- It is more environmentally friendly as there is less need for infrastructure and hardware.

Cloud computing is not without faults and hazards though ;

- Requires internet connection to be constantly on
- Hosting server needs to be robust
- Any disruptions will be felt by all users
- Reliance on upon network connectivity.
- Legal issues such as who owns the data if it is stored off site.
- Having to update hardware so that it works with offsite hardware. This may mean that printers, scanners etc, need to be updated.

Most importantly though, cloud computing offers great strides and advantages to the overall educational community in that it can bring about ;

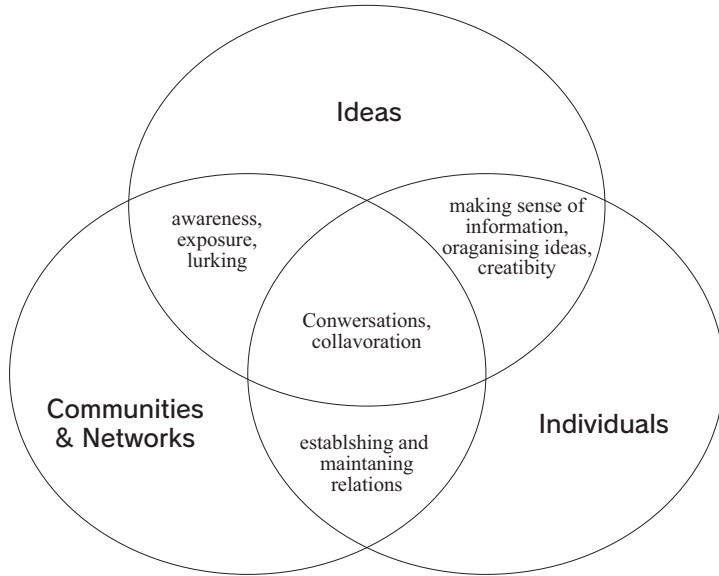
- + Flexible learning toolboxes
- + Virtual Enterprises
- + Virtual Chat Rooms for Learning
- + Online/Distance/Correspondence Education and Training
- + Simulated Learning Systems (Cloudtweaks, 2010)

3 . Web 2.0

Another emerging technology that is making great strides is that of Web 2.0. It is not an emerging technology per say, but an inevitable evolution of an existing one. In this case it is the progression of functioning technology. Currently, Web 1.0., could be described as a true melding of education and technology. There are many tools available now that can assist in the educational process. These tools are already in the hands of learners and lecturers. Unlike previously, when someone wanted to teach someone something ; depending on where they were, it was highly unlikely that they could just make a blackboard magically appear and pronounce “*okay let’s learn*”. Now with portable devices and accessibility in most any environment (at home, on a bus, in a classroom), learning can take place.

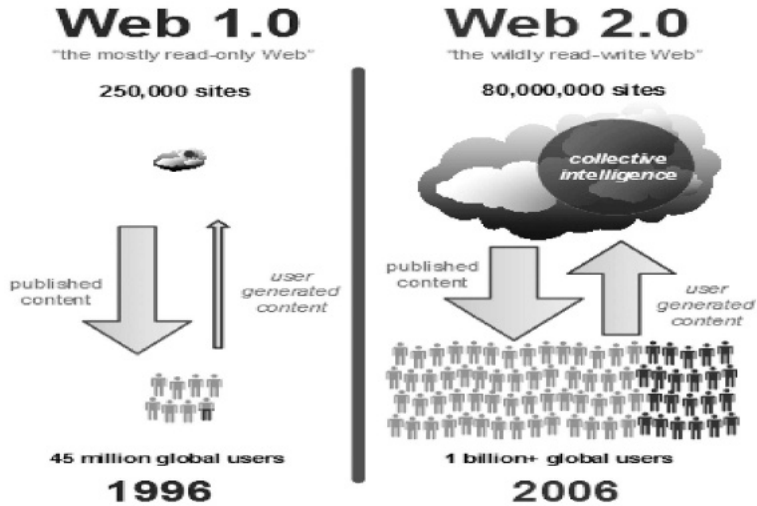
Efimova (2004) interprets the transfer of knowledge with Web 2.0 as ;

Furthermore, as the following picture illustrates ; vast increases have already transpired in the availability and access to users. This has happened in a time span of only ten years. As the example further shows, the amount of ‘*user generated*



content' has seen unimaginable growth.

