

# New Media Communication Skills for Engineers and IT Professionals: Trans–National and Trans– Cultural Demands

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## Chapter 2

# 21st Century Education Technologies for Engineers and IT Professionals

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### **ABSTRACT**

*The word technology is inaccurately linked to hardware or tools only, and this misunderstanding has resulted in large sum of money invested in hardware or tools. In consequence, institutions and companies do not get the expected returns from these investments. One of the possible reasons for this could be the lack in understanding and knowledge of software and technology. This chapter attempts to describe the various education technologies in the forms of hardware or tools as well as software which include teaching and learning methods and how they are blended together to achieve effective communications. The technologies described in this chapter are blended learning, podcast, reciprocal peer tutoring, and personal learning environment. Finally, the chapter outlines some future research directions in the area of education technologies.*

### **INTRODUCTION**

The word technology is erroneously linked to hardware or tools only. This misunderstanding has resulted in large sum of money invested in hardware and yet institutions and companies do

not get the expected returns. One of the possible reasons is the lack in software and technological knowledge. For instance, a great disparity exists between information and communication technology driven productivity levels between small businesses and large corporations. One possible reason for this disparity is lack of technological knowledge and education and not because of the

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lack of funds or access to technology (Wielicki, 2005). This chapter attempts to put forward the various education technologies in the forms of hardware or tools and software which include teaching and learning methods among others blended learning, an education technology which is effectively carried out by engineers, IT professionals and lecturers in tertiary teaching. They blend online learning activities in the forum with offline activities carried out in the classrooms and beyond the four walls. Other technologies like podcast and reciprocal peer tutoring are used to support the learning activities in the online and offline modes. Students and practitioners can learn the technique of online forum discussion which is a very useful communication skill nowadays. Online forum discussion is the medium of communication in blended learning. Recent research in blended learning carried out by the author in Malaysia as well as in joint research in Pakistan will be discussed in comparison with other findings ranging from Abu Dhabi to Hong Kong which touch on peer collaboration.

In relation to blended learning, the author will discuss how podcast which is a series of video or audio files available on the Internet can be used to support learning. It is necessary to subscribe to Rich Site Summary (RSS) to keep in touch with the latest developments in podcast, online news, blogs, photos, and others needed in learning or work assignments of engineers and IT professionals.

This chapter will also discuss hardware like the eBeam and MIMIO pad in relation to teaching methods and presentation skills. Briefly, eBeam is a portable device which can easily convert any hard surface into a smart-board capable of recording, playing back, enlarging and even supporting the video and the Internet. The MIMIO pad is portable and light; everything written on it gets projected on the screen and the written work can be saved and played back.

The subsequent education technology software under discussion is the Reciprocal Peer Tutoring (RPT) developed by John Fantuzzo in 1984. In the

modern age, we can incorporate email, lecture-text in SMS format, and e-assessment with RPT. The strategy works well in a two-person or a small group of four persons setting. They provide mutual support through prompting, evaluating, monitoring, setting and conducting test on one another. Research on RPT conducted in the Philippines and the West will be discussed.

Having mentioned a few technologies thus far, probably we can ponder over the question, "Are we using technology to differentiate the different teaching strategies or are we differentiating technologies to suit the tasks at hand?" In the current learning environment, we encounter different interactions such as:

- Student with computer;
- Student with lecturer via computer;
- Student with student to the outside world.

Technologies to fit into the different interactions come from Web 2.0, Cloud Computing, Personal Learning Environment and Personalized Content through tagging objects.

Once the learning environment is intact, the introduction of education technology may fail if we do not receive support from the management and faculty. The management must fully understand the technology being introduced and must give full support to see it implemented successfully. It is not enough to provide financial support only and abstain from other obligations.

Faculty members usually fall in line if the management is serious in seeing the technology work. They will learn to implement and love the new technology if it can prove positive results. For instance, if students' academic performance improved, teaching is made more interesting and exciting.

Based on the author's personal experience, sometimes the classroom physical environment is not ready for the implementation of new technology. Changes are needed to the classroom

layout plan to the extent of even changing the tables and chairs.

