2. Malaysia's Experience in Training Teachers to Use ICT

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Introduction

This case study begins by describing the Malaysian "Smart School" project and goes on to explain the teacher education component of the project. This paper examines the key areas in which teachers require training and discusses the issues that have been experienced in Malaysia in training teachers to utilize information and communication technologies (ICT) effectively to improve learning outcomes.

Background

At the turn of the century, educationists and policy makers in Malaysia debated about the challenges of the new millennium. In particular, policy makers were keen to know how to make the best use of information and communication technologies (ICT) to deliver knowledge and information to all; to facilitate communication; to provide greater interaction; and to encourage innovation and creativity to improve national productivity and competitiveness.

In its Seventh National Plan (1996-2000), Malaysia outlined its strategy to develop the labour needs of the nation, particularly in the fields of science and technology. The Plan identified one of the objectives of education and training as to produce an adequate number of highly skilled workers and gave high priority to reorienting the education and training system so that by 2020 Malaysia would have workers with the knowledge, skills and expertise necessary to support a knowledge-based society and economy. Malaysia saw innovations in ICT as an opportunity to review the country's public education system. Schools were identified as having a key role to increase the number of ICT-skilled people to meet the demands of industries that would be integrating ICT into their processes.

The purpose of this paper is to introduce readers to the Smart School initiative and a range of related activities that Malaysia has undertaken. A major government initiative, the Smart School initiative has focused on preparing a pilot group of selected schools for the changes that are taking place as a result of the advances being made in ICT. This initiative provides selected schools with ICT tools and manages change towards integrating ICT into teaching and learning. As a result of this project, which has been underway for ten years, Malaysia has accumulated considerable understanding of the potential and the pitfalls of introducing ICT into education. The work is continuing and other projects are now being rolled out across the country, designed in the light of the experiences gained through the Smart School initiative.

The Malaysian Smart School Project

Since 1996, the Government of Malaysia has targeted education as one of the main vehicles to bring about the planned accelerated development of Malaysia. Knowledge and information were identified as important prime movers of the nation's economy for growth, wealth creation and competitiveness.[7]

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[7] The Malaysian government set aside RM105.6 billion for education in the 8th Malaysia Plan. This represented an increase of 50.4 percent of the budget for education in the 7th Malaysia Plan.

In 1997, the Smart School initiative was launched as one of the flagship applications of the Multimedia Super Corridor, under the management of the Multimedia Development Corporation[8] (formerly MDC, now MDeC). The Smart School concept came out of a brainstorming session held at the Ministry of Education. Officials from the MDeC, the Ministry of Education and industry representatives produced a Conceptual Blueprint of Smart Schools, then appointed Telekom Smart School Sdn Bhd (TSS), a consortium of seven Malaysian companies and three multinational companies, in a project management role. TSS became a partner of the Ministry of Education, and was responsible for implementing the Smart School Integrated Solutions (SSIS) in cooperation with the Ministry. It was the first partnership of its kind for a national education project. In support of this initiative, the Government invested in the development of Malaysia's ICT infrastructure, to enable new technology to be used in the selected schools. The arrangement was for TSS to complete a pilot programme for a group of selected schools by December 2002. On completion, the programme would be rolled out to all of Malaysia's 9,000 schools by 2010. The project involves 87 schools nationwide.

Malaysia's Smart School project involves a wide range of inter-related initiatives. These include schemes to improve Malaysia's ICT infrastructure, training in change management for teachers and school managers, a national school management system to link schools and the communities they serve, integration of software, and a help desk facility. The result is the incorporation of ICT into schools at a rate not far behind the rates of more developed nations.[9]

The first step in the Smart School initiative was the introduction of computers, related applications, software and courseware into schools, classrooms and the teaching and learning processes. The 87 participating schools were divided into three types or "models". There are four "Model A" schools and four "Model B Plus" schools.[10] "Model A" schools , all of which are situated in the Klang Valley (which includes Kuala Lumpur), are equipped with computers in every classroom and with video conference facilities. In these schools, the ratio of students to computers is 5 to 1. "Model B Plus" schools[11] are equipped with computers in selected classrooms and in the science laboratories. The other 79 schools are Model B schools.[12] These schools are equipped with a single computer laboratory.

