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# The Implementation of Ict Integration in Malaysian Smart Schools

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## 1. Introduction

Information and Communication Technology (ICT) has a dramatic impact on every facet of our lives. Many of the industrialized worlds are using Personal Computers (PC) and information or web appliances at home and at work. The number of world Internet users surpassed 400 million in year 2000 and will continue to grow strongly in the next 'five years. Most of the growths are in Asia, Latin America and parts of Europe. By the end of the year 2005 the number of worldwide Internet users will triple to 1.17 billion. The worldwide scenario for the tear 2010 will be over 1.8 billion Internet users and over 1.4 billion PCs in use. There will be over 20 percent of the office workers using PCs at home and at work as well as over 2.5 billion web appliances in use. Over 25 percent of office workers will also use web appliances at home and at work (Juliussen, 2001). Thus, it can be concluded that the impact of ICT plays a very important role in today's world.

Subsequently, Malaysians' participation in the use of Internet by the end of the year 2005 is said to increase to 25 percent. Datuk Tan Chaff Ho, the former Deputy Minister of Energy, Communications and Multimedia Ministry (2001) stated that computer ownership in Malaysia was eight people per 100 population in 2001 and is expected to increase to 15 by year-end and hit 30 by 2005. The world class standard for Internet user is 40 people per 100 population. Recognizing that the technological changes have become increasingly important in developing a knowledge-based economy, the Malaysian government is presently strengthening its ICT sector. Steps have been taken to encourage Malaysians to venture into the ICT sector. Some of the measures that have been taken by the Government to widen public accessibility to ICT are as follows:

a tax rebate of RM400 on the purchase of a computer for the family. This rebate is allowed once in 5 years;

loan facility for Government servants to purchase a computer is given once in their tenure of service; and EPF contributors are eligible to withdraw their contributions to purchase a computer for their children aged 10 years and above. (Malaysian Taxletter, 2001)

In the Eighth Malaysia Plan (2001 to 2005), the Malaysian Government had a located about RM5.2 billion to the ICT-related programs and projects. A total of RM 1.82 billion were allocated for the Multimedia Super Corridor (MSC) flagships application (Economic Planning Unit, 2001). The MSC was meant to provide the most conducive environment to achieve the government's goal to be a world-class information and multimedia player in this information age (Ministry of Education, 1997). The MSC flagships include the E-Government, Smart School, Telehealth, Multi Purpose Card, Research and Development Cluster and Cross Flagship (Economic Planning Unit, 2001). About 401 million Ringgit (RM) had been allocated for the Smart School flagships application and the money would be channeled out to more schools. During the Plan period, about 8,000 schools, nationwide would be supplied with computers. The use of ICT for teaching and learning would be expanded to ensure wider coverage of students, especially in rural schools. The development of courseware for Mathematics, Science, Bahasa Melayu and English Language would be intensified, while courseware fore other subjects would be developed. Information Technology (IT) is aimed at producing students with knowledge, thinking skills and innovations, which eventually contribute to the knowledge-based economy (Economic Planning Unit, 2001).These moves show that the government aims at positioning Malaysia as a competitive knowledge-based economy that enables Malaysians to have equitable access to knowledge and inform ation. In line and in support of this vision, the main focus of the Malaysian Ministry of Education (MoE) now is to maximize utilization of these facilities. It can be achieved by internalizing the vision that calls for:

*...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.* (MoE, 1997, p. 9)

The Ministry of Education has proposed a technology-support Smart School or locally known as *Sekolah Bestari* to achieve the National Philosophy of Education (NPE) and subsequently developed a work force to meet the challenges of the 21st. Century. The NPE states that:

*Education in Malaysia is an on-going effort towards further developing the potential of individuals in a holistic and a integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally and physically balanced and harmonious, based on a firm belief in and devotion to God. Such an effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are responsible and capable of achieving a high level of personal well being as well as being able to contribute to the harmony and betterment of the family, the society and the nation at large.* (MoE, 1997, p 19)

It can be said that the Malaysian government is spending huge amount of money for the advancement of ICT use in schools. Thus, it is important to see that the ICT has been adopted in the schools. In line with the advancement of ICT use in the Malaysian school, the MoE has drawn-up an Education Development Program from year 2001 to year 2010 that sees ICT being incorporated as part of the education mission. In this program, ICT in education is one of the main focuses (MoE, 2001).

## 2. Background of Research

Research findings (Combs, 2000 and Taylor, 2000) showed that ICT motivate teachers and students in their learning process. Technology as a tool helps teachers to accomplish their educational goals with students. Both teachers and students took more responsibility for their own learning, and there were more opportunities for individualized and hands-on learning. Combs (2000) echoed in his finding that teachers and students have positive attitudes toward the use of technology in the classroom. Taylor (2000) carried out a two-year research on the impact of students' use of laptop technology at Swarthy Community College in Cambridgeshire, United Kingdom. It was reported that use of laptop did appear to have positive and significant impact on students' motivation and task orientation.

The arrival of computer technology in the classroom has changed the way lessons and information is presented to teachers and students. According to Simonson and Thompson (1997), being able to read and write was no longer adequate for the Information Age. They argued that a computer, which was at its basis, a communication tool, provides fertile ground on which information literacy skills could be nurtured. Forcheri, Molfino and Quarati (2000) pointed out that technological innovation called on teachers to modify their role to introduce new contents, tools and methods. They stressed that teachers had to shift away from traditional mode to a new one. Lebrun (2000) emphasized that changes from a traditional mode to a new one, supported by technological tools go through different phases: a phase of "assimilation" in which the new tools are used "like' the old one and a phase of "accommodation" in which the new tools find a particular "niche" for themselves which demands time and effort. The phases demand time and effort of all the players involved in this new environment.

Putting the innovation into practice was a difficult and demanding task (Anderson, 1995). It was hard work, and it took a lot of time over an extended period of not months but years. Teachers who are engaged in this new revolution are personally interested in the process and devote large amounts of time and effort to it. Hawa (1986), Sharifah Maimunah (1990) and Sharifah Nor (1994) in their studies discovered that principals, teachers and students cooperation and hard work contributed to the success of innovation. Anderson further explained that the movement towards change would bring dilemmas. The tension between the ideal and what teachers can actually achieve is real, and change is never easy. The shift in the teacher's role from source of knowledge to facilitator of learning is itself a big shift that creates many problems.