If you want lecturers to teach with technology, then the classroom should be ready and convenient for usage. For instance, the VGA cable, LCD, power source for technology should be easily available. Lecturers get put off when they are faced with unnecessary technical hitches.

Specifically, the objectives of this chapter are to discuss the following:

- Education technologies are taken to mean hardware and software
- Blending of hardware and software to achieve effective communications
- Research and development in education technologies used in communications
- Are we using technology to differentiate or are we differentiating technologies?

## **BACKGROUND**

Technology is constantly being used to support collaborative learning in particular blended learning. The aim is to create an environment for students on-campus as well as those geographically distributed to collaborate with one another and thus enhance their learning processes (Kreijns, Kirschner & Jochems, 2003), and facilitate collective learning and group cognition (Stahl, 2006). Universities in Malaysia as well as around the world are shifting their focus on student-centred learning. This is in line with UNESCO (2005) observation of the social demands of a highly diverse, interdependent, and technologically rich workplace that calls for teamwork. When our students graduate they will find themselves in a workspace where their colleagues are distributed in time and place. Hence, if we fail to equip our students with social interactive online communication skills they may find themselves unemployable. This is because our students are in the NetGens 2.0 era where social networking

2.0, communication tools 2.0 and productivity tools 2.0 are common cloud computing practices (Brown, 2008). These soft skills are attainable through blended learning. According to the Ministry of Higher Education Malaysia (MOHE) soft skills are personal attributes that enhance an individual's interactions, job performance and career prospects. These skills cut across the curriculum and MOHE introduced seven soft skills as follows: communication skills, critical thinking and problem solving skills, teamwork skills, moral and professional ethics, leadership skills, lifelong learning and information management, and entrepreneurship skills.

At present, there are a few major problems in the effective implementation of blended learning especially so in Asian countries. In Japan, for instance, the students are accustomed to a lecture style of teaching where the students are passive recipients of knowledge (Kennedy, 1991). There are some students who are reluctant to take charge of their own learning and students who are involved in independent learning still show a strong preference for the lecture style of teaching. In a 2005 survey, Hong Kong adult students preferred the blended learning mode with more face-to-face elements (Lee et al., 2006). Hence, it appears that students from Japan and Hong Kong still perceive face-to-face sessions as highly valuable. This perception holds true for Malaysian students as well. In an experiment on blended learning carried out in 2008, both the lecturers and students prefer a 50% online mode as compared to a 75% online mode (Chan et al., 2008). One possible reason is in the 75% online mode, the students do not get to see their lecturer as frequently as they desire. Similarly, in a case study conducted in Zayed University, Abu Dhabi by Doiron (2006) it was reported one in three students would rather not stray from the traditional face-to-face activity, a clear evidence of strong resistance to change.

Besides blending face-to-face to online mode of teaching, we can also blend podcast to learning activities. Podcast is a combination of iPod and

broadcasting. With a podcatcher (RSS aggregator) a listener can subscribe to his or her favourite podcasts which will then be downloaded conveniently to a computer. A student can listen to a podcast while driving to college, walking or exercising in a gym. Campbell (2005) reported the popularity of podcast jumped from 24 hits on September 28, 2004 to over 60 million hits in less than a year.

To tap into the potential of this technology, educators must incorporate instructional strategies in podcast. Podagogy.com suggests a combination of Keller's ARCS (Attention, Relevance, Confidence, Satisfaction) model with Gagne's Nine Instructional Events which include gaining attention, informing the learner of the objectives, stimulating recall of prerequisite learning, presenting the stimulus materials, providing learning guidance, eliciting the performance, providing feedback about performance correctness, assessing the performance, and enhancing retention and transfer. One must always remember it is the instructional strategies that drive the technology and not the other way round. Hence, we have to blend podcast with learning activities.

Podcasting has already become an important component of work routines and job expectations in some fields. For instance, Outing (2006) reported a modern day journalist is given a chance to contribute "his news and have it published under the company's brand name". In Australia, Hartfield (2009) reported podcasts focused the students' attention to core learning concepts and supported them in their understanding and learning of the lecture materials. Unfortunately, Asia is slow in catching up with this new instructional technology.