Smart School Integrated Solution

The Telekom Smart School and its consortium members developed the components of the "Smart School Integrated Solution" (SSIS). This comprehensive approach to integrating ICT into education encompasses five main elements:

» Teaching-Learning Materials.

Materials include 1,494 items of courseware and printed matter for four subject areas: Bahasa Melayu (Malay language), English, Science, and Mathematics.[13]

» Smart School Management System (SSMS).

This is software for managing and administering student enrolment, educational resources, school finances, human resources, external resources, facilities, technology, and hostel facilities.

[8] MSC Malaysia, formerly known as the Multimedia Super Corridor (MSC) is a national initiative spearheaded by the Malaysian Government to promote the national ICT industry and to provide a test-bed for the global ICT industry.

[9] Frost and Sullivan, 2004, Benchmarking of the Smart School Integrated Solution (Strive for Knowledge), Smart School Development, Educational Technology Division, Ministry of Education, Malaysia. p.11.

[10] Model A provides schools with 520 computers, five notebooks, six servers and video conferencing equipment and COINS leased line (512/256 kbps).

[11] Model B Plus provides schools with 81 computers, two notebooks and three servers and COINS leased line (128/64 kbps).

[12] Model B provides schools with a computer lab comprising 37 computers, two notebooks and three servers and COINS leased line (128/64kbps).

[13] Courseware is being developed for other subject areas, such as Physics, Biology and Chemistry.

» Technology Infrastructure.
The infrastructure provided to schools included hardware, software and other equipment.

» Systems Integration.
This was implemented to ensure integration between the various components and processes of the SSIS, between the Smart School System and other flagship applications, and to ensure data integrity and security.

» Support Services.
The support services include Help Desk services, maintenance and support. The Help Desk is located at the Educational Technology Division of the Ministry of Education.

The SSIS was implemented in the 87 pilot schools at a cost of about RM300 million (USD78 million).

Malaysia's innovative approach

In a study comparing Malaysia's approach to introducing ICT into schools with the approaches taken by eight other countries, researchers found that Malaysia's approach is radically different from the others.[14] In Australia, Britain, Canada, Ireland, Japan, New Zealand, Singapore and the USA, initiatives for incorporating ICT into education have tended to be initiated by schools rather than by the national governments. The schools set the goals themselves, with the governments providing funds.

These ICT initiatives usually began as small-scale projects. Many started with installing ICT tools in schools and then providing professional development for teachers. This was normally followed by the development of a communications network and provision of access to on-line content. In the other countries studied, the schools aimed to integrate ICT into education and teaching and learning materials were usually produced as a result of the professional training and development of teachers.[15] Often, projects began at school level and moved on to a cluster of schools and then to the national level.

The SSIS is innovative because it is government-led and is multi-faceted in its approach. An advantage of the leadership role of the government is that relevant policies are in place to support the necessary changes in theory and practice in education.

Another innovative aspect of the SSIS is the partnership between the Malaysian Government and the private sector in development, testing, installation and implementation of the SSIS. The Government sets the vision and provides the budget. For example, the building of schools and computer laboratories and the setting up of networking systems in the Smart Schools have been entirely funded by the Government. The private sector provides their expertise in their particular area of interest.

A further innovative aspect of the project is its focus on developing locally-relevant courseware. The courseware was created in recognition of the fact that teachers require digital content that is compatible with the curriculum. The quantity of courseware created has been impressive. By 2003, 1,494 courseware titles had been created at an approximate cost of RM1 million (approximately USD285,000). Each title

[14] Frost and Sullivan, 2004, Benchmarking of the Smart School Integrated Solution (Strive for Knowledge), Smart School Development, Educational Technology Division, Ministry of Education, Malaysia.
[15] Ibid, p.10. The comparative study shows that this works well in developed countries where expenditure per student as a percentage of per capita GDP is relatively high compared to developing nations. Malaysia spends 10.7 percent of GDP per capita on education. The US for example spends a high 18 percent of its GDP per capita on education. The US GDP is more than eight times that of Malaysia.

