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# Implications of E-Learning on Learning and Teaching in Higher Education

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## ABSTRACT

E-learning is defined as learning via electronic means such as the internet, video, audio or multimedia. Students may access learning material anytime of the day and any where in the world as long as they have access to the server which house the material. With globalisation and technological advancement, e-learning has transformed the traditional mode of instruction in higher education. It is apparent that the trend in higher education is to incorporate e-learning in the curriculum.

Singapore Polytechnic organised its first campus wide e-learning week in December 2005. During this week, students and lecturers were off campus and lessons were conducted online. A range of e-learning activities were used to deliver subject content and activities and to assess students' learning.

This paper compares the range of e-learning activities used for online subject delivery and activities. A survey on students' perception of the different e-learning activities and how e-learning impacts students' learning was conducted. A total of 40 polytechnic students from a Diploma in Multimedia (DMMT) course participated in the survey. The results showed that the students preferred outdoor activities that required some form of engagement with the real world. These experiences enhanced the knowledge they acquired in the classroom. The implications of e-learning on teaching and learning in higher education are discussed in this paper.

**Keywords:** E-learning, perception, subject delivery and activities

## INTRODUCTION

In the recent years, the number of e-learning subjects being offered by tertiary institutions has increased (Bates, 2001). This was in response to a growing demand for flexible accessibility to higher education, a growing shortage of resources and funding, and a greater emphasis on lifelong learning. Continual access to education, therefore, is crucial in order to keep pace with change (Morrison & Oblinger, 2002, p.2).

The introduction of information and communication technology (ICT) into education creates new e-learning paradigms. It underpins the notions of independent and self-directed learning. It is unlike the traditional lecture centred mode where instructors would prepare and

disseminate copies of lesson plans for the subject and structure lectures, tutorials and practicals.

As the new mode of e-learning delivery poses questions about the students' learning and motivation, there is a need to analyse the effectiveness of the various e-learning teaching delivery and assessment methods and study how they impact student attitudes to learning. The results of the study will help us use these new teaching and learning modes more effectively.

This paper describes and compares the various e-learning activities used to deliver subject content and to assess learning. The paper also reports on a study conducted in the School of Media and Info-communications Technology (SMIT) on students' perception of the different types of assessments and on e-learning as an instructional strategy. The study explores the following areas:

1. Students' perception of the different types of subject deliveries
2. Students' perception of the different types of activities
3. Students' suggestions on future e-learning activities

The results will be discussed and some conclusions drawn.

## LITERATURE REVIEW

Information Technology is seen as providing the impetus for change in education today. Ross and Bailey (1996), for example, states:

> "..technology is a core aspect of educational change. Without making effective use of emerging technologies in the learning process, change efforts will be incomplete." (Pg 1.)

However, the promise of use of technology in education to improve student engagement and enhance learning has been disappointing (Zemsky and Massy, 2004). Most lecturers even when they use technology, still lecture, that is, their focus is to deliver the basic knowledge required by the curriculum. Elearning will become pervasive only when faculty change how they teach—not before. To do this, lecturers need not only good technology but also good ideas and sound applications.

In 2002, the Ministry of Education (Singapore) launched the second Masterplan for IT in Education, or mp2 for short. MP2 was aimed to consolidate and build on the achievements of the previous Masterplan. As recognised by the Minister of Education, Tharman Shanmugaratnam (2002) at the launch of the IT Master Plan, the "goal is ultimately not about the use of technology, but about changing the culture of the classroom and school to support and motivate thinking and independent learning among our pupils". In relation to teaching and learning, 2 key areas were identified: to get students to use IT for active learning, where IT is used to stimulate pupils to think and experiment, independently and creatively; and to use IT to enhance the connection between the curriculum, instruction and assessment methods. Here, IT tools will be used to increase the efficiency of summative assessments, and to expand the scope and nature of formative assessments.