Another technology under consideration is the Reciprocal Peer Tutoring (RPT). This technology has been used extensively in schools and universities and it helps students improve their academic skills (Choudhury, 2002; Gartner and Riessman, 1994). In RPT, students play two roles, as tutors and tutees. This dual role is beneficial to the students because as tutors they have to master

the content in order to teach and to set questions. Subsequently, as tutees they learn from their peers and share knowledge as well.

Reciprocal peer tutoring is used successfully in Nigeria and it has a significant impact on the enhancement of career making among secondary school adolescents (Obiunu, 2008). In the Philippines, Henson (2009) reported a significant improvement in her students' performance in college algebra and she recommended using RPT in other courses as well. However, in Malaysia, we need to carry out more research on RPT and one big obstacle to overcome this is students' trust of peer tutoring. The author will discuss more on the students' trust in the later part of the chapter. Meanwhile, let us move on to another technology called eBeam.

eBeam is a device that can effectively convert an ordinary whiteboard or any hard surface into a smart-board. One important feature of eBeam is the Scrapbook Pages. Images, PowerPoint, Excel, Word can be imported directly into the Scrapbook and changes to the Page are shared in real-time over the Internet or Intranet. This technology by itself does not mean much to teaching and learning. In this chapter, the author will show how it can be incorporated into blended learning, reciprocal peer tutoring and even used together with podcast. In addition to eBeam, the author will also discuss another device called the MIMIO Pad in relation to teaching and learning.

In this 21<sup>st</sup> century there may be a need to push student centred learning to the next level. That simply means to provide students with Personal Learning Environments (PLE) to enable them greater control of their own learning experiences. The tools needed are available: they are blogs, wikis, podcasts, video/YouTube, Google Docs, Social Bookmarking, Flickr, Skype, Facebook, EduSpaces, Myspace and Web 2.0. These tools can be linked together and aggregate content using RSS feeds. Most importantly, we need open Application Program Interface (API) and open protocols for PLE to grow as a concept.

According to Attwell (2007), PLE places emphasis on informal learning, how an individual organizes his or her own learning in different contexts and situations which may not be possible for a single learning provider to handle. The issue here is not the tools, not PLE which is a collage of approaches to support personal learning, but the players namely students, lecturers and the institutional management. Are they ready?

## **BLENDED LEARNING**

### **Definitions and Types**

There are numerous definitions of blended learning. The most common definition states that blended learning combines offline instruction with distance education (Osguthorpe and Graham, 2003). Other researchers prefer to define it as blending technology based learning with face-to-face learning in particular in work places for training and learning purposes (Kerres and De Witt, 2002). This type of blended learning is useful for engineers and IT professionals in their work environments. There is another definition that integrates e-learning with traditional learning thus creating the term blended learning. According to Valiathan (2002), blended learning mixes face-to-face classroom, live e-learning and self-paced learning. By far the best definition of blended learning suitable for IT and engineering education is given by Fox (2002). He states that blended learning combines classroom training with live and self-paced e-learning together with advanced supportive learning services in a manner that provides a tailored learning.

### **Student and Lecturer Perspectives**

When blended learning was first introduced in my research in 2007, a question frequently asked by the lecturers was “Why do I need online forum discussions when I can very well conduct face-

to-face discussions in the classroom?” This is indeed a genuine question, as lecturers want to know what can online forum discussions offer that face-to-face discussions cannot. According to Spilka (2002), online forum discussions require students to extend their thinking much further than in face-to-face discussion. Consequently, students acquire high quality analysis and thinking resulting in more thoughtful, tactful, and sensitive reports or assignments. On another note, it has been reported in many researches that students participated more actively in online discussions than in face-to-face discussions simply because they are afraid of being laughed at when they blurted out ‘wrong’ answers in the classroom. On the other hand, in the online mode students can think over the answers until they are fully satisfied before they post their arguments to the forum.