required about nine months to develop. The courseware were created in four subject areas: Bahasa Melayu, English language, Science and Mathematics, for students from Year 1 to Form 5 (Grades 1-11). They are web-based and run on all platforms, including open source. They also conform to the Shareable Content Object Reference Model (SCORM) standard for web-based e-learning. The subject matter incorporates Malaysia's education philosophy, which includes knowledge, competency, moral values, and personal well-being of an individual and the need for each citizen to contribute to the harmony and betterment of family and Malaysia's multicultural society and nation.[16] The courseware was distributed to all the schools participating in the project.

The Smart School initiative emphasizes the constructivist approach to learning, taking the focus off "teaching" and placing it on "learning". This approach recognizes that students will construct knowledge for themselves if teachers create the right learning environment.

In Malaysia today there is nationwide awareness of the Smart School initiative. The launch of the project sparked new ICT training initiatives, schemes for parents to buy computers for the home and initiatives to establish learning centres, colleges and universities which specialise in ICT and multimedia development.

Obstacles and Challenges

The initial phase of the SSIS exposed a range of obstacles and challenges. Achieving a consistent level of ICT infrastructure in schools has been one of the biggest challenges facing this project. There continues to be enormous disparity in the level of ICT availability and in the level of ICT use in schools, especially between schools in rural areas and schools in urban areas.[17] The issue of lack of Internet connectivity is a particular challenge. At the current rate of development of connectivity, it is unlikely that the infrastructure will be in place in time to connect all schools to the Internet by 2010.

The lack, or low quality, of connectivity in rural schools threatens to amplify the disadvantages of rural learners. Without infrastructure and connectivity, the integrated system (encompassing web-based courseware, on-line management tools, and technical support) provided by the Smart Schools project is not accessible to rural schools. This poses a big challenge for the Ministry of Education. To address this issue, the Ministry provides schools in remote areas with special training programmes and provides teachers with notebook computers and with CD-ROMs containing teaching materials. In addition, the Ministry has launched special schemes for the schools and communities which are located on remote islands and in mountainous districts. For example, in Bario, an isolated community on the island of Borneo in the Malaysian state of Sarawak, there is no road access and poor telecommunications infrastructure. For Bario, the Smart School project was divided into two Phases. Phase I involved conducting a baseline survey to gain an understanding of the information needs of the local Kelabit people. Phase II involved the establishment of a telecentre in a secondary school. Internet access was provided to this school via a VSAT satellite link. Another initiative implemented in remote areas is the Demonstrator Application Grant Scheme.[18]

[16] Quoted from the Malaysian National Philosophy of Education.

[17] Zaitun Abu Bakar, University of Malaya, Malaysia, The utilization and integration of ICT tools in promoting English language teaching and learning: Reflections from English option teachers in Kuala Langat District, Malaysia, 2005.

[18] The Demonstrator Application Grant Scheme (DAGS) was launched by Ministry of Science, Technology and Innovation on 21st April 1998. DAGS is a key initiative for the realization of objectives set out in the National IT Agenda. The grant scheme is a platform for building human capacity and capability through ICT applications.

The integration between the Smart School System and other flagship applications is another challenge. Developing the courseware through a single vendor (though the vendor is a consortium) led to over-reliance on a single source of supply. Some companies within the consortium could not produce the work on time and to the quality specified. Beset with internal administrative problems and issues relating to evolving needs, and suffering from a lack of insight into developments in new technology and changes in national education policies,[19] TSS lost the monopoly on the production of courseware. Government tenders for courseware development are now open to all companies. This involves lengthy procedures for tendering and evaluating and selecting companies but has seen an increase in the standard of courseware.

Currently, courseware developers for the Ministry of Education assign their intellectual property rights and copyright to the Government. The contract for developing courseware includes minimal service levels, mostly restricted to meeting specifications and satisfying user acceptance tests and other technical criteria. Advanced services for updating and corrections post-delivery have not been sought so far.