Web 2.0, which is actually a combination of web applications and technology, allows medians of education that are ever expanding. As the World Wide Web becomes more of a sharing and interactive tool, educators are finding that students can benefit from this domain. Students growing up in the 21st Century are exposed to information technology in a way that no other generation has been before. An example of this is the trend in which students rely on the web for their sources rather than books. In turn many universities and schools subscribe to journals online rather than in traditional hardcopies. There are many components to web 2.0.



Usage of Web 2.0 in Educational Environments

4. Blogs

A blog is a system that allows a single author (or sometimes, but less often, a group of authors) to write and publicly display time-ordered articles (called posts). Readers can add comment to posts.

“Blogs enable students to structure their thoughts and to make them publicly available on the Internet. Blogs feature, in this sense, the characteristics of shared interests and of shared support, which are rarely possible in traditional classrooms.”
(Sun 2010)

Examples of blogging for educational uses include :

- A group of bloggers using their individual blogs can build up a corpus of interrelated knowledge via posts and comments. This might be a group of learners in a class, encouraged and facilitated by a teacher, or a group of relatively dedicated life-long learners.
- Teachers can use a blog for course announcements, news and feedback to students.
- Blogs can be used with syndication technologies (below) to enable groups of learners and teachers to easily keep track of new posts.

Most importantly Blogs can generate and produce better attitudes, desire, and inspiration in writing classes. Blogs are easily accessible and the writings of fellow learners are also easily obtainable for comparison and reflection. Blogging provides the traditional aspects of a writing course—writing, editing, and re-writing, in easier more eco friendly (paperless) technologically advanced format that makes learners eager to participate. The day of writing in ledgers and notebooks has been phased out. Blogging or others forms of community access material is now the preferred choice among learners.

4.1 Wikis

A wiki is a system that allows one or more people to build up a corpus of knowledge in a set of interlinked web pages, using a process of creating and editing pages. They are user friendly to learn and use in an educational environment.

Examples of educational uses for wiki's are :

- Wikis can be used for the creation of annotated reading lists by one or more teachers (see also social bookmarking below, for an alternative method for doing this).
- Wikis can be used in class projects, and are particularly suited to the incremental accretion of knowledge by a group, or production of collaboratively edited material, including material documenting group projects.
- Wikis can be used by teachers to supply scaffolding for writing activities—thus in a group project a teacher can supply page structure, hints as to desirable content, and then provide feedback on student generated content.
- Students can flag areas of the wiki that need attention, and provide feedback on each other's writing.

Similar to blogging, wikis can be very user-friendly and in some ways easier to understand than common e-mail software. Students also appreciate it's convenience as per comments from learners in Singapore, *An Investigation of Students' Perceptions of Learning Benefits of Weblogs in an East Asian Context: A Rasch Analysis*. (Goh, Quek, Lee, 2010)

The students appreciated the use of blogs for its convenience and efficiency, in particular when doing group projects. This was because they did not have to meet up physically with their team members to get things done, and they could easily access information from the blogs of others. The following verbatim responses highlight this point :

“My friends can just post it on the blog. There is no need to print out and pass it

to each other. I can see it immediately after she has updated the blog. No need to wait for us to meet up to get the information". (Female, 18, Chinese)

"If I don't understand the topic, then I can go and get more information from other people's opinion without meeting them". (Male, 18, Chinese)

According to some students, blogs were also a convenient way to learn from others as well as gauge their own learning when compared with others.