In terms of content acquisition measures by the grade averages, there is no significant difference between the blended and the offline modes (Tang and Byrne, 2007). Other studies, however, reported an improvement in the learning outcomes for students (Twigg, 2003; Garnham and Kaleta, 2002), lower withdrawal rates and retention equivalent to that of face-to-face courses. Lecturers involved in blended learning reported that students wrote better papers, produced higher quality projects and were capable for more meaningful discussions on course materials (Vaughan, 2007). It is interesting to note that Sands (2002) claimed that blended courses have become “de facto writing intensive courses” for the students due to the text-based nature of the online forum discussions and emails. Spilka (2002) went a step further in stating that blended learning increases the opportunities for self-directed learning and develops project and time management skills. It may not be true for Thai students as reported in Prangpatanpon’s study (1996). There is a lack of self-learning activities among these students because they are used to the authoritarian practice, and are willing to accept what their lecturers say without questioning.

In blended learning, students need to change their mindset to be self-learners and to accommodate lifelong learning strategy, to work as a group collaborating and tapping into each other's strengths to acquire knowledge and skills to carry out self and peer assessments for self-improvement and to provide mutual support. Are we demanding too much from our students? In Malaysia, we have students who want to be taught the traditional way for the simple reason that they pay hefty tuition fees. These students still cling strongly to lecturer delivered lessons and they find it hard to let go. They do not want to take responsibility of their own learning. Research findings have shown that students from Hong Kong, Japan, United Arab Emirates and Abu Dhabi share similar view.

### **Technical Issues**

In the 21<sup>st</sup> century, we would naturally expect splendid networking and server support. However, the reality is far from expectations. In my research, we still face some technical problems like difficulty in logging into the system and speed needed to access and download materials. I have students who complained it took them ages to post their replies in online forums and to participate in online assessments. The peak time to login is between midnight and 2.00 am. The network gets congested with downloading and sharing of huge video and movie files.

Occasionally, the firewall of the server may log out students from accessing the learning management system where the online forum discussions are taking place.

Surprisingly, the network and server problems are not unique in a particular institution. They happen in other institutions in Malaysia as reported in local conferences on teaching and learning. Looking beyond our shore, the lecturers in India face technical problems as well when they run blended learning where they blend different media used in learning like the video lecture and teleconferencing. However, in South Korea

instead of blended learning, the lecturers utilize mobile learning with PDA. There is no report of technical problems.

### **Shared Features**

Podcast and reciprocal peer tutoring can be incorporated into blended learning for both online and offline modes. Hence, the features in the eBeam and MIMIO pad like scrapbook pages, recording and Internet support capability are very useful. The detailed usage of these features is described under podcast and reciprocal peer tutoring.

### **PODCAST**

#### **Intellectual Property**

When lecturers develop podcasts to support their teaching and students' learning, the question arises who owns the intellectual property? In some institutions in Asia, every academic material written and developed belongs to the institution. In such a situation, lecturers may be discouraged to develop new teaching methods and materials.

There should be a win-win situation here. The institutions should let the lecturers keep the intellectual property rights and they can share the glory and certain percentage of the capital gain. The author believes this is the normal practice across the world and it will certainly benefit the institution, lecturers and students alike.

#### **Capturing Class Discussions**

eBeam and MIMIO pad can be used to record group discussions in the class. This recording can be included in your podcast episode series. Lecturers can also use it as set induction to start a podcast. IT professionals and engineers can use podcast to share and acquire knowledge from their peers around the world. They can also use eBeam and MIMIO pad in their work presentations.

Students can refer to the notes in the scrapbook pages in eBeam as reference materials for podcast while listening to the audio.

## **RECIPROCAL PEER TUTORING (RPT)**

### **Students' Trust**

Initially, when students are introduced to student centred learning which requires collaboration, discussion and sharing of knowledge among peers, there is the element of trust that bothers them. The students would like to know whether their peers are giving them the correct information. They are used to receiving knowledge from the lecturers in the teacher centred approach. Now, we are asking them to collaborate and share knowledge among themselves. Hence, lecturers have to step in to overcome the doubt of trust.

This issue is pertinent among Asian students especially undergraduates who are still quite depended on their lecturer. They need to be convinced that under the student centred learning approach they are learning the right thing and not otherwise. If this issue is left unchecked, it will eventually lead to students losing faith in the new approaches and RPT in particular, will fail. Hence, lecturers have to summarise the student presentations and confirm student responses to the issue discussed. At the initial stage of the student centred learning, these two roles of the lecturer are crucial to build up the confidence level and trust the students have of each other.