Providing teachers with courseware has its advantages but this system also has disadvantages. Under this system, teachers are not trained to create and implement teaching materials themselves. There is no requirement for teachers to experiment with the particulars of using ICT in the classroom or to explore the vast resources available on the Internet. In addition, some teachers see the courseware as a replacement for pedagogy. A common misconception among teachers is that using the courseware simply means assigning a topic for students to learn or search. Thus, the teacher merely projects the courseware on the screen and the students use the courseware without any guidelines or teacher supervision. At the other extreme, some teachers claim that teaching with the provided courseware requires more preparation time and creates more work, requiring them to structure the learning by providing a framework, formulating guide questions, recommending websites and facilitating discussions. Some teachers feel they can teach more content and make students understand better by using traditional chalk and talk methods.[20] The courseware remains in its boxes for these teachers.

To make the best use of new ideas and tools, teachers must understand the relevance, usefulness and usability of those ideas or tools. Teachers need to be computer literate themselves and be confident in the use of ICT in order to understand what ICT can do to enhance their own development and to enrich the learning experience of their students.[21]

Teachers also need help and support when things go wrong or technology does not function. While technical support is a component of the SSIS, it is perceived by some as being inadequate. In a review of the SSIS carried out by the Ministry of Education, an important recommendation was in the area of technical maintenance and the need for more suitable and adequate technical support for teachers in schools.

Opportunities

Positive unintended consequences have arisen from the decision to provide courseware to the 87 Smart Schools. This major investment of Ministry officers' time and Government funds has resulted in the development of a vibrant e-learning and creative content industry with over 100 companies. Malaysia is becoming noted for its capability in content development for on-line learning and its expertise in areas

[19] Between 1999 and 2005 significant changes were made to the school curriculum and there was a major change in teaching of science and math ematics.
[20] Integrating Courseware for Teaching and Learning in Classroom Setting, Mathematics, MSC and Ministry of Education Malaysia.
[21] The Smart School Roadmap *(A consultative paper on the expansion of the Smart School initiative)* 2005-2020: An Educational Odyssey, October 2005.

such as interactive multimedia courseware development. Phase One, which covered the launch in 1996 through to 2003, saw small and medium sized enterprises and multi-national corporations working together, generating over 5,000 jobs.

Alongside the growth of companies which specialize in developing on-line learning content, and the software and related technology for delivery of on-line learning, a growing number of teachers and officers are developing skills in mapping curricula and using progressive checks on learners' achievements. Involvement in courseware development and evaluation has enhanced the professional development of teachers and officers at a much faster rate and in more depth than traditional training would provide. Teachers with subject specialization were seconded to companies in the TSS consortium as subject matter experts and evaluators.

Training Teachers to Use ICT

Training teachers in computer skills and the incorporation of ICT into lessons to improve students' achievement were not major focus areas of the SSIS. This was an obvious omission in the Smart School project.

TSS and other vendors saw this as an opportunity to propose ICT training for teachers as an additional element to the SSIS. Fujitsu Systems Business (Malaysia) Berhad (FSBM), submitted a proposal to the Ministry offering their on-line teacher training software, the Malaysian Teacher Training Program (MTTP). FSBM's on-line teacher training software was designed by Internexia, using as a guide the United Kingdom's Teacher Training Agency (TTA) specification,[22] to equip teachers with ICT skills and with the knowledge and understanding to make decisions about when and how to use ICT in their teaching and to improve students' learning achievement.

The teacher training software that Internexia designed for FSBM is an on-line learning tool, enabling teachers to learn at their own pace, place and time. The software incorporates tracking of learning and a self-assessment system, and also maps the learning pathway for each teacher. Teachers are expected to complete the training in nine to 12 months at their own pace. On successful completion, teachers are awarded an internationally recognised certificate of competency.

In 2004 FSBM and partner organization Prestariang Technology Sdn Bhd were awarded a contract by the Malaysian Ministry of Education to train 100,000 practising teachers to use the FSBM program, MTTP. The software was given a new title: BPPT *(Bimbingan Perguruan Profesional dalam Teknologi Maklumat dan Komunikasi)* or Teachers' Continuing Professional Development in ICT.