"It is only after seeing his work that I knew I didn't focus on the right things. A bit out of point. So I went to change mine, not copying lah [sic], but at least avoid [sic] my work from getting out of point. So next time I always check their work before I do mine". (Male, 18, Chinese)

5 . Media-sharing services

These services store user-contributed media, and allow users to search for and display content. Besides being a showcase for creative endeavor, these services can form valuable educational resources. Compelling examples include YouTube (movies), iTunes (podcasts and videocasts), Flickr (photos), Slideshare (presentations), DeviantArt (art work) and Scribd (documents). The latter is particularly interesting as it provides the ability to upload documents in different formats and then, for accessibility, to choose different download formats, including computer-generated speech, which provides a breadth of affordances not found in traditional systems. Podcasting is a way in which a listener may conveniently keep up-to-date with recent audio or video content. Behind the scenes podcasting is a combination of audio or video content, RSS, and a program that deals with (a) RSS notifications

of new content, and (b) playback or download of that new content to a personal audio/video player. Vidcasts are video versions of podcasts.

Examples of educational uses are :

- Podcasts can be used to provide introductory material before lectures, or, more commonly, to record lectures and allow students to listen to the lectures again, either because they were unable to attend, or to reinforce their learning. Podcasts can be used to make lectures redundant while still supplying (possibly didactic) presentations of learning material by lecturers.
- Vidcasts can be used to supply videos of experimental procedures in advance of lab sessions.
- Podcasts can be used to supply audio tutorial material and/or exemplar recordings of native speakers to foreign language learners.
- Distribution and sharing of educational media and resources. For example, an art history class could have access to a set of art works via a photo sharing system.
- The ability to comment on and critique each other's work ; including by people on other courses or at other institutions.
- Flickr allows for annotations to be associated with different areas of an image and for comments to be made on the image as a whole, thereby facilitating teacher explanations, class discussion, and collaborative comment.

According to Hargadon (2008), Web 2.0 will have a greater impact on society than did the invention of the printing press. The two way nature of the internet will cause unimaginable changes that will have important implications for education. In fact, education is about to undergo its biggest revolution in decades. He identifies a number of trends that have significance for teaching and learning and then offers seven suggestions for how teachers can learn more about these changes.

Trend 1 : A New Publishing Revolution. *The web has moved from a one way medium, where users were passive participants, to a collaborative environment where users can create their own content through applications such as, blogs, wikis, video/photo-sharing, social networking.*

Trend 2 : A Tidal Wave of Information. *This publishing revolution will produce a overwhelming volume of content. Therefore, it is important to be as selective as possible. A way to counter act the information overload is to produce more content. Through being a creator of content, students will have a new relationship with it, and become more engaged and skilled as a result.*

Trend 3 : Everything is Becoming Participative. *E-book readers such as the Kindle will revolutionize how we read. E-book readers can allow us to comment on specific sentences or sections of a book and see the comments of others, and then be engaged in an electronic dialogue with those readers.*

Trend 4 : The New Pro-sumers. *The term “prosumer” is a mix of the words “producer” and “consumer”. Customers are becoming active participants in the process of producing goods that companies make. A good example of this is a reality show like American Idol, where the public has a hand in creating the next*

superstar.

Trend 5: *The Age of the Collaborator.* The ability to collaborate will become increasingly important. How knowledge is created and disseminated is changing from an era of trusted authority exemplified by publications such as the New York Times to an era of collaborative and transparent scholarship most notably in the form of sites like Wikipedia. The expert will be superseded by the collaborator.

Trend 6: *An Explosion of Innovation.* Innovations are often the result of knowledge from one field being applied to another. The web allows for a gathering of a diverse range of collaborators to work on specialized problems, which should result in an increased amount of innovation.

Trend 7: *The World Gets Even Flatter and Faster.* Access to knowledge and education is getting much easier. Anyone in the world with internet access can study any of the 1800 open courses offered by MIT.

Trend 8: *Social Learning Moves toward Center Stage.* Real learning takes place outside of the lecture room. The ability to participate in study groups is a significant contributor to academic success. Study groups using electronic methods are just as successful as those that meet face to face.