### **Choosing Peers from Afar**

With the aid of an eBeam, reciprocal peer tutoring can take place in real-time over the Internet or Intranet at locations far and near. With this convenience, RPT takes on a different dimension. Students can choose their peers from another institution of a different culture and nationality.

It opens the window to a rich learning environment encompassing soft skills like communication skills and teamwork which are needed in today's workforce be it engineers and IT professionals or other professions.

## **PERSONAL LEARNING ENVIRONMENT (PLE)**

How much of student learning actually takes place in the Learning Management System (LMS) set up by the universities? Why do students shy away from the university's LMS? One possible reason is the LMS is developed by the university's authority with the understanding that students learn from the materials posted by the lecturers. They have forgotten the social aspect of learning and knowledge management and the need for LMS to be people-driven and not institution-driven (Chatti, Jarke and Frosch-Wilke, 2007). As reported by Brown (2002), students did not conform to the traditional image of learners as permissive sponges. In fact, the traditional producers of knowledge (faculty) are becoming consumers of knowledge and their traditional consumers (students and industries) produce. Universities are bringing industry players into the classroom, sending students for internship training and even lecturers for industrial exposure.

Consequently, our LMS should evolve into a Personal Learning Environment (PLE) which can be easily integrated with cloud-based applications like Google docs, Twitter, Facebook and Delicious to name a few. These social websites allow our students freedom to express themselves, to write and post what comes to their minds, and there is practically no restriction on what they can post as long as it is within the law.

The issue at hand is how to integrate these social websites into the academic environment so that while our students enjoy posting to these websites they also learn. It is a delicate integration and we do not want to create a situation where the

students move out of these social websites when the lecturers move in.

### **Are the Players Ready?**

If you ask the students, “Are you ready for PLE?” you may get a resounding ‘yes’ response. Yes, because they are not in favour of the current education system where they have to follow strict rules and regulations, submit assignments on time and take sit-in tests that run for hours. Yes, because they have to sit in the classroom listening to lectures and looking at PowerPoint slides hours on end. Given an alternative, they will snatch it not knowing what they are in for. No doubt, they are familiar with the tools mentioned under the PLE. The issue is whether they know how to use them to support their learning, be it formal or informal?

If you ask the lecturers, “Are you ready?” you may get a resounding ‘no’ response. No, because majority of the lecturers do not want to leave the comfort zone of the teaching methods they are used to. They do not want to venture into an unknown area of PLE where they fear they may have to put in more effort in teaching. When we first started student centred learning, for instance, the problem based learning approach there was some resistance from the lecturers as they had to read and to keep abreast with the latest developments in their field. Another critical issue is the role of lecturer in PLE.

If you ask the institution management, “Are you ready?” they may respond by retorting, “Ready for what?” PLE recognizes the importance of informal learning and how much of informal learning is provided by an institution. Students plan and organize their learning environment and collaborate with their peers and other professionals. How much leeway is an institution willing to give in these areas? In the current learning environment we encounter different interactions such as;

- Student with computer,
- Student with lecturer via computer,

- Student with student to the outside world.

Are institutions ready to accommodate these interactions? Yes, it is already happening in most institutions around the world. Is the response still positive if we would to place these interactions in a PLE scenario where students control them with little interference from the management?

### **SOLUTIONS AND RECOMMENDATIONS**

Students and lecturers need to appreciate the benefits and advantages of blended learning. One of the possible ways is to give them hands-on experience with blended learning. Let them know that it is more meaningful and exciting to acquire knowledge through collaboration and discussions than to get it directly from the lecturer through a teacher centred approach. In my research, initially the students were resistant to blended learning because they had a misconception that their lecturers were not teaching them and they had to learn on their own. After going through the learning activities prepared by the lecturers for blended learning, then only the students realized that they actually learned more from the applications of the concepts in the online forum discussions.

Hence, it is imperative that students are made aware of the lecturers’ roles in blended learning or other student centred learning approaches and the benefits they can obtain through their participations in the learning activities. In this way, students will more readily accept the onus of learning is on them.

Whether it is blended learning or other instructional strategies, at the initial stage it is advisable to engage the catalyst group first and to subsequently set up a support group. The catalyst group consists of a few lecturers who are adventurous and are constantly willing to try new teaching methods. They will inform you of any technical problems encountered and possibly suggest ways to promote

the new methods to their colleagues. As more and more lecturers use the new methods then it will be essential to set up a support group. This group will assist lecturers who face implementation problems and to give them the moral support to push on.

Once we have identified the lecturers for our new instructional strategy, the next issue is, on whether our students know how to learn from their peers and do they trust their peers' capabilities to teach them. In Malaysia, students are very accustomed to the teacher centred approach since early education at primary school. Hence, when we shift to student centred learning, we have to prepare them on how to learn and to collaborate to acquire knowledge; how to ask thought provoking questions and also to probe deeper for better analysis of the concept learned. Reciprocal peer tutoring and podcasts can assist students in learning how to learn. To overcome the problem of trust, initially lecturers have to step in to confirm the peers' responses as accurate and to explain incomplete answers. It is imperative that lecturers sum up the students' presentations in the class and draw conclusions where appropriate. Once the students know how to learn, the role of the lecturers in drawing summaries and conclusions can be diluted.

Another thorny issue is the technical support from staff stationed in the Information System Office (ISO). For any new teaching technology that requires the server and network system to function, the support from ISO would be crucial. We do not want lecturers and students to get discouraged due to slow accessibility to the Internet and constant breakdown of the system. It is embarrassing when we have the right teaching technologies to move forward, but we do not have the right information systems to support.

Last but not least, Personal Learning Environment (PLE) is a relatively new idea so much so that its definition differs from author to author. It is certainly encouraging to move towards student centred learning where our students are more accountable for their learning. We can expose them

to the working environment through learning activities and site visits so that they can learn to apply their knowledge and acquire the latest know how in their profession.

## **FUTURE RESEARCH DIRECTIONS**

Let us consider the following scenarios: the world is flat; you are working with some virtual colleagues; you meet and discuss your work across different time zones and yet we have lecturers and students who are against distance learning and e-content.

We have to adapt and change as the workforce and workplace have changed. Students, IT professionals and engineers have to learn how to learn, un-learn and re-learn. They must adopt a learning culture where they constantly upgrade their capabilities to stay employed. Otherwise, they will be obsolete and their jobs out-sourced.

Likewise, lecturers must remain at the forefront of knowledge so that they can share with their students the latest findings and developments in their fields. They have to use student centred learning strategies so that their students are active learners seeking applications of the knowledge and analyzing facts acquired.

Students can set up their own Personal Learning Environments (PLE) and yet remain in the formal established education institutions. They can use the PLE for informal learning and to socialize through the various tools mentioned. Until more researches are carried out on the PLE we should be cautious in making this major paradigm shift.

## **CONCLUSION**

In the name of advancement, we have to move forward otherwise we are left behind. Moving ahead will lead to changes where all parties involved, that is, students, lecturers and institution management, have to adapt. We have to change to progress or

be changed. This chapter attempts to put forward the various education technologies in the forms of hardware or tools and software which include teaching and learning methods and how they are blended together to achieve effective communications. On a final note, are we using technology to differentiate or are we differentiating technologies? If we are differentiating technologies, then we fail to tap into the strengths of the technologies in teaching and learning. We fail to go beyond the technical aspects of the instruments and as such they will remain as instruments per se.

On the other hand, we can use technology to differentiate the various teaching and learning methods and bring out their strengths and weaknesses. We can also use technology to differentiate the various means to access information and to socialize in the Internet and hence tap into their potential in teaching and learning.

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## **KEY TERMS AND DEFINITIONS**

**Blended Learning:** Blend online and offline modes of learning.

**Education Technology:** Hardware or tools and software which includes teaching and learning methods.

**Online Forum Discussion:** Asynchronous online discussion.

**Peer Collaboration:** Sharing knowledge and learning from each other.

**Personal Learning Environment:** Collage of learning approaches.

**Podcast:** Audio broadcast to support student's learning.

**Reciprocal Peer Tutoring:** Tutor and tutee change role in assisting each other.

**Student Centred Learning:** Student actively involved in acquiring knowledge.