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A Malaysian tale: Pre-service teacher education and ICT integration for a better world

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Abstract: The use of Information and Communication Technologies (ICT) in education is often a topic of much discussion within all sectors of education with educators and educational researchers continually looking for innovative ways of using these technologies to support and enhance student outcomes in education. Consequently, Malaysia is no exception to this and as the Ministry of Education (MOE), Malaysia strives to meet its government's Vision 2020, educational reform across all educational sectors has become imperative. ICT will play an integral role in the educational reform process and teacher education programs are no exception to this. ICT and capacity building are essential components in the re-conceptualisation of teacher education programs. This paper reports on how a collaborative capacity building project between two Malaysian teacher education Institutes and an Australian University has given lecturers and pre-service teachers an opportunity to redefine their use of ICT in their prospective teaching areas of science, mathematics and design and technology. It also highlights the positive capacity building programs that occurred between both Australian university lecturers and Malaysian Institute lecturers and how this contributed to the effective integration and use of ICT.

Keywords: Multimedia, Developing countries, Integration of ICT, Teacher Education, Thinking

1. Introduction

There is considerable pressure for teachers to prepare students to be active participants and contributors in the knowledge society in which we live and work (Sprague & Dede, 1999; Wood & Smith, 2005). It is now regarded as imperative that students have opportunities to create and work with new knowledge (Bereiter, 2002) requiring them to apply their learning in new ways. Emerging technologies have allowed new practices in teaching and learning, while, conversely, new pedagogies have demanded new technologies or extended use of existing media. Consequently, there is an increased expectation for all educators to use

Information and communication technologies (ICT) to support students' development of knowledge building in all curriculum areas. ICT has been said to have "the potential to extend student learning capabilities, engaging them in understanding concepts and processes in areas of learning and facilitating change in learning, thinking and teaching" (Curriculum Corporation, 2006, p. 2).

However, the mere introduction of the computer and more recently, the plethora of online applications that exist and have been touted as essential for the attainment of educational goals, does not automatically ensure that learning will occur. Many claims have been made on behalf of ICT in education and consequently, expectations are high that ICT will deliver sweeping changes in education. In late 2007, a new federal government was swept into power in Australia partly because of its promise of a digital education revolution. Through a newly formed National Secondary School Computer Fund, the aim is to "make every classroom 'a digital classroom'" and to place "a computer on the desk of every upper secondary student ... by providing Australian schools with fibre to the premises, connections which will deliver broadband speeds of up to 100 megabits per second" (ALP, 2007, p. 4).

1.1 Smart School Initiative

The Ministry of Education, Malaysia has also recognised the importance of ICT in fulfilling its Vision 2020, through educational reform (Government of Malaysia, 1997). This Vision calls for "sustained, productivity-driven growth, which will be achievable only with a technologically literate, critically thinking work force prepared to participate fully in the global economy of the 21st century" (Government of Malaysia, 1997, p. 9). The catalyst for this educational reform and fulfillment of the Vision will be "Technology Supported Smart Schools" (p. 9).

The Smart School's initiative is one of seven flagship applications of MSC Malaysia (formerly known as the Multimedia Super Corridor (MSC)). The Malaysian Smart School Flagship was "premised on the strong belief that information and communication technology is a key enabler to imparting the learning desire to all" (Smart School, 2009, NP). As of December 2007, there were a total of 88 schools participating in this program (Smart School, 2009, NP), with an expectation that all 10 000 of Malaysia's primary and secondary schools would be smart schools by 2010 (Government of Malaysia, 1997, p. 9).

There has been limited published research into the use, or effective implementation of ICT in Malaysian education however a recent study (Sa'ari, Luan and Roslan, 2005) indicates that while there are positive attitudes towards the use of ICT by teachers, their research findings indicate there is only moderate levels of ICT competencies and many teachers lack the skills to integrate ICT into the curriculum. In supporting this claim, it is worthy to note that the preliminary observations of the introduction of laptops for teaching and learning under the Teaching and Learning of Science and Mathematics in English Program (Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris,

PPSMI) found that teachers were not fully utilising these facilities in their teaching (Keong, Horani and Daniel, 2005). A further study (Luan, Bakar, Hamzah and Ahmad, 2002) found that most teachers have some skills in productivity software such as presentation and spreadsheet software and word processing, though most teachers only used the computer for word processing.

It is within this context that the role of teacher education must be considered if the Smart Schools initiative is to further succeed and technology is to be effectively used within the classroom. All new teachers need to be equipped with the skills and knowledge to use ICT in effective ways in their core teaching areas.