Trend 9: *The Long Tail.* Web technologies make differentiated instruction a real possibility and students will be demanding this more and more. It is possible to view instructional videos on YouTube and to have your own personal online language tutor. The internet allows students who have a strong interest in a subject to go online and learn about it and even contribute to the field. (Haragadon, 2008)

6 . Voki



Further interesting is a technology that has immense possibilities in language learning as well as other disciplines. That is the use of Voki talking avatars. Their potential seems limitless, especially in language learning since they are adaptable to any language not just English.

More specifically a Voki is a talking voice character, a computer-generated version of oneself. The more generic term for a Voki is a speaking avatar, a digital representation of a person or being. Teachers and educators are discovering some of the unique roles these speaking avatars can play in education particularly in the online classroom. For teachers these speaking avatars can add a more “human” element to the *online class* website or blog. It is especially useful for those of us who may not be all that great with videotaping or vodcasting. Instructors can use a voki avatar to introduce the course or topics. It can also be used to aid in instructing those who are more audio/visual learners. Voki is also a great way to get shy students involved or to share comments with students in other countries.

Voki’s could have wide uses and ramifications in teaching in the future. This

is the generation that has grown up with texting, twittering, and the internet. Can we expect learners to become interested in textbooks and paper tests? The '*personal learning*' has come into existence, meaning that learners are requiring a personal interest, a personal say, and a personal involvement with their own learning process.

7. Personal Learning Environment

There seems to be a lot of definitions out there for what constitutes a Personal Learning Environment. (PLE) This definitely shows that this is still an emerging environment and it is taking form as we speak. The nature of PLE's is always evolving, as the essence of a personal learning environment is one that changes as new technology becomes available.

A Personal Learning Environment is a facility for an individual to access, aggregate, configure and manipulate digital artifacts of their ongoing learning experiences. (Lubensky) Personal Learning Environments are systems that help learners take control of and manage their own learning. This includes providing support for learners to :

- Set their own learning goals
- Manage their learning ; managing both content and process
- Communicate with others in the process of learning and thereby achieve learning goals.

Many learning institutions are embracing the trend in the use of information technology in higher education. The institutions can in turn provide a PLE that enhances the learning experience of students. This in turn ultimately encourages

staff to innovate with curriculum design and teaching approaches.

Personal Learning Environments can provide students with :

Course information

Online resources

Course calendar for due dates or lecture recordings

Real time Chat

Forums and Wikis

Quizzes and Questionnaires

Space for a personal blog or journal

Personal Learning Environments can benefit learning by :

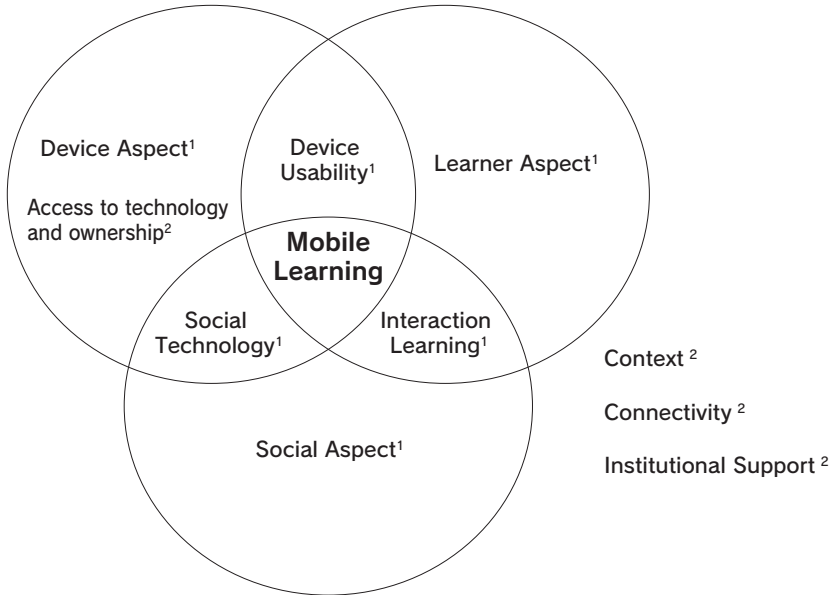
- providing a single point of contact for resources and support specific to course work
- enabling students to contact and share with other students and teachers outside of classes using a great variety of communication tools
- allowing easy navigation and accessibility to quality course work
- providing timely and regular feedback on progress (this is still only applicable to the diligence of the course staff)
- being available anytime, anywhere, so that students can work at their own pace thusly enabling students to manage their learning time to suit their lifestyle.