This concern could be seen at the World Education market 2002 in Portugal 21 - 24 May 2002. During the conference it was reported that technology was not applied effectively to teaching and learning. Some teachers have fear of technology while others refuse to adapt (Gomez, 2002). Findings from national survey in late 1990's of teachers' education in preparing new teachers to use technology in the classroom, found that student teachers had access to computers and basic technology skills courses. However, they did not apply the technology in their teaching and learning (Bielefeldt, 2001). Although they had access to computer, they, did not have many examples of actual application of technology in teaching and learning. According to Becker (2000), the use of technology of K-12 teachers on a regular basis is only a small percentage. As Hall, Hord, Rutherford and Huling-Austin (1987) warned do not

assume people would use an innovation just because it had been introduced.

Therefore, change is not an easy process. When an innovation is introduced, certain conditions need to be present. Conditions that can facilitate the implementation of innovation need to be fulfilled. Only then will the innovation be successful (Ely, 1999; Fullan, 2001). Theoretically, there are many models on change in education. Meaning of Educational Change by Fullan (2001), Conditions of Change framework by Ely (1999) and Diffusion of Innovation Model by Rogers (1995) are some of the models that have been identified to give better understanding on the implementation of ICT integration experienced by the teachers teaching in secondary schools. These models also act as a guide to answer the research objectives and research questions of this study.

Fullan's (2001) factors affecting implementation are similar to Rogers and Ely's models in term of the "Characteristics of Change" and "Local Characteristics". Need clarity, complexity, and quality are four factors related to the characteristics of change. While, teacher, the principal, the student, the district administrator, the consultant, and the community which include the parent relate to local characteristics. The external factors include government and other agencies. It is found that if any one or more factors are working against implementation, then the process will be less effective.

Ely (1999), on the other hand has identified eight conditions that facilitate the implementation of innovations. The eight conditions are dissatisfaction with the status quo, existence of knowledge and skills, availability of resources, availability of time, rewards or incentives exist, participation, commitment, and leadership. If all the eight conditions are present in the innovation introduced, it indicated that there is high probability of sustained implementation leading to institutionalization. The implementation of an innovation will not work if one or more of the conditions are absent and consequently, less likelihood of continuation.

Rogers' (1995) diffusion process consists of knowledge, persuasion, decision, implementation and confirmation contributed to the Diffusion of Innovation model. An adopter of an innovation needs to learn about the innovation, be persuaded to try it out before making a decision to adopt or resist the innovation. Then, the adopters decide to continue or stop using the innovation. Rogers has also identified element of innovation attributes that will assist the adopter to accept or reject an innovation. This means that the innovation attributes, as perceived by an adopter help to explain their different rate of adoption. The elements of innovation attributes are trialability, compatibility, complexity, relative advantage, and observability. Fullan, Ely and Rogers had identified conditions that should be present during the implementation of innovation in education. These conditions complement each other. These conditions should be present for the innovation to be successfully implemented. Absence or lack of these conditions would see to the discontinuation or diffusion of the innovation. Based on the above discussion, the focus of this study is to look at the implementation of ICT integration in the Malaysian Smart School program locally known as *Sekolah Bestari*. The study also attempts to discover problems that emerge during the process of integrating ICT in the schools

## 3. Methodology

### 3.1 Research Design

Exploring the implementation of ICT integration in Malaysian Smart Schools and identifying the problems that emerge during the process would call for a qualitative method. By using this method, the researchers would be able to discover the insight perspective of the people involved in the phenomenon. In-depth interviews, classroom observations and document reviews were used as a method to generate the data.

### 3.2 The School

In this study the focus was on Malaysian technology-rich secondary school, the Smart School. The reason being that the study looked at the reasons teachers in technology–rich school had all the facilities that should enable teachers to integrate ICT in the curriculum and the teachers were exposed and trained in using the technologies.

Three Smart School in this study were chosen from the three levels of technology specifications started by the Smart School Pilot Project Team. School A had a technology B+ level; School B, a technology B level and School C, a technology A level. The minimal technology equipped was at Level B and the highest was at Level A. All the schools in this study had also acquired computers from other sources like contributions or donations in the form of monetary or hardware from parents, private sectors, PTA and from activities organized by the schools.

All the schools were in urban area. The students came from middle class to upper class socio-economic group. Some had computers with or without Internet connections. Almost all the students were computer literate.

### 3.2.1 School A

The school had 80 computers under the Bestari project. They had three serves to link all the computers to Internet connection and LAN. With the schools existing computers, there were a total of 120 computers in this school. There were three computers were placed in fifteen classrooms and science lab, the resource centre, staff room, the serve room and the office. However, the researcher observed that the computer in the classrooms had been relocated to the four computer labs. There were no computers in all classrooms. In the form one classrooms, LCD was fixed permanently hanging from the roof. The LCDs were supplied to the school under the ETeMS's[1] project.

Some of computer hardware found in this school were given by the ministry, individual, private sector, alumni and PTA. The school had also conducted several activities such as dinner, Jogathon and Walkathon to buy the computers, computer peripherals and to pay for computer maintenance and electricity bills. The school had tree routers that were connected to three computers labs and the Multimedia room situated in different buildings. This had enabled the teachers to use the computer, Internet and courseware. Some of the teachers' computer could be used as standalone if there is a serve brake down. At the time this study was carried out, the computer system at one of the buildings was down due to faulty router.

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[1] ETeMS stands for English for Teaching Mathematics and Science.

The router was strike by lighting about two months before the researcher's fieldwork. Teachers and students could not access the SSMS[2] and the Internet.

### 3.2.2 School B

School B had two computer labs, one for the Information Technology (IT) subject and the other for the Smart School project and a multimedia room. Unlike School A, School B did not have as many computers. The computers under the Smart School project were placed in the Smart School computer lab, 10 computers in the resource centre, 10 Smart School computers and 10 existing computers in Multimedia room and five computers in the staff room. The entire computers were connected to a server in a LAN environment with Internet connection using the lease line connection. They also had one new building specially built as a computer lab contributed by the PTA. Unfortunately, the room was empty as they were short of cash to buy the hardware at the time of the researcher's fieldwork. Besides hardware given by the ministry, they also had computers in other rooms such as the English room, which were contributed by individual, private sector and bought from the money collected from the school activities.