At present, technology is used mostly to present traditional subject matter in new and exciting ways to support a given, existing curriculum. But, technology can also be used to individualise learning, for group learning, to manage and co-ordinate student learning, for student expression and for knowledge production (Hopkins, 1997). To capitalise on the strengths of technology, teachers need to empower the student with technology. Here, the art of teaching changes from "sage-on-the-stage" to "guide-on-the-side". According to Ross and Bailey (1996), when learning is empowered with technology,

> "Students become self-directed learners. They learn and study in "technology infused environments". Their investigations fulfil or expand their own constructionist meanings. In this empowered environment, learning takes place in a world of information literacy where anyone, learns anything, anytime, anywhere." (pg 15)

The design of the curriculum will now have to take into account new teaching methods made possible by technology. Pedagogy has to evolve and should be built around the learner and his/her learning abilities and needs. As the centre of learner control changes from the sole teacher to the learner, the role of the teacher changes from examining the instructional process to examining the learning process and the use of engaged learning practices. According to Berenfeld (1997), in this learner centred environment, technology can be used to

- bring real world relevance to the learning contexts,
- provide students with an effective model of lifelong learning,
- bolster social, communication and critical-thinking skills,
- meet emerging standards for inquiry-based learning, and
- increase the authenticity of the learning environment

When used with appropriate pedagogies, IT can help students build knowledge as they collaborate with others while completing authentic tasks. In the process they take responsibility of their own learning and develop the skills for lifelong learning.

A range of pedagogies can be used to engage the student. For example, in a teacher-centred use of technology, the lecturer is in charge of the pace of the instruction and the subject matter. Instruction is provided in the traditional linear fashion. Students benefit from this use of technology by having knowledge presented in numerous ways using interesting graphics and other multi-sensory techniques. In the collaborative learning approach, learners separated by time and/or distance, work together to create, access, discover and share information. In this student-centred use of technology, learners are in charge of the pace and direction of their own learning. According to Johnson and Johnson (1985), students working collaboratively could

- observe, imitate, and build upon each other's strategies, thereby increasing mastery
- experience the encouragement, support, warmth, and approval of classmates
- have peers evaluate, diagnose, correct, and give feedback on understanding
- have greater exposure to diverse ideas and procedures
- develop more critical thinking and more creative responses

Singapore Polytechnic implemented its first elearning week in December 2005. The aim of the week was to build our capabilities to use technology in teaching and learning. Both lecturers and students were off campus. Both teacher-centred and collaborative elearning activities were designed and delivered online to students. The students were required to be responsible for their own learning. This paper will report on the students' perceptions of the different activities used and their implication for future elearning events.

## E-LEARNING IN THE SCHOOL OF MEDIA AND INFO-COMMUNICATIONS TECHNOLOGY

Singapore Polytechnic is a tertiary institution offering three-year specialised engineering, art and business courses to students aged between 17 and 19. At the end of three years, the students are awarded a diploma. There are two semesters in a year and there are six semesters in a three-year period. In one semester, there are 16 study weeks.

In the School of Media and Info-Communications Technology (SMIT), 26 to 31 Dec 2005 were allocated as e-learning week. During the e-learning week, all students and lecturers were off-campus. Lecturers were expected to design e-learning lessons and activities for students to access online anywhere and anytime. Students were also expected to study specific topics independently for each subject.

Different modes of online delivery were adopted during the e-learning week. They were:

(a) Lectures recorded using PenDA***** software. This multimedia authoring tool enables lecturers to develop lectures incorporating audio and video clips of the lecturer's live explanations presented on an electronic whiteboard. Students were required to listen to the recorded lectures using the PenDa viewer software. The software would be automatically downloaded into the students' PC.

(b) Lectures delivered with the use of Microsoft PowerPoint. These were uploaded to Blackboard (BB) **, our e-learning platform.

(c) Video recording of a lecture given on campus.

*Remark:*
**PenDA is a multimedia authoring tool for cyber-education which enables teachers and students to maximize learning by using Multimedia devices such as microphone, audio, or video. Users can achieve more effective online learning using audio and video clips of lecturer's live voice.*

*** Blackboard (BB) online learning software enables Singapore Polytechnic to utilize the Web to enhance classroom instruction. Lecturers can use BB to create full-featured, online subject environments for the subject.*

Different activities were also used. Below is a brief description of the six core subjects and the activities given during the e-learning week.