Personal Learning Environment is an emerging e-learning environment whereby the learners are more organized with their learning tools. As savvy teachers are lifelong learners hence PLE's provides tools for better organization and learning in

different context and situations. The social software is one of the tools for PLEs which keeps learning ongoing. Different learning styles are used by individuals for different contexts. To be competent the learner's e-portfolio can be one of the tools for self monitoring and self promotion as well. Use of flickr, bookmarking, podcasting, emailing, blogs, twitter and all under one roof allows the learner to control the present and see the near future. There is also ongoing collaborative learning through wikis on the learner's interest of topics. The following link has more on PLE's-the future of e-learning. (<http://www.elearningeuropa.info/files/media/media11561.pdf>)

8. Mobile Technologies and Learning

Mobile learning offer learners increased 'just-in-time' access to relevant information, people and systems(Koole, 2009). Though the concept has been around since the 1990s, this mode of learning did not gain much traction till supporting technologies, such as podcasting, location awareness systems and image recognition software were widely implemented on mobile devices. Mobile devices are ubiquitous in the developed world today—be it the mobile phone, personal digital assistant or a MP3 player. Some of these have features that include receiving email, web browsing or even Global Positioning System(GPS) ; easily surpassing the processing power of a mid-1990s PC(Prensky, 2004). Learners own and frequently use their mobile devices for personal communication and entertainment that it is an integral part of their daily lives(Alexander, 2004). Robinson and Sebba (2010) suggested that learning opportunities increase when learning material is made available for mobile consumption. But there are some critical factors for successful mobile learning adoption.



Relationship between factors affecting successful mobile adoption

1 Koole (2009) ; 2 Sharples (2007)

Nasimeth and Corlett (2006) in Sharples (2007) identified the following five critical success factors for mobile learning :

Access to technology and ownership

Students own and treat their mobile devices as digital extensions of themselves (Alexander, 2004). This presents an opportunity for increased learning times if academic material is made available to them (Robinson & Sebba, 2010). Students prefer to be able to control the pace of learning themselves (Liaw, 2010 ; Lofoe, 2009 ; Sankey, 2007). Koole (2009) adds that device aspects such as ergonomics, file storage and hardware configurations affects how the device is accepted by learners.

Connectivity

Access to learning resources is a must as learning information tend to be updated frequently. There are various avenues for larger data transfer through wireless access, such as Bluetooth and Wi-Fi. Booth (2009) advises institutions to provide for offline access where possible in case the students go to areas where connectivity is limited.

Integration

Hoppe (2007) listed ways how learning content should integrate into the curriculum :

- > *Media integration* The way data flows across different kinds of media (e. g. Polling of results during a lecture through clicker or mobile phone)
- > *Process integration* Technical facilitation and support for participants in different roles (Functions for the teacher on the same device will be different from that of the learner's)
- > *Knowledge integration* 'Chunking' instructional content in different formats (The same course may differ in structure when presented as lecture notes, reading or videos)

Context

Course deadlines and written instructions should be clear to help students keep on track. (Booth, Carroll, Papaioannou, Sutton, & Wong, 2009). Booth et al. also recommended varying formats make the course more interesting for participants. Herrington (2009) recommends that authentic activities modeled after real-world scenarios, consists of complex tasks to be fielded over a period of time. These tasks support active knowledge construction and application instead of rote learning (Wagner, 2005). Koole (2009) advised course designers to be mindful of the target audience's motivation. The ARCS model of motivation (Keller, 2006) is especially

relevant here : (a) Attention—What is the novel about the new knowledge ; (b) Relevance—How do learners apply to their situation ; and (c) Confidence and satisfaction—How to enable learners to apply the same knowledge in different contexts. Koole also cautioned that social distance and interaction may vary across different cultures.