All the form one classrooms had a trolley with plug for LCD and computer connection was placed at the back of the classroom. If a teacher wants to use the laptop, he or she had to push the trolley to the front and fixed the equipment. There was a roll-up screen in front of the classroom. The ICT infrastructure in all the form one classes was provided by Ministry of Education for the ETeMS project.

### 3.2.3 School C

School C was one of the nine new schools selected for this project. This school had more technology infrastructure compared to School A and B. The hardware in these schools were located at the classroom, science lab, teacher's computer room, computer lab, resource centre and office. They had more than 500 computers. They had two computer labs unlike School A and B. Each computer lab consisted of 30 computers, and LCD and one laser printer.

Similar to School A and School B, School C had also made an effort to obtain computers from other resources. They had computers and money received from individual, private sector, alumni, PTA and the school had also organized activities for the purpose of buying and maintaining the computers.

### 3.3 The informants

The informants of this study consisted of twelve teachers, three principals, three heads of curriculum department and three ICT coordinators. The teachers formed the primary informants. The principals, head of curriculum department and ICT coordinators were the secondary informants. The data from primary informants were triangulated with the secondary informants. The informants were selected using purposeful samplings. Purposeful sampling is when the researcher select the individuals and sites with some purpose in mind (Creswell, 2002). In this study, the informants must have ICT knowledge that enables them to utilise the ICT. They must have the knowledge on how to operate the

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[2] SMSS stand for Smart School Management System

hardware and software as well as actively involved in this project. They must also have teaching experience for more than three years in the school. This experience was important because the ICT integration was stressed in the teaching and learning in all Smart School. From each school, the teachers represented the four subjects, which had been revised by the curriculum to implement ICT integration in teaching and learning. The subjects were English Language, *Bahasa Melayu* (Malay Language), Mathematics and Science. All the teachers were interviewed as well as observed during the classroom observation to look at their use of ICT at work. The background description of every primary informant of this study can be referred from section 3.3.1 below. In presenting the description, the informants were given fictitious names to protect their identities. The secondary informants, the Principals, Head of Curriculum Department who were also the Assistance Principals and ICT coordinators were also interviewed to get a better view of the implementation of the innovation. The principal's role in this study was as the head of administrator who overseas the running of the school while the assistant principal acted as the head of curriculum implemented. The ICT coordinator was the technical support for the project and the person who supervised the running of the computer system.

### 3.3.1 The Primary Informants Background

The informant come from different levels of Smart School, they had different amount of working experience, and taught different subjects. They, however, shared common characteristics; they were teachers from Smart School and they had ICT knowledge.

Most of the teachers in this study had attended 14-weeks Bestari course on Smart Teaching and Learning conducted by the Teacher Education Division, Ministry of Education of Malaysia. Some of them had not attended the course but had been exposed to the project and computer related courses and in-house training session organized by the school. Only few of the teachers had no computer and Internet connection. Those teachers who had no computer and internet connection had used the school computer or had borrowed laptop from the school. For example, Mdm. Chu of School C had the school's permission to borrow the school laptop when she needed to do her schoolwork at home. Most of the time she stayed back in school to prepare her lesson or do school work.

Most of the teacher had more than five years of teaching experience. This showed that at the point this study was carried out, they were experiencing a transition period from traditional teaching method to the latest teaching method of integrating ICT in their teaching. The traditional teaching method was more focused on teacher-centred approach. In discussing the finding, this information had influenced the teacher's decision to integrate ICT in his or her lesson. All the teachers in the study were having almost the same amount of teaching periods according to the subject taught except for Mdm. Bala of School B who had less teaching period because she was the head of the subject department.

### 3.3.1.1 School A

Below is the description of every informant.

<u>Mr. Alias</u> had sixteen years of teaching experience. He taught Mathematics to form three[*] and form five[*] students and Additional Math for form four and form five students. He was

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[*] Form three, form four and form five is equivalent to junior high.

involved with the construction of examination questions for lower and upper secondary schools at the Ministry level. He owns a computer with Internet connection. He had also attended other ICT related courses such as Microsoft Words and Multimedia.

<u>Mdm Aini</u> was a Science teacher. She had five years of teaching experience. School A was her first posting. She taught Biology to form four and form five students, and Science in form two. Besides teaching, she was also the school hostel warden. She taught form two and form four Science students. Although she had not attended the 14-weeks Bestari course, she was exposed to the program through the school in-house training. She had also attended ICT related course on building homepage, Microsoft Words and Excel program. She had a computer but had no Internet connection. She used the school computer to get access to the net.

<u>Mdm. Ang</u> was an English teacher. She had been teaching for five years. She taught English Language to form one, four and five students. She was also a teacher trainer for ETeMS project. Like Mdm. Aini, she had five years working experience and School A was her first posting. Some of the computer related courses that she had attended were ETeMS course and Power Point. She had also attended in-house training on Smart School.

<u>Mdm. Alia</u> taught *Bahasa Melayu* (Malay Language) in form three, form four and form five classes. She had eleven years of teaching experience. It was her third year in School A. Previously she was teaching in one of the boarding schools. She owned a computer with Internet connection. Computer related courses that she had attended were 14-week Bestari course and Microsoft PowerPoint. She was also involved with the evaluation of Smart School's courseware.

### 3.3.1.2 School B

<u>Mdm. Badariah</u> taught Mathematics and Geography in form one. She also the school library teacher. She had twelve years of teaching experience. She owned a computer with Internet connection. The computer related courses that she had attended were 14-week Bestari course and Media Material Production course.

<u>Mdm. Bala</u> taught Science in form four and Mathematics in form five. She was the head of department for Science and Mathematics. She had twenty-six years of teaching experience. School B was her second school. She owned a computer with Internet connection. The only computer related course that she had attended was Microsoft Office. She had also attended meeting related to implementation of Smart School project.

<u>Mdm. Bedah</u> taught English Language in Form two and Form three. She had twenty years of teaching experience. She owned a computer with Internet connection. The computer related course that she had attended was the 14-week Bestari course. She has also conducted in-house on Bestari course for the school.