The aim remained the same: to equip teachers with the knowledge, understanding and skills about when and how to use ICT in their teaching. Most of the original objectives were also retained:

- To raise the standard of students' achievement by increasing the use of ICT in their learning.
- To create a national resource data bank of high quality, technology-enhanced teaching and learning materials created by teachers for teachers.

[22] The specification listing expected outcomes for teachers was provided by the UK Government's DfEE for training teachers in the use of information and communications technology in subject teaching under UK's New Opportunities Fund (NOF) Training. NOF is the £230m. of lottery funds set aside for the purpose of helping teachers use the potential of ICT to raise pupils' standards of achievement in the NC core subjects at primary level and NC core, and non-core, subjects at secondary level. Every maintained school in the UK benefit from the NOF training, a big initiative in the professional development of teachers and school librarians. The money is to be spent on training in the use of ICT, not basic computer skills.

- To enable teachers to make sound judgements about when and how to integrate ICT in the classroom.

- To enable teachers to acquire the confidence and skills to make use of and to integrate ICT into their lesson plans and teaching of the subjects in the classroom.

- To provide teachers with access to the national resource data bank: an ever-growing pool of teaching materials.

The Malaysian Ministry of Education required the training to be implemented through face-to-face instruction to accommodate the style of learning preferred by teachers. Prestariang Technology re-worked the on-line program into a full-time,10-day, face-to-face training course. Internexia was appointed by Prestariang Technology to train a group of first-level Master Trainers who would undertake the nation-wide training of 100,000 teachers. The BPPT was launched in 2004 and the first phase was to be completed in mid-2007.

The adaptation from an on-line, part-time self-study programme to a two-week face-to-face course had advantages and disadvantages. Among the advantages were: concentration on training without being distracted by day-to-day teaching activities; immediate tutorial support from the trainer; opportunities for collaborative work with fellow teachers; and a quick evaluation of progress. The disadvantages were that ICT skills and new pedagogy require time to be absorbed and adopted into classroom practice. The intensive face-to-face training did not allow time for teachers to absorb the lessons and teachers returned to the classroom and tried to implement what they had learned without continuing support from the trainer. Another disadvantage of the face-to-face course, from the schools' perspective, was the need to replace teachers for two weeks while they attended the training programme. This caused disruption and detracted from the motivation of teachers to participate in the training course.

Using ICT in Teaching

Broadly speaking, ICT can be used in education in two ways: as a subject (learning to use ICT) and as a tool (using ICT to learn). Using ICT to learn requires first learning to use ICT.

The BPPT course focuses on using ICT to enhance learning rather than on teaching strategies. The course covers four main areas: informatics; independent learning skills; goal-oriented, resource-based subject learning; and assessing achievement.

- Informatics

The BPPT provides training in informatics (how to use computer-related technologies). The core of informatics competence training include enabling teachers to: use standard office applications; understand the components and structure of computers and networks; and utilize relevant educational software. The BPPT also ensures that Master Trainers were in a position to develop and incorporate optional modules to suit particular national needs and student aspirations. Such options covered competences for language learning, mathematics, science, engineering, software development, multimedia production, and software applications, among others.

- Independent learning skills

Many studies have shown that learners are motivated to learn and learn best when what they learn is relevant to their needs at the time of learning and how they learn is consistent with their individual

learning styles. Conventional curricula and approaches to formal education tend to neglect both these aspects of learning. An emphasis on students as learners, rather than as recipients of teaching, demands significant shifts in teachers' behaviour and attitude. ICT offer opportunities to bring education closer to the needs of the individual learner. The BPPT course encourages teachers to become familiar with ICT tools for accessing learning resources and information, solving problems and presenting results. The course also enables teachers to learn to support their students in adopting learning skills that would enable them to learn independently in the future.

- Goal oriented, resource-based subject learning

The BPPT course explains that using technology to develop new skills is a means of re-balancing the curriculum, but does not imply abandoning subject-based learning. The course demonstrates that most subjects can be explained and enhanced through using ICT applications. The course also promotes a shift from interpreting the curriculum as a list of facts to be learnt towards treating a subject as content with a set of competences to be acquired. This is most obvious in subjects such as language, informatics and mathematics, which are already both learned and tested as skills. But relevance and a focus on individual learning styles, as well as the need for communicative and collaborative skills, require that even knowledge-based subjects, such as history, science and geography, should be learned in the context of problems to be solved and challenges to be undertaken. The challenge for teachers, and the trainers of teachers, is to restructure subject learning as a series of increasingly demanding goals to be achieved, with technology tools giving access and structure to the resources needed to stretch the students' capabilities and to measure their success in rising to the challenges posed by the curriculum.

- Assessing Value Added and Achievement

Assessment is conventionally seen as something that schools and teachers do to students, through tests and examinations. ICT tools provide an opportunity to enable the student to participate more actively in the process.

Various aspects of assessment lend themselves well to technological enhancement and to the closer integration of assessment into the learning process. Diagnostic assessment can be used by students and teachers to identify gaps between present knowledge and skills and the required knowledge and skills. This helps to focus on the progress to be made in learning and in achievement. Furthermore, with a curriculum expressed as measurable learning outcomes (as is the case now in Malaysia), the distinction between learning and assessment blurs. Formative learning, at the early stages of a subject or level of difficulty, can be closely guided and monitored with the support of ICT tools. Technology-enriched developmental learning activities enable the student to attain knowledge and skills beyond the basics, and help the student to identify the subjects most closely suited to his or her needs, desires and talents. Problem-based learning is particularly well suited to provide learning activities that develop competencies, and to measure the outcomes of such learning.

What skills should teachers have?

Teachers are the key to the successful integration of ICT into education. They manage the processes of teaching and learning. Without the active, enthusiastic and skilled participation of teachers, innovations to enrich education with the advantages offered by technology are doomed to fail. The full participation of teachers in adopting new technologies to enhance education requires a commitment to ongoing professional development of teachers.

Two broad questions stand out for attention:

- What are the competences that can reasonably be expected of a teacher engaging in ICT-enriched education?
- What are the methods by which the expected levels of competence in the teaching profession can be achieved?

All teachers who use ICT to enrich their teaching and their students' learning need to develop specific educational competences to do so effectively. Teachers should be volunteer learners, motivated to learn to use ICT based on their interest in seeking out learning opportunities and in managing the changes taking place among their students, and in their classrooms, schools and profession. Teachers are motivated to learn when the new knowledge or skills can be used to better their position or to make improvements. They are not always interested in knowledge for its own sake. For many teachers, learning is a means to an end, not an end in itself.

In any ICT in Education professional development programme, teachers first need to gain the knowledge and judgement to be able to select and evaluate ICT resources that are suitable for teaching and learning in their own subjects. In particular, teachers need to be able to use the internet to search and select, with a critical eye, information and resources that are relevant for their subject and their students.

Secondly, teachers need to be able to judge when and how to integrate ICT into their lessons. Many aspects of education can be enriched with the judicial use of technology while some topics and aspects cannot. A teacher needs to be able to distinguish between these, and finer, distinctions.

Thirdly, teachers need to able to evaluate the effects of ICT on their teaching and on their students' learning. If the curriculum is defined in terms of learning outcomes, and standards for ICT-enriched teaching and learning are clearly defined in measurable terms, then the teacher would be able to apply the outcome measures, both to their own teaching and to students' results.

The training course offers the following: competence in the use of relevant technologies; competence to apply these technologies appropriately to teaching; competence in the development of resource materials and content for teaching; and competence in working collaboratively to improve the quality of ICT-enriched resources.

The course begins with providing training in basic ICT applications – Introduction to Computers and Applications (ICA). ICA is an on-line self-learning course with eight modules. The course comes with a set of instructions which include text, audio and images. Practical exercises can be followed by teachers to learn how to utilize ICT to develop lesson plans and teaching materials. Teachers have access to the on-line programme 24 hours a day, seven days a week.

Beyond the computer skills, the course extends teachers' competence in ICT to a level that enables them to produce teaching and learning materials for their own use and to share them with subject colleagues. In particular, the course gives instruction in how to access and utilize a resource bank which contains examples of lessons, and how to share their resources with others.