Institutional support

Support at institutional level is important for implementation of mobile learning. Without the technical and communal infrastructure, mobile learning projects may face many obstacles. Firstly, ample wireless access points have to be set up where students are like to study ; such as lecture halls, cafeterias, etc. ; though this may present a significant upfront cost, but will more likely to serve more students in the long run than computer labs (due to hardware and software upgrades approximately every two years). Dependence on physical library resources and office operating hours will be reduced. Secondly, a dedicated team of technical support staff is required to assist recovery in case of breakdowns or technical errors during learning. A formal query answering protocol, targeted response times, a list of Frequently Asked Questions and templates for additional clarifications are recommended (Booth, Carroll, Papaioannou, Sutton, & Wong, 2009). Thirdly, institutions need to encourage academic staff to participate, as mobile learning adoptions tend to lack funding support, recognition and awareness. Educators who were keen to develop meaningful connections with students were compelled to be up-to-date with necessary technology ; skills and knowledge to implement appropriate mobile learning strategies (Ferry, 2009, & Herrington, Herrington, Mantei, Olney, & Ferry, 2009). Their main concern was the availability of technical support staff (Harrington et al.) since they lack confidence to handle technical issues. When these instructors become more familiar with tools, they change their focus to how to

adapt the technologies for existing practice.

9. Conclusion

Most recently there was an article entitled *‘Why Students Treat Teachers like TV Sets (and How to combat it)’* (Preble, 2010). The author describes her experience over the past 10 years as more and more students in her high school students took greater and greater liberties while she was conducting class; chatting, texting, getting up to throw something away. She comments that *“They didn’t see me as a person. They saw me as entertainment. I was just like a television.”* But regrettably I have noticed the same experiences in my years of teaching. She also remarks; *“It didn’t matter what I was saying—this was a generation of ultra-multi-taskers who did five things at once, none of them very well. But that was their world.”* And so this is our world too emerging technologies and all.

Presently, learners are growing up with 3-D, virtual reality and gesture based computing (think Wii and Sony PlayStation). Their home environment has always played a key role in their learning environment at school. Electronic games and gaming has been a natural part of many of these individuals’ entire lives. The youth of today are maturing with electronic games and continue on gaming even into their adulthood. Since children of today have access to computers and instant information, it seems to reason why it should not be any different at learning institutions. In the article *Learning in the Age of Networked Intelligence*, (Tuomi, 2007) demonstrates ten theses’ which discussion education, learning and its future.

Thesis 1 : Education becomes Global.

Thesis 2 : New Disabilities Become Challenges for Pedagogy

Thesis 3 : Blogs Become More Important than Formal Certificates

Thesis 4 : Demographic Changes Leads to Slowdown in the Growth of Human Capital in Europe

Thesis 5 : Home Becomes the Classroom

Thesis 6 : Immersive Social Games Replace the Textbook

Thesis 7 : Audio Makes Education Portable

Thesis 8 : Products Become Pedagogical

Thesis 9 : Informal Social Learning Becomes the Key to Competence Development

Thesis 10 : Educational Programs Become Integrated with Real Social Change

In theory we are still utilizing some of the same technology for education that is hundreds of years old. Mass produced type-printed books are agreed to have been introduced by the German, Johannes Gutenberg around the 14th century with the invention of the printing press. While today students sit between/in classes using smart phones and technology that is no more than twenty or so years old.

No one can predict the future but what is certain is that education and how we educate is changing. Emerging technologies bring forth uncertainty and apprehension but also opportunity and growth to expand in knowledge and experience ; being on the ‘cutting edge’ as the saying goes. Passing on that new found information and understanding is what education is all about.

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