<u>Mdm. Boon</u> taught Bahasa Melayu in form four and form five. She was the head of Bahasa Melayu Panitia. She had fifteen years of teaching experience. She owned a computer with Internet connection. The computer related course that she had attended was 14-week Bestari course.

### 3.3.1.3 School C

<u>Mdm. Camelia</u> had eighteen years of teaching experience. She taught Mathematics in form four and Additional Math in form five. The computer related courses that she had attended were Intel Teaching to the Future and 14-week Bestari course.

<u>Mdm. Cempaka</u> taught Science in form one and form three. She was also the school Examination Board secretary. She had eighteen years of teaching experience. She had been in School C since her first posting. She owned a computer with Internet connection. The computer related courses that she had attended were Phase I and II computer course, Intel Teaching to the Future, and ETeMS course. She had also attended a self-sponsored course of Microsoft Office before Bestari project was launched.

<u>Mdm. Chandra</u> had nine years of teaching experience. School C was not her first school. She had applied to be posted to this school. She taught English in form five and form three. She also taught Moral Education in form three and Physical Education to form four. She owned computer with Internet connection. Computer related courses that she had attended were Intel Teaching to the Future and 14-week Bestari course.

<u>Mdm. Chu</u> taught Bahasa Melayu in form two and History to form two and three students. She had five years of teaching experience. She did not own a computer. The computer related course that she had attended were Multimedia Learning System (MMLS) and Intel Teaching to the Future.

### 3.4 Data Gathering

The duration of data gathering took about five weeks per school. Classroom observations were carried out first, followed by in-depth interview. Yin (1989) explained that the observation was an opportunity for the researcher to gather evidence for a case study. Since the study was to look at technology at work, observation was crucial for further understanding of issues that emerged during the implementation. Besides that, classroom observation triangulated the findings with the findings from the interviews and documents (Merriam, 1998). The classroom observation looked at evidence of ICT access in the classroom, students' related ICT activities, software and courseware applications that were being used and teacher's teaching practices in using ICT. During the classroom observations, the researchers had written field notes which included the basic information of date, place of event, people involved, the physical setting, and occurrences of interaction and activities that had taken place.

### 3.4.1 In-depth interview

Interviews were carried out with the informants after the classroom observation. The interview was designed to elicit in-depth feedback in relation to teachers' own experience in integrating ICT within the classroom. It was carried out in a non-threatening atmosphere. The questions were semi-structured type of questions. The interview aims to access whether teachers integrate or do not integrate ICT in their teaching and learning process and not how they feel about it (Hall & Hord, 1987).

There were two phases of interviewing. The first phase was the formal interview session whereby the researchers explored the topics for investigation. Then, the second phase was to check the reliability of the data collected from the informants earlier. The informants were asked to read the transcriptions of their interview to see if there were any misinterpretations

on the part of the researcher. The informants were given a week to read the transcription. All interviews were tape-recorded and where necessary notes were taken during the interviews. The interviews were later transcribed verbatim.The interviews with the informants begun with open-ended questions such as "What is your understanding of ICT integration in the curriculum?" Subsequent questions were conversational in an attempt to get the informant to discuss further on the topics. Stating that the study was on ICT integration in classroom preceded each interview. The interviews were carried out using bilingual, Malay Language and English, depending on the informants' comfort. All informants were kept anonymous. The information gathering during the fieldwork was kept confidential and pseudonyms were used to protect the anonymity of the informant (Bogdan and Taylor, 1975). Most interviews were held in private area and with the informants' choice of the venue.

### 3.4.2 Classroom Observations
The classroom observations were carried out for one learning outcome of teaching and learning of a particular subject in a class. The classroom observation looked at:

1. Evidence of ICT access in the classroom.
2. Student's related ICT activities.
3. Software and courseware applications that were being used.
4. Teacher's training practices in using ICT as in Table 1.

| | Teaching Practices using ICT | | |
|---|---|---|---|
| Learning Material | Heavy reliance on content, text books and traditional aids, such as the blackboard. | Emphasis on learner-centred activities such as experiments, worksheets, resource kits. | Determined by the problem areas under study. Diverse use of resources and ICT tools. |
| Learning Activities | Traditional verbal activities | Emphasis on learners' active participation but not on authentic context. | Emphasis on learner and issues; investigations; authentic hand-on inquiry related to real world problems. |
| Technology | Drill-and-practice, little integration with topic | Isolated hand-on experiences such as word processing spreadsheet graphing, e-mail and information searches | Expanded vie of technology as a process, product and tool to find solutions to authentic problems, information literacy is advanced. |

(Source: Adapted from http://www.school.za/edict/edict/appf.htm.retrieved February 12, 2002)
Table 1. ICT Teaching Practice Observation Checklist

During the classroom observations, the researcher had written field notes. What was recorded became a raw data, which eventually emerged as the findings of the study. Field notes contain a written account of what the observer had observed (Patton, 1990; Merriam, 1998). In the study, the field notes included the basic information of date, place of event, people involved, the physical setting, occurrences of interaction and activities that had taken place.

All observations were carried out at the beginning of a new learning sub-learning unit. Most of the learning units being observed took about two to four teaching periods. If the teacher plan to take their students to the computer lab, the researcher goes to the school an hour early before the teaching time. The researcher was able to observe the students' behaviour of coming to the computer lab.

### 3.4.3 Document reviewed
Document reviewed were carried out during the fieldwork at the time when no observations or interviews were being carried out. In this study, the documentation reviewed was teacher's record book. It is a legal document which teacher wrote down the yearly and daily teaching plans (MOE, 1999). In Malaysia, it was mandatory for a teacher to bring the record book to the class. In the daily teaching plan, the learning objectives, learning activities and teaching aids were written to guide teachers to achieve the learning objectives of the day. Thus teachers' record books were reviewed in this study to triangulate the source for ICT integration in the classroom.

### 3.5 Data analysis
The data generated by interviews, classroom observations and document reviews were transcribed, coded and categorized relating to common conditions arising from the data. The data were analyzed manually and also with the used of the QSR N6 Qualitative Data Analysis software (N6).

## 4. Findings

### 4.1 Integration of ICT
Observations and documentation data revealed that the teachers in school C and School B integrate ICT in their teaching. The observation data is illustrated in Table 1. In Table 1, under the teachers' teaching practices, it was found that textbooks and ICT were widely used by most teachers as learning materials.