1.2 Building partnerships

As Malaysia strives to reach Vision 2020, a number of plans have been developed. In particular the Ninth Malaysia Plan, 2006–2010 that charts the nations development plan, has an impact on current education within Malaysia. An area of significance within this plan is to reform pre-service teacher education by developing specialist primary school teachers (Rahman Idris, 2005). This has become a motivating factor in the negotiation of an international collaborative program between Australia (Queensland University of Technology (QUT) and Deakin University) and England (University of Hertfordshire and Canterbury Christchurch University) to design and implement new Bachelor of Education degrees with a focus on either science, mathematics, design and technology, physical education or a combination of these. In particular QUT focused on 2 separate degrees with one in Science and one in Design and Technology. Each of these degrees had mathematics and Physical Education as a minor. A driving force behind the implementation of this collaborative project was for Malaysia to draw upon International expertise to move from their current Diploma degree in primary education to a Bachelor of Education degree within their institutes. Each of these degrees focused on a capacity building for each of the institutes and their lectures. While a major emphasis of this capacity building was on the core teaching of each unit, there was a large focus on the integration of ICT within the degree.

2. Course Development

QUT collaborated with two institutes in urban areas of Peninsular Malaysia and co-designed the course ensuring that the degree was contextualized within a Malaysian context. The resultant courses, one in Science Education and the other in Design and Technology, each had a minor in Physical Education and Mathematics with a total of approximately 90 students in each course over the two institutes. As a result there were a number of similar units between the two

institutes and each institute was able to support each other locally as well as be supported internationally from QUT.

In the first semester of the degree, students undertook compulsory Malaysian studies units which the students received credit for before undertaking the QUT units. Each subsequent semester involved lecturers from QUT preparing a week one document with lectures from the Institutes and then a week of capacity building prior to the start of the semester. QUT staff and Malaysian staff would then co-teach together in the institutes for 1 to 2 weeks directly after the initial capacity building workshops.

The initial units that students undertook in semester 2 were foundation units to help them develop skills and understandings that they could apply throughout their course. These units included; the development of skills in information and communication technologies; primary curriculum and pedagogy in health and physical education; English for teachers; and, in the case of the Science course, an integrated mathematics and science foundation unit to develop scientific and quantitative literacy while the Design and technology course had an introduction to Design and Technology. Students also participated in a two week school based experience unit where they were able to observe and work alongside teachers in a school. The unit that focused on the development of ICT skills in this first semester would give students many underlying skills that they could then apply to a number of various contexts within each of the following units that they would undertake.

2.2 Integrating ICT

While this was not an ICT degree it was essential that students had adequate ICT skills that they could apply within any school to enhance the teaching and learning of their students, whether it was a smart school or not. An essential component of the course structure was to ensure that students had the opportunity to develop and demonstrate these skills. In subsequent semesters staff from each of the institutes each semester would look at their unit outlines and look at how they could use ICT in an effective manner with their students and also encourage their students to use it for the attainment of their educational outcomes.

The problem and focus of the capacity building became how to design curriculum that makes best use of the interactive nature of ICT as opposed to introducing ICT to the set curriculum. It could be argued that this is a perennial problem in that it was first identified in 1986 as being one of “not how to introduce computers into education, but how to build education in the presence of the computer” (Sendov, 1986, p. 16). Linn (2004) has addressed this question through the development of four practical principles which are designed to maximise the “pedagogical advantage” of ICT. These principles describe:

1. how ICT can make information accessible as teachers choose topics and use models that learners can understand;

2. the need to make thinking visible – using visualisations and representations to connect ideas;
3. how teachers need to help students to learn from each other through collaboration, particularly through the use of collaborative tools, online discussion and group projects; and,
4. how ICT can promote autonomous learning through its use of reflective practice, critique, argument and comparison and design activities.

It is through these more interactive, visual and autonomous uses of technology that students can learn through the active construction of knowledge (Brady & Kennedy, 2003; Dexter, Anderson and Becker, 1999; Jonassen, 1996). When students learn *with* technology rather than *from* technology, they function as designers and the computer functions as a *mindtool* for interpreting and organising the learner's personal knowledge (Jonassen, 1996). *Mindtools* are "computer based tools and learning environments that have been adapted or developed to function as intellectual partners with the learning order to engage and facilitate critical thinking and higher order learning" (Jonassen, 1996, p. 9).

Parallels can be drawn between what Jonassen (1996) described as *mindtools* and that of the cognitive technologies defined as "any medium that helps transcend the limitations of the mind, such as memory in activities of thinking, learning and problem solving" (Pea, 1985, p. 168). The *mindtools* thus described also have a relationship to the pragmatic educational philosophies of John Dewey with Bonk, Hay, and Fischler (1996) claiming that "popular ideas about students using electronic tools to be designers of knowledge are akin to Dewey's argument that children must actively construct and interrelate knowledge by learning in more authentic ways" (p. 95).