The training model is flexible and can be adapted to meet the needs of individual schools. The training co-ordinator is a key element in the organization and delivery of the course. Action planning is

addressed throughout the training and there are opportunities for teachers to meet ongoing needs as they are identified. The provider has rigorous procedures in place for quality assurance, which confirms its commitment to a programme of ongoing monitoring and improvement.

Following participation in the training course, most teachers responded positively in their feedback form and on the BPPT website.[23] Teachers reported that the training had a positive impact on their professional practice and that they were increasingly confident in the use and application of ICT in their teaching.

The BPPT website provides examples of (unedited) responses from teachers who have participated in the training course. Some of the teachers' comments are reproduced below.

- "This course has enabled me to use ICT in teaching and learning in line with the current developments in the education system."
- "After the course I became aware of the importance of ICT for the future and learned that it is very important to use ICT in Teaching and Learning. The use of ICT enables the process of teaching and learning to be more enhanced and complete."
- "This program has enabled me to increase my knowledge and skills in ICT. In particular it is a great help for me in lesson planning. I received a great deal of understanding and knowledge from my friends and peers from other schools."
- "This is an eye opening to a new way of teaching."
- "It's a great course, a useful tool; opening doors to learning, to turn children on to lifelong interest."
- "A very beneficial course to all teachers regardless of what subject we teach. For sure this is one of the best ways to educate and guide our pupils/students."
- "To all teachers, grab this opportunity to attend this BPPT course because it has many benefits for teaching and learning."
- "This course is very significant for me where I where I was able to learn many things about ICT. It also helps me in my area of teaching and learning."

In 2007, consultants from the International Islamic University of Malaysia began evaluating the BPPT programme. When complete, the evaluation report will be published on the BPPT website.

Malaysian Grid for Learning

In response to feedback from teachers, a decision was made to upload to the Malaysian Grid for Learning portal the best lessons developed by teachers.

The Malaysian Grid for Learning (MyGfL) is a strategic initiative and a vital part of the Malaysian Government's commitment to the creation of a knowledge-based society. MyGfL is managed by the Malaysian Government through the Ministry of Education (MOE) and aims to cater to the educational needs of learners and educators of every age, in both formal and informal learning environments, towards achieving national excellence in education. The MyGfL Formal Learning portal offers all schools in Malaysia a one-stop gateway to useful educational resources from Malaysia and other countries.

[23] BPPT website: http://www2.bppt.com.my/index.php

Assessment of the SSIS

In 2005, the Ministry of Education and MDeC published a report which documented an study of the changes brought about by SSIS and the impact the SSIS had on teachers, students and school administrators. The study also assessed the "first-of-its-kind" partnership between the Government and the private sector in the development, testing, installation and implementation of the SSIS.

The study focused on initiatives undertaken between 1999 and 2002. It surveyed 33 of the 88[24] Smart Schools and found that around 90 percent of students in the schools were ICT literate and could use ICT facilities for learning. Although teamwork, peer learning and independent learning are valued by more than 50 percent of the students in the survey, the study report noted that there was reluctance among students to work in teams because this was seen as an obstacle to completing assigned exercises during lessons.

The study also found that a high percentage (83 percent) of teachers were ICT literate. Furthermore, around 90 percent of teachers were using the computer laboratory for lessons and preparation of materials and most teachers (73 percent) found their productivity improved by using ICT facilities.

The report noted, however, that there was a need to establish a minimum ICT competency level for teachers, particularly in terms of competency in the innovative and creative use of ICT in teaching. The report recommended further provision of training in teaching methods and recommended that the teacher training curriculum should incorporate competence in the use of specific ICT tools, competence in integrating ICT into subject teaching, and competence in utilizing ICT for planning, preparing, teaching, assessing and evaluating lessons.

The report also recommended updating courseware to incorporate changes in the curriculum and in technology. The report noted that there was a need to implement the Smart School initiative in a more defined, structured and balanced manner and to improve the management of the various projects. A key recommendation was to enhance the classification standards for what qualifies a school to be "Smart".

Smart School Qualification Standards

In June 2006 MDeC published the Smart School Qualification Standards (SSQS).[25] The SSQS – a five star ranking system – provides the criteria for achieving Smart School recognition. The SSQS also provides a set of indicators for measuring progress.

The objectives of the SSQS are to:

- Develop a system to measure ICT use in education
- Provide a basis for policy planning and programme improvements
- Raise standards in education
- Serve as a catalyst for educational change
- Empower teachers and learners

[24] Thirty-three of the 88 pilot schools were selected for the purpose of impact assessment study, which was undertaken in October 2005. Students, teachers of Bahasa Melayu, English, Science and Mathematics and administrators provided insights and feedback on their experience of the SSIS implementation. Frost and Sullivan, 2006.

[25] Smart School Qualification Standards (SSQS), MSC Malaysia Client Contact Centre (CliC), Multimedia Development Corporation Sdn Bhd, 2007.

The SSQS has four focus areas for assessing Smart Schools: utilization of resources, human capital, applications, and technology infrastructure. The schools must achieve the minimum conditions (1 star) for each of the four focus areas to qualify as a Smart School. An essential criterion is the ability of teachers to utilize the schools' resources (such as ICT-enabled tools), to bring about an increase in pupils' learning and achievement.

Ministry reports state that the initiatives and implementation of the SSIS are heading in the right direction. Teachers are adopting new roles in the changing school environment, developing their ICT skills. Teacher training has brought about several significant effects. ICT training programmes have improved teachers' ICT skills, enabling them to incorporate ICT in their lesson plans. Teachers are able to produce digital materials and to integrate ICT in teaching and learning.

The Ministry has also provided a programme to train trainers to meet the demand for the large number of courses conducted by MOE. Encouraged by the improvement in teachers' skills and knowledge, the Ministry has recently identified 30 schools as "centres of excellence".

The Ministry continues to monitor strengths and weaknesses of the SSIS to enable appropriate intervention and support for schools. In a recent paper, Dr Masnah binti Ali Muda[26] wrote that the viability of the SSIS depends on ensuring that its management modules are scalable, web enabled and flexible for integration with on-going ICT initiatives. He also recommended that the student-to-computer ratio should be reduced, with better connectivity and broadband access; that schools should create champions who will lead change; that schools should take a holistic approach to change management issues; and that the Ministry should continue to provide guided training. Echoing the findings of the impact assessment study, Dr Masnah concluded that there should be alignment of policy objectives at all levels within the Ministry of Education, between Ministries and among agencies.

Conclusion

Through the Malaysian Smart School project the Malaysian Government has: made a strong commitment in policy, created a blueprint and guidelines, provided funds and resources to develop the necessary infrastructure, identified experienced and qualified teachers and officers, allocated a large budget for the development of teaching and learning materials and initiated a national thrust to bring about accelerated improvement in the application of ICT in education.

Teachers at Malaysian Smart Schools are perhaps some of the most advantaged professionals in the region. Their schools are well equipped and they are well supported in terms of access to ICT tools and to teaching materials and resources. Impact studies, government monitoring and evaluation reports of developments[27] and reports of visits to schools show that there is widespread use of ICT in the 87 Smart Schools by teachers, students and administration staff. Nevertheless, what is missing are the ingredients that make teachers innovative and creative in their role as facilitators to promote learning. There remains a need for teachers to develop confidence in new methods of promoting learning. The BPPT programme seeks to address this issue by providing training for teachers, giving them competence in the use of specific ICT tools, competence in integrating ICT into subject teaching and competence in utilizing ICT in planning, preparing, teaching, assessing and evaluating lessons. This training enables teachers to

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develop confidence and encourages teachers to introduce more innovative methods in teaching. While the training has been warmly received by teachers, conventional didactic methods are deeply ingrained into educational practices and will not be overcome easily.

The 87 Smart Schools are poised to be graded according to the SSQS five star ranking system. This ranking system aims to encourage teachers to be innovative and creative in using the large collection of educational aids available to them, including ICT tools, courseware and other materials, to bring about an increase in students' learning and achievement.

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