A class is classified as teacher-centered learning when the teacher did most of the talking and giving of information. On the other hand, when the teacher acted as facilitator and students did most of the talking and giving of information, it was classified as student-centered learning. In this study it was found that learning activities were more on teacher-centered.

Under technology practices, it was found that students are exposed to isolated hands-on experience and group presentation. Isolated hands-on experience was when the student sat in front of the computer individually and followed the instruction found in the courseware or they surfed the Internet. No interactive activities were found between student and student, or students and teacher. The students would only refer to the teacher or friends when they are faced with technical problem or had problem understanding the instruction found in the computer.

Group presentation was referred to group activities in using ICT. A representative from each group would present their work in front of the class. For every presentation there would be questions and answers from their classmates and teacher.

| School | Informant | Evidence of ICT access in the classroom | | | Students related ICT activity | Software applications / Courseware being used | Teacher's teaching practices | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Physical | Verbal | Handouts | | | Learning Materials | Learning Activities | Technology |
| School A | Mr. Alias (Math) | No | No | No | No | NA | Textbook | Teacher-centered learning | NA |
| | Mdm. Aini (Science) | No | No | No | No | NA | Textbook, transparency | Teacher-centered learning | NA |
| | Mdm. Ang (English) | No | No | No | No | NA | Textbook, transparency. A4 size paper | Teacher-centered learning | NA |
| | Mdm. Alia (Malay Language) | No | No | No | No | NA | Textbook, Mahjong paper | Teacher-centered learning | |
| School B | Mdm. Boon (Math) | Yes | No | No | No | Courseware | Textbook, workbook | Teacher-centered learning | NA |
| | Mdm. Bala (Science) | Yes | No | Yes | Yes | Courseware | ICT, textbook | Teacher-centered learning | Isolated hands-on experience Group presentation |
| | Mdm. Bedah (English) | Yes | No | No | No | PowerPoint | ICT | Teacher-centered learning | Group presentation |
| | Mdm Badariah (Malay Language) | No | Yes | Yes | No | NA | Textbook | Teacher-centered learning | NA |
| School C | Mdm Camelia (Math) | Yes | No | No | Yes | Internet PowerPoint | Textbook ICT | Teacher-centered learning | Isolated hands-on experience. |
| | Mdm. Cempaka (Science) | Yes | No | Yes | Yes | Courseware PowerPoint Internet | Experiment equipments, ICT, Worksheets | Student-centered learning | Isolated hands-on experience. |
| | Mdm. Chandra (English) | Yes | No | No | Yes | Courseware MSWord | Textbook ICT | Student-centered learning | Isolated hands-on experience. |
| | Mdm. Chu (Malay Language) | Yes | No | No | Yes | MSWord | ICT Textbook | Student-centered learning | Isolated hands-on experience. |

Note:

| | | |
|---|---|---|
| Teacher-centered learning | - | Teacher did most of the talking and giving information |
| Student centered learning | - | Teacher acted as facilitator and student did most of the talking and giving information |
| Isolated hand-on experience | - | No interactive activities were found between student and student or student and teacher |
| Group presentation | - | Group work activities in using ICT |
| NA | - | Not applicable |

Table 2. Findings of Classroom Observation

Findings from observation also indicated that the teachers in these two schools employed four levels of ICT integration in the school as shown in Table 2.

| Level | Approaches | Situation |
|---|---|---|
| Level 1 | ICT as verbal resources | Teacher teaches with the aid of ICT as verbal resource. Teacher gives the website addresses or name of courseware that would help students to enhance their understanding of the topic. |
| Level 2 | ICT as printed resources | Teacher teaches with the aid of ICT as printed resources. Distribute printed downloaded information as teaching aids. |
| Level 3 | ICT as hands-on experience | Teacher teaches with the aid of computer, courseware, software or Internet only. |
| Level 4 | A combination of all the levels. ICT as hands-on, printed resources and verbal resources. | Teacher teaches with the aid of computer, courseware, software or Internet in delivering the lesson. She or he also gives out handouts with information printed from the Internet or courseware. |

Table 3. Level of ICT Integration Approaches in the Curriculum

The highest level of ICT integration in the investigating schools is level 4. The teachers at level 4. The teachers at level 4 combine all the approaches in integrating ICT in the schools. The teacher integrated ICT as a hands-on, printed resources and verbal resources. For example in School C, Mdm. Cempaka integrated ICT by using all the three approaches. She instructed her students to browse for information from the Internet. She also asked her students to do exercises at one of the selected website as enrichment exercises on the topic. During the classroom discussion, she distributed handouts with materials downloaded from the Internet. She then gave the students websites addresses for further reading on the topic taught as homework. In Mdm. Cempaka's lesson, she practiced student-centered activities. The students were however, exposed to only isolated ICT hands-on learning when using ICT.

Level 3 of ICT integration would see to teacher using ICT as hands-on experience. Mdm. Camelia, Mdm. Chandra and Mdm. Chu of School C integrated ICT by using the computer, courseware and software. Mdm. Camelia conducted her lesson in the computer lab. She integrated ICT using PowerPoint presentation to show how the concept taught earlier could be applied in Mathematics. She also asked her students to surf the Internet to look out for some examples on the topic taught. The lesson was more on teacher-centered and isolated hands-on experience by the students. Meanwhile, Mdm. Chandra utilized Teaching Learning Material (TLM) courseware where the students had to follow the instruction provided in the courseware. In this lesson, the students experienced isolated ICT hands-on learning experience. Mdm. Chu, on the other hand, integrated ICT using MSWord application software projected through LCD. Then the students were assigned to use the MSWord program to type and print their work. Similarly, Mdm. Chu's students also experienced isolated hands-on ICT learning experience.

Three teachers of School B were found to be at level 3 of ICT integration in the teaching and learning process. Mdm. Boon, Mdm. Bala and Mdm. Bedah integrated ICT in their teaching during the classroom observations. They had integrated TLM courseware, Internet and PoverPoint program in their lessons.