The critical thinking and active construction of knowledge identified here is consistent with trying to fulfill the needs of Vision 2020 and it does require a holistic approach to course development. While all students and lecturers at the institute would be using a learning management system (LMS) for the delivery of the course units, it was necessary to go beyond this to identify ways in which curriculum could be designed to make best use of the available technology

3. Results and Discussion

Access to ICT resources in Malaysia can often be very inconsistent and difficult and as a consequence the course development needed to take these issues into consideration. For example access to the Internet was either unreliable or slow, therefore a unit of work that was developed largely around online activities did not have the potential to succeed, however, a unit that encouraged students to use ICT to be creative designers through the use of digital media had more chance of success. With such a large number of units within the course it was decided that the redevelopment of units with a focus on using ICT would be a gradual process with greater emphasis placed on semester four to Semester 8. The

discussion in this section will be focused around the redevelopment of three units that were initially redeveloped in consideration of the available technology. The three units redeveloped were; Excursions in mathematical reasoning; Life and Living Processes; and Introduction to Agrotechnology. Each of these units originally had a written curriculum component and a curriculum resource development as part of their assessment. Each of the units developed ways in which concepts and skills could be developed through the use of supportive technology and how the assessment could encourage the students to develop teaching resources and activities that enhanced the teaching and learning within a primary school environment. While some Internet activities and in particular web 2.0 tools were used, a focus was on the use of digital media and how it could be used for the active construction of knowledge.

“Digital media” is a fairly new term that we use, perhaps in place of the term “multimedia”. Whereas multimedia could be referred to as “pertaining to a computer mediated software program or document containing media such as text audio, video, animation and graphics” (Fox, 1995, NP) “digital media” broadens this concept beyond the computer and instead focuses on the format of the media. “Digital media”, therefore, refers to any content or presentation provided in a digital format. While a computer plays a role in production and presentation of the activity or concept, this role has lessened considerably since the days of multimedia production. Instead the students work more with digital devices such as still and video cameras, mobile phones and ipods for image and audio recording.

A survey of all current work undertaken with the use of ICT in these teaching areas prior to the redevelopment and implementation of the Bachelor of Education course identified students and lecturers only using word processors or presentation software and some limited use of spreadsheet software. During the initial capacity building workshops there were many areas that needed to be developed including professional development in the areas of criterion based assessment, teaching and learning strategies, the use of learning management systems and data retrieval through library management systems including referencing styles. In addition to these areas and others capacity building needed to occur for lecturers in using digital media in their units of work. This had a very positive outcome with over 60 different lecturers attending sessions that allowed them to explore alternative ways of using ICT, and in particular, digital media in their teaching and learning. This also included the lecturers identifying different ways in which ICT could support assessment in their units of work.

In the three units identified as focus units for this discussion, the lecturers transferred their skills and knowledge they had learned about using digital media and combined this together with the skills that each of the students had in the use of digital technologies to create learning resources they could use with their students while also developing an understanding of the Mathematical concepts or scientific concepts associated with their topic of study. It is not uncommon for students in developed and developing countries to have a high level of competence

with the use of digital media and recent research by the Australian Communication and Media Authority claims “electronic media and communications activities take up around half of young people's total discretionary time” (ACMA, 2008, NP).

The final outcomes of the projects that the students developed all included the use of either animation, video, still pictures, audio or a combination of these media to develop a concept in their prospective areas. For example in the life and living skills unit one group of students animated the life cycle of a living organism and then demonstrated the impact of humans on the environment and the causes this had to that particular organism. While the comments from the lecturers in the institutes were all positive, the comments from the students were also positive with some students claiming that “I had a lot of fun this semester and really understood what we were trying to learn” (science student 1, 2008) and another comment from a mathematics student claims that “the approach that was taught in this unit was interesting as it develops from a basic skill” (mathematics student, 2008). Each of the units received a satisfaction rating in excess of 4.5 out of 5 which was above the current faculty satisfaction mean.

4. Conclusion

Malaysian education is in a position where it is building a better world through education and technology. It is employing the strategies learnt through capacity building opportunities with international partners to reform teacher training while also striving to meet the Vision 2020 goal. The capacity building efforts identified in this course redevelopment and design of a new Bachelor of Education degree for two teacher training institutes in Malaysia has had a positive impact on teacher training and is leading the way in preparing teacher graduates to use ICT effectively in the classroom and to prepare students to be active participants and contributors to a knowledge society (Sprague & Dede, 1999; Wood & Smith, 2005).

The teacher training programs are being developed with a view to the available technology and how this will be used for the achievement of student outcomes, however the education of pre-service educators must remain a priority if quality teaching is to be evident in the school systems and the Vision 2020 goal is to be reached. While the Smart Schools initiative aims to implement a curriculum where people learn how to learn for continuing education throughout their lives it is essential that the teacher training programs prepare graduates to be a key component of this teaching and learning process.

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