- Database Management Systems
  This 75-hour examinable subject aimed to equip students with the database knowledge including the characteristics of a relational model, process of normalization, entity-relationship modeling, and Microsoft Structured Query Language.

  For this subject, students were required to view the lecture on the concept of joining tables. The lecture was recorded using PenDa Software. For the assessment, a tutorial was given and students were required to attempt five questions on joining using Microsoft structured query language to answer the questions. The assessment was submitted electronically in the BB drop-box.

- Drawing
  This 45-hour subject aimed to teach students to work with a variety of drawing media. Through drawing exercises, students were taught different aspects like texture and volume, space relationships, proportion, perspective, human figure and composition.

  For this subject, lecture notes on a specific topic were uploaded to the server. For the assessment, students were required to go to a scenic park - Ridout Tea Garden and they were required to draw a landscape and one item on nature each. They were asked to scan and submit their drawings electronically in the BB drop-box.

- Graphic Design Using Imaging Tools
  This 60-hour subject aimed to train students on the use of image processing and illustration tools for graphic design.

For this subject, lecture slides on a specific topic were uploaded to the server. For the assessment, students were required to go to a shopping mall (Orchard Road) where a photographic exhibition was being held. Each student would choose a photograph taken by a renowned French photographer, Mr. Yann Arthus-Bertrand. Each student had to write an A4 page of comments on the chosen photograph and submit the assessment electronically in the BB drop-box.

- Modeling and Photo-Rendering
  The 60-hour subject aimed to equip students with the basic knowledge to create 3D models and photo realistic images.

  For this subject, students watched a 20-min video recording of a lecture on-campus, i.e. before e-learning week. The lecture was on 3-D modeling of a car. For the e-learning assessment, students were required to attempt an associated quiz on 3-D modeling a car. For the online quiz, students were given designated date, time and duration to attempt 15 online multiple choice questions.

- Oral Communication
  The 30-hour subject aimed to equip students with practical oral communication skills and to make individual and group presentations that were persuasive by using relevant information and/or demonstrations.

  For this subject, students were required to refer to recommended books. Lecture notes on a specific topic were also uploaded to the server. For the e-learning assessment, there were six speeches that were written by former students were uploaded to the server. The length of each speech is about 3 to 4 pages. Students were required to give their opinions on any 2 speeches.

- Critical Reasoning Skills
  This 30-hour subject emphasized the process of writing a structured, coherent argument. Students learned to critically examine issues across disciplines, and apply various thinking strategies, evaluate arguments and opinions.

  For this subject, lecture notes on a specific topic were uploaded to the server. For the e-learning assessment, a few blogs were initiated. There are about 2 classes and each class has on average 4 groups and each group has 5 students. Every student was asked to participate, apply various thinking strategies and give their opinions on the specific chosen blog.

## METHODOLOGY

A questionnaire was administered at the end of semester 2 of academic year 2005/2006 to 40 Diploma in Multimedia Technology (DMMT) year 1 students. Year 1 DMMT students take six core subjects in semester 2. The six subjects were Graphic Design using Imaging Tools, Modeling and Photo-rending, Drawing, Oracle communication, Critical reasoning skills and Database Management Systems. The different subjects used different e-learning activities. The students were asked to identify the activities they preferred and to state reasons for their preferences.

The primary aim of the questionnaire was to determine students' perception of the effectiveness of the different modes of online delivery and activities adopted during the e-learning week. The questionnaire contained 6 open-ended questions. Those who participated in the study were told that the information provided by them would be kept

confidential. They were also informed that the data would be collated, analysed and used to improve future e-learning activities.

**Students' perceptions of the different activities during e-learning week**

Table 1 below shows the preferences of 40 Diploma in Multimedia Technology (DMMT) students with respect to the e-learning week activities they were given. In addition, students also indicated the e-learning week activities they did not enjoy doing.

**Table 1: Responses to questionnaire on students' preferences of e-learning activities**

| | Total no. of responses | | | |
|---|---|---|---|---|
| **Categories of activities** | **The most preferred activity** | **The second most preferred activity** | **The least preferred activity** | **The second least preferred activity** |
| **Drawing (outdoor)** | 12 | 12 | 1 | 2 |
| **Photographic Exhibition + critique (outdoor)** | 18 | 4 | 3 | 2 |
| **PenDa recorded lecture + tutorial (indoor)** | 2 | 5 | 11 | 8 |
| **Blog + critique (indoor)** | | 3 | 1 | 6 |
| **Speeches (text) + critique (indoor)** | 2 | 8 | 6 | 3 |
| **Video recorded lecture + quiz (indoor)** | 3 | 5 | 10 | 2 |
| **No response** | 3* | 3* | 8** | 17** |
| **Total number of responses** | 40 | 40 | 40 | 40 |

Remark:

* Students were indifferent about the activities given because they did not participate in the e-learning activities.

** Students were indifferent about the activities given. Generally, they felt that all e-learning activities were enjoyable and enriching.

From Table 1, it is noted that 75% (12+18) preferred "out-door" activities. The 2 outdoor activities required students to go to a shopping mall and a scenic park respectively. It was noted that 30% (12) and 45% (18) rated the photographic exhibition and drawing activities as the two best activities. The reason most students rated the photographic exhibition as the most preferred activity, was that they could appreciate the remarkable masterpieces taken by famous French photographer, Mr Yann Arthus-Bertrand. They could visit the photographic exhibition at their own time and convenience. By viewing and commenting on the famous masterpieces, students felt that they learned good photographic compositions. This reinforced the knowledge acquired during lectures and which they could apply to their future work. The Drawing activity was also a preferred activity. Students commented that they had fun sitting in a park. The enjoyed the natural beauty around them and drawing leisurely. As it is a scenic park, it inspired students to draw well.

There are 27.5% (11) who rated PenDa recorded lecture on DBMS cum tutorial activity as the activity they least preferred doing. Students were required to view the recorded lecture using the PenDa viewer software. After listening to the lecture, students were expected to complete a tutorial and submit it electronically. Unlike the other five subjects, DBMS has been considered as a theoretical subject whereby students were expected to understand and apply the concepts taught. The reasons for not liking the activities were as follows: poor

performance of the server, long waiting time (10 minutes) to download the lecture materials, boring and monotonous voice of lecturer, complexity of the subject matter and no guidance given to a difficult topic and unclear instructions given for the assessment. It was unlike on-campus lectures where the lecturer would explain and illustrate certain difficult concepts with examples clearly and repetitively.

A minority of students had differing views about DBMS. They felt the DBMS recorded lecture and tutorial were awesome as they could refer to the recorded slides and the text book a few times to have a better understanding of the topic before attempting the 5 tutorial questions.

There were 25% (10) who rated the video recorded lecture cum quiz activity as the second least preferred activity. This was because students felt that watching a blurred, muffled video on three dimension modelling was passive and boring, as there was no interaction. For the assessment, students were required to attempt a quiz at a designated date, time and duration. In general, students felt the quiz with multiple choice questions was boring and hence students were disengaged. The less disciplined students felt that the online quiz should be made more flexible; allowing them to attempt the quiz at their own time rather then being restricted to certain date and time. Some did not attempt the quiz because they missed the deadline stipulated.

Another activity students least preferred working on was the critique on speeches. There were 15% (6) who rated the activity as their least preferred activities. Students were asked to critique two out of six speeches. Some students felt the piece of assessment was extremely difficult and taxing. Similarly, the students disliked the other critique activity using “blog”. The reasons for not liking the activity were as followed: students lost the flow of the argument, the blog was not managed by anyone and the some replies were out of contexts. Hence, the students felt that the assessment could be improved if someone were to manage the flow of argument.

**DISCUSSION**

In general, students preferred “outdoor” and “interactive” activities as compared to the traditional classroom and computer laboratory activities. Students felt that the out-door activities were more interesting, exciting and enriching as they enhanced the knowledge learnt in lectures. For example, some out-of-classroom assessments include going to a shopping mall or a scenic place to take photographs and draw nature.