Classroom observations were carried out in various venues. For Mdm. Boon the observation was carried out in the classroom. Mdm. Bala on the other hand, held all her lessons in the computer labs while Mdm. Bedah had her first two teaching periods in the classroom. The next two periods she conducted the lesson in the Multimedia room and the last one period in the classroom. Two of the teachers, Mdm. Bala and Mdm. Boon used courseware provided by the Ministry of Education (MoE). Mdm. Bala used the Bestari courseware that is the Teaching Learning Materials (TLM) while Mdm. Boon used English Teacher Mathematic and Science (ETeMS) courseware in her lesson.

During the first two periods of Mdm. Bala's lesson there were group presentations by students. The students were assigned to present their understanding of related topic they had learned the year before. Students presented their findings through various means such as PowerPoint presentation, mahjong paper and manila card. In the next four lessons Mdm. Bala employed the TLM courseware as an isolated hands-on experience. Her students were assigned to read and do exercise on a specific topic found in the TLM. Mdm. Boon on the other hands employed teacher-centered learning activity. She explained the concept of the topic by using the courseware projected on the screen in front of the classroom. Students just sat and listen to her teaching.

Mdm. Bedah used PowerPoint software. The PowerPoint was part of students' presentation. During the first two lessons the teacher had assigned the students in their group to prepare a simple PowerPoint presentation on a given topic. The students held the discussion in the classroom. Students with computer at home were assigned to prepare the PowerPoint slides. The students presented their work in the next two sessions. Teacher and friends gave their comments. The teacher's comments were on the language structure as well as the slide form at. The last teaching period was allocated for written exercise.

Teacher in Level 2 would integrate ICT as printed resources. For example, in School C, *in* one of Mdm. Cempaka's lessons, she had distributed printed materials on the topic she taught as her set induction in her teaching. She gave the students about

five minutes to read. Later, questions were asked based on the reading materials before the students started their science experiment. Mdm. Cempaka was the only teacher in School C found to be in Level 2. No teachers in school B were found to be at Level 2.

Level 1 is the lowest level of ICT integration in curriculum found In two of the schools observed. The teachers observed experienced Level 1 ICT integration approach when ICT was integrated as a verbal resource. For example, Mdm. Badariah of School B integrated ICT as a verbal resource during her teaching. She conducted her lesson in the classroom. There were no computers in the classroom. She instructed her students to surf the Internet to look for more information on the topic that would be discussed the day after. She also gave her students website addresses to surf. Mdm. Badariah was the only teacher in this study who applied the Level 1 approach of integration ICT in the school.

Teachers' record books supported the observations evidence that ICT was being integrated in School C and B through out the year. In School B, three teachers had written a lesson plan with ICT integration. Only one teacher did not state the integration of ICT activities in her lesson pelan. In School C, all teachers had clearly described the integration of ICT in their teaching pelan. These findings were congruent to findings from the classroom observations and interviews.

Even though ICT was seen as a tool to enhance the learning process, teachers in School A felt that not all topics or units needed the assistance of the technology. Therefore, during the classroom observation, the researcher was not able to see the ICT integration in the subjects taught by these teachers. It seems that teachers' understanding of ICT integration in curriculum had enabled them to decide when and when not to use the technology. Findings from teachers' record books and interviews also showed that these teachers did not integrate ICT in their teaching at all.

Data showed that these teachers had not been implementing ICT integration in the curriculum since the beginning of the year. The teachers' record book also revealed that before and after the researcher's fieldwork, there was no evidence found of ICT integration in the classroom (SAD). The teachers admitted during the interviews that they had not integrated ICT in their classroom for various reasons. Mdm. Aini admitted, "*During teaching and learning if use IT, I use less*" [Mdm Aini: 639 - 639]. Mdm. Alia had also admitted that she did not integrate ICT in her teaching (Mdm. Alia 138). Mr. Alias has this to say about ICT integration in his lesson.

*But to actually sit down with the, and go into them, I don't think I have done that. Usually we will say, "In your free time, whoever interested, you can browse this website to get, get additional information* [Mr. Alias: 542 - 545]

When probed further to know when he had informed his students of the related website he admitted "*I think it was last year*" [Mr. Alias: 551]. As for this year he said, "*I, I, I think no. Sure no*" [Mr. Alias: 554-555].

They claimed they had tried to integrate ICT in their lesson the year before. Since the present study aimed to look at integration of ICT in curriculum in the current year, teachers' experiences in the year before the study could not be taken into consideration. Thus, what the teachers experienced reflected the true situation in schools. These teachers did not integrate ICT in the curriculum instruction probably because they faced problems during the implementation process.

**4.2 Problem That Emerged During The Process Of Integrating ICT In The Smart School**

Teachers in this study faced some problems during their attempt to integrate ICT in their schools. The data had uncovered that teachers in this study faced two folds of problems in implementing ICT integration in Smart School. The first fold was on the initial problem faced by the teachers during the initial introduction of ICT in the school. All the teachers in the study had been teaching in their current schools before and when the Smart School program was introduced in their schools. Thus, they were involved from day one when ICT was being implemented in their schools. Therefore, when enquired about problems they faced during implementation of ICT integration in school, they wanted to relate their experience during the first year of the implementation.

The second fold was on the current problems faced by them. In this study, the discussion would be focused on the current problems. Fullan (2001), Ely (1998) and Smith (1998) had pointed out that during the first two years of implementation, the teachers would face lots of adjustment in adapting the innovation. Thus, the current problems were more relevant in this study because it would help to overcome the problems and made the implementation more successful.

The implementation of ICT in the curriculum had placed certain demands on the teachers. They had to develop their own ICT skills. They had to change their teaching practices. They had to monitor the activities they introduced and overcome the problems that arose. Thus, problems emerged from these demands. During the data analysis, common pattern appeared in all the three schools in this study on why teachers ignored ICT usage or use it less frequent in the classroom. In this study the inform ants had voiced out their feelings and thoughts about the problems. Sharing their experiences in using the ICT in their teaching had enlightened the problems

**4.2.1 Time Factor**

Time factor was prevalent among the teachers. Time had influenced the implementation of ICT integration in all schools in this study. The time factors could be divided into three categories. The categories were teacher's free time, lesson preparation time and teaching time. The categories formulated were the results of the interviews conducted with the informants from the three schools. The categories were operationally in Table 4.

| Category | Operational definition |
|---|---|
| Time | Time for teachers to reflect their teaching, to learn, to prepare lesson and to rest. |
| **Sub-category** | |
| Teacher's free time | Teachers' free period to rest, to reflect their teaching or do other non-teaching activities. |
| Lesson preparation time | Time taken for teachers to prepare their lessons |
| Teaching time | This time allocated for teaching period for a day |

Table 4. Time factor

### 4.2.2 Teacher's Free Time

Teachers' free time in this study refers to free time from teaching. In all the three schools, during their free time teachers would prepare their lessons, mark books, have their break or do some administrative work. These teachers complained that the free time was too short for them to prepare their lessons using ICT. Surfing the Internet to search for information, skimming and selecting information took a long time. During this free time they had to do many other tasks. Mdm. Ang said,

*It is interesting if we could have the free time even though the teachers had been given a lot of free time. But our free time is not use for lesson, preparing lesson. We have to do other things* [Mdm. Ang: 65 - 68]

Mdm. Cempaka shared her experience in preparing her lesson. She explained,

*Generally, oh, err for examples ok, like today lesson you saw, I need to go to few websites, ok. I have to check whether it's their level or not. So once I identified, that's take time. Initially it's take time* [Mdm. Cempaka:36-38]

The teachers were given approximately between 23 to 26 periods of teaching a week. This meant about four to five periods a day. Teachers were left with about an hour a day to mark books, prepare lessons and to do administrative work for the school. Sometimes their free time was taken to relief a teacher who was absent. Thus, there was less free time for them at school on that particular day. The average teaching times per week for teachers in this study were about between 23 to 26 periods. According to the teachers, it would be ideal if they get between 18 to 20 periods of teaching per week. They felt that by having ample free time, they could prepare their lessons using ICT and would be able to view the TLM courseware. Teachers in this study felt that there should be lesson preparation time allocated for them to prepare their lessons.

### 4.2.3 Lesson Preparation Time

Teachers in Malaysian school were not given lesson preparation time. Preparing of lesson was done at home or during teachers' free time. Teachers felt in this information age there should be allocation of lesson preparation time. Thus, this would enable teachers to spend time in producing ICT based teaching materials. Moreover, the schools had provided them the high-speed computers, and the round the clock access to the Internet and TLM.

Teachers who were ICT competent were found to need shorter time to prepare their lessons using ICT. Whilst teachers with low ICT competent were found to take a longer time to prepare their lessons. Teachers in School C experienced that once they had the materials then it would be fast to prepare for the next class.

Mdm. Cempaka related her experience on preparing her lesson, she said,

*Ok, to find the website it took me time about two hours, I can say. The correct web, it takes one hour, one and the half hour or so. But to prepare the slide was very fast. Because I was quite expose to all these courses that I went. you know, I err...* [Mdm. Cempaka: 192 - 195]

Mdm. Chandra admitted that initially it was time consuming to prepare her lesson using the ICT, especially the TLM courseware. She explained,

Err it is umrn in a way it is time consuming because err it's new to us we have to go through the content first before giving it to the students. So in that way it is time consuming but if let say after we have got the experiences, 'we know where to, where to surf for example or what is the content of certain courseware then I feel that it will be faster [Mdm. Chandra: 254 – 258]

However it was not for teachers in School A and some of the teachers in School B.

*You want to put in a lot of things in the PowerPoint but you don't have time to do that. Sometimes, sometimes, do it, preparing PowerPoint is not that easy. Some of the keys I already forgotten. You need to practice to co me out with the PowerPoint. I've attended two days course and after that I did some of the presentations in the PowerPoint then I forgotten already* [Mdm. Ang: 433 – 4381].

### 4.3.3 Teaching Time

Teaching time in this study refers to time where teachers actually engaged in teaching. On average, the class time or a teaching period in Malaysian secondary school is between thirty-five to forty minutes. Most schools have eight periods a day. All teachers in School C and School B would use their double periods to integrate ICT in the lesson. During the single period, the teachers would teach theory and concept. They found that integrating ICT needed extra time for students to come to the computer lab, settle down and then switch on the computer. Thus, the time left was inadequate for teachers to integrate ICT.

During the classroom observation in School C, the researcher found that students had to rush with their task that was required to be submitted on the same day. They had to queue for the printer. The one-hour learning period, was not enough for these students especially when the need to print their work at the end of the lesson.

Observation data showed that students took -about five to ten minutes to reach the classroom and five to ten minutes to settle down. The researcher had purposely arrived at the computer lab half an hour early before the classroom observation. The researcher had time to view the movements of the students coming and leaving the computer lab. It was discovered that they took about five minutes to operate the computers. If they faced technical problem, the teacher took another five to ten minutes to start the lesson. Thus, this had shortened the teaching time. School A teachers were not too happy with this reduced time

In School A, the school had rearranged the teaching timetable from 40 minutes to an hour so that teachers could use ICT during their teaching. According to the Principal A,

*Err...we had extended to one hour... because we ...we know if we use multi...we used Multimedia ... we need you know that time...extra time ...and also ...that's why...that's why* [Principal A: 156-158].

However, teachers in this school felt that the one-hour allocated for teaching was not enough if ICT is used in the teaching and learning process.

### 4.3.4 Course Content

The ICT knowledge was one of the essential conditions that should be present in implementing ICT integration in the Smart School. Most of the teachers in this study had attended the 14-week course. Data revealed that some of the teachers were not happy with the course they had attended. The knowledge that the teachers acquired during the course could not be applied in their school. Teachers who had attended 14-week course had found that the software and hardware they learned during the course were not the same with what was found in the school. Thus, they found their knowledge was not relevant to the school setting. They were quite disappointed. Thus, they had to learn the hardware and software found in the school and this had taken much of their time. They also felt the 14-week course did not teach them on how to integrate ICT in their teaching. Mdm. Chandra clarified,

*...other colleges they used umm Macromedia. So when we use ...I think we are the only group using Toolbook instructor and I can't see the benefit of it because err when we come back to school we don't have the programmed* (Mdm. Chandra: 395-397]

During the 14-week course, teachers had to do a practicum for a month. However, during the practicum they were given less teaching periods. Thus, this had enabled them to implement ICT integration in their teaching. But once they went back to their schools, they were given the normal amount of teaching periods. Therefore this had caused some problems to them. As Mdm. Bedah explained,

*Err you see my practicum time it was so nice in the sense, they only gave 10 periods. So I plot all the time to prepare what I want. All my worksheet typed nicely and all were done properly and I had differently, different, different groups doing as required. But now I am teaching five classes, how am I going to do that?* [Mdm. Bedah: 271 - 276]

The courses that the teachers had attended did not contribute much to the implementation of ICT integration in the curriculum. This is finding consistent with the study carried out by Mohammed. Sani, Jamalul Lail, and Mohd Izham (2001). Their finding showed that teachers who had attended the 14-week Bestari were weak in IT skills and selecting and using appropriate software.