Those with good language ability preferred the two activities where they could critique speeches and a selected bog. Perhaps, students felt that they could air their views and share their opinions on certain topics with others. In general, passive activities such as recorded lectures cum online quizzes or tutorials did not seem to appeal to students. The possible reasons could be due to the poor performance of the server, heavy network traffic, unclear instructions given for assessment, boring and monotonous recorded lectures and no guidance from the lecturer. Due to the poor performance of the server and the network, some students could not complete the quiz within the designated time slot. Some students could not complete the more challenging tutorial questions.

Overall, students were quite positive about e-learning activities they were given during the e-learning week as they seemed engaged with and, largely, interested in what they were doing; some students worked well collaboratively. In addition, students’ responses were particularly positive with respect to descriptions of learning objectives and content, appropriateness of activities and improvement of their knowledge and skills. The negative aspects of e-learning week reported by students were that the time required to complete the e-learning activities were significantly underestimated by their lecturers, and the slow performance of server.

## CONCLUSION

An e-learning environment can supplement or complement a traditional face-to-face learning environment. It provides greater access to learning and provides greater diversification to learning. E-learning is a sub-set of flexible teaching and learning that seeks to provide greater access to learning for all students. Flexible teaching seeks to provide educational programs in ways that meet the changing needs of learners

E-learning should be adopted in the Polytechnic's curriculum. It is a powerful instructional teaching and learning process, where students experience authentic learning, for example in the case of GDIT subject where students had the opportunity to appreciate remarkable photographs taken by famous photographer. In future, perhaps, lecturers could introduce a variety of new e-learning subject deliveries and activities so as to engage students in the learning and hence make learning meaningful and enjoyable. To ensure that future e-learning week is smoothly implemented, the following aspects of resources should be looked into and addressed:

> Upgrade or install high performance servers, upgrade network infrastructure, provide software license, provide technical and academic support and services, allow more time to attempt the quizzes, provide guidance to students via email, design more interactive activities, provide clear instructions, develop interesting slides, issue needy students with computers and design outdoor activities that could engage students in their learning.

Tertiary education should look beyond the traditional boundaries of classroom instruction by augmenting their current best practices with the new advances in learning and collaboration technologies to maximise results. Most importantly, education institutions must seek to empower every individual in the institution to become an active participant in the learning and collaboration process. E-learning is here to stay and it should be implemented in all institutions of higher learning as it helps students to acquire competencies and skills necessary for lifelong learning and learning outside of the classroom. It would be a strategy that would promote life-long habits of learning in both students and lecturers.

## REFERENCES


Bates, T. (2001). The continuing evolution of ICT capacity: The implications for education. In G.M. Farrel (Ed.) The changing face of virtual education. (pp. 29-46). The commonwealth of Learning. Retrieved from http://www.col.org/virtualed/.

Berenfeld, B. (1997). Linking students to the infosphere. In Technology in the Classroom: A collection of articles. T. King (Ed). IRI/SkyLight Training and Publishing, Inc., Arlington Heights, IL.

Hopkins, M. (1997). Technologies as tools for transforming learning environments. In Technology in the Classroom: A collection of articles. T. King (Ed). IRI/SkyLight Training and Publishing, Inc., Arlington Heights, IL.

Johnson, D. W. and R. T. Johnson (1985). Co-operative learning: One key to computer assisted learning. The Computing Teacher 13(1): 11-13.

Morrison, J.L. & Oblinger, D.G.(2002). Information technology and the future of education: An interview with Diana Oblinger. The Technology Source, Vision, March/April 2002. Retrieved from http//ts.mivu.org

Ross, T. and Bailey, G. (1996). Technology based learning: A handbook for teachers and technology leaders. IRI/SkyLight Training and Publishing, Inc., Arlington Heights, IL.

Shanmugaratnam, T. (2002). Speech at itopia 2002, 24 July 2002. Available at : http://www.moe.gov.sg/speeches/2002/sp24072002.htm

Zemsky, R. and W. F. Massy (2004). Thwarted Innovation: What happened to e-learning and why. Learning Alliance, University of Pennysyvlania.