### 4.3.5 Technical Malfunction

Technical problems had also contributed to the other problems the teacher faced during the implementation of ICT integration in the curriculum. The malfunction of computer, server, router and technical problems to gain access to SSMS and TLM were some of the major problems faced by, the teachers. Although technicians were positioned in all these schools, the frequent technical malfunction had imposed problem to teachers.

During the classroom observation in School C, about three computers and the LCD were faulty. Therefore, during the lesson, about three students had to share a computer. Since the LCD was faulty, Mdm. Chandra had to move around from one computer to another to give instruction on using the courseware. That had taken much of her teaching time. Mdm. Chandra had encouraged her students who were good in ICT to assist her. Mdm. Camelia did not manage to start her lesson on time. That was because the LCD in the computer lab was out of order. She only knew about the faulty LCD when she went to the computer lab. She had to get another set from the office. It took her about fifteen minutes to get and setup the LCD. While Mdm. Camelia was setting up the LCD, she instructed her students to surf the Internet to look for some information with regards to the topic taught. She was disappointed when her planned lesson could not be carried out. She voiced out,

*Actually we wanted to use the Internet because on that day as you saw we did not have the LCD projector and then I have to spend time going and getting the projector. So I actually intended to go along with the student 2nd search the net and then come up with those sites the stuff that I wanted wasn't actually carried out very well. Because, I wanted them to access some data on a particular... such as statistic err histograms. l wanted them to see for themselves first was a histogram without me doing telling them what it was. So, I wasn't able to do that.* [Mdm. Camelia: 37-44].

School A experienced router break down. The router was struck by lightning. All computers in the block could not be connected to the Internet, SSMS and TLM. According to the ICT coordinator, it would take sometime for the school to buy new routers since it was quite costly. In the meantime, the ICT coordinator had configured some of the computers to be 'standalone. So teachers could still use the computer. However, they could not access to the SSMS where teachers' folders and materials were kept. This had discouraged teachers from using ICT.

The SSMS had caused a lot of headaches and dissatisfaction among the teachers. The Smart School Team also highlighted this problem when they visited the: schools in January 2003. The SMMS was identified as a crucial component that had to be set up correctly before the program can be expanded to other schools (MoE 2003). Teachers in Smart School had not only to teach using ICT but they also had to learn

the system. Besides learning to use the hardware and software, teachers had to learn how to operate the SSMS. Teachers in these schools had to learn two things, one, to integrate ICT in their teaching, second, to use the electronic management system, the SSMS. The management system is where the teachers had to write their weekly lesson plan, key-in students profiles, and set timetables. If a server breaks down, the teachers could not get access to the SSMS. Thus, lessons prepared and saved in the teachers' folder found in SSMS could not be retrieved. Teachers felt frustrated over this problem.

If a teacher had planned to use the materials they had prepared earlier they had to get access to SSMS. A lesson plan had to be written using the SSMS. Registration of the students was also done using SSMS. These h_ead created problems to teachers in all schools. There were not many computers online with SSMS. In School B, there were three computers in the teachers' room. The teachers had to rush for these three machines. Even in School C, the teachers faced the same problem too. According to Mdm. Chandra,

*Umm, well err most of the time if... let say in term of hardware, err we just have to search for other computers. Some of us have even gone to the classroom to use the classroom's computer instead of the staff room computers. So we still can do that but then we have to err, err see to the ability of the computer* [Mdm. Chandra: 526 – 530]

Mdm. Camelia commented on the SSMS, "*It's a lousy system*" [437] and Mdm. Chandra put the blame on the system, " *Actually the problem of using SSMS*" [Mdm. Chandra: 686]. The SSMS had also caused problem to the teachers because it could not be accessed from home. Teachers had to prepare their lesson in school if they want to use the courseware. The courseware could only be viewed by using TLM. Therefore, if the server breaks down, teachers and students could not view the courseware and teachers could not prepare their lesson plan. This had caused teachers to feel frustrated and disappointed in using the computer.

## 5. Discussion

All the three schools are experiencing enormous pressure to adopt and promote technology innovations. They have not only learned to be familiarized to the ICT hardware and software but also the SSMS and TLM. Thus, this has caused strenuous pressure among teachers. They have to learn the computer skills, different pedagogical approaches and have to learn the system. The implementation of ICT integration in the school is very demanding on the teachers. However, this has not stopped some of the teachers to integrate ICT in their school.

Sathiamoorthy (2001) carried out a study on Smart School using the Hall's Concerns-Based Adoption Model (CBAM). The finding showed that teachers' ability in managing Computer and their Level of Use (LoU) in Smart School were low. He found that 64.3 percent of teachers were clustered in the "Mechanical" user, Level III. The "Mechanical" user generally reflects lack of effective management and anticipation in day-to-day needs. It could thus be concluded that teachers were aware of the technology but had not utilise ICT fully in the classroom. The study was carried out in the year 2000 when the project was only its second year of implementation, while Smith (2001) stresses that evidence of change could only be

seen in the third year of implementation. The current study found that teachers' ability in managing computer integration were high except only for School A.

Hall and Hord (1987) Level of Use (LoU) addresses behaviours related to how the individual uses the technology. In Smart School, the decision to use an innovation was decided by the Ministry. Thus, the teachers in Smart School were categorized at Level of Use II – Preparation, where the focus was on preparing for the first use of the innovation. Findings from classroom observations and interviews indicate that the teachers in School C have moved from LoU II to LoU IVA, where the use of innovation is stabilized. Teachers in school B have also moved from LoU II to LoU III. At this level, the teachers have put some effort to use ICT but still showed the inefficiency of using the technology. However, teachers in School A are at Level II – Preparation. They are still at the same level as when this program was introduced.

Techers' levels of use in these schools are found to be influenced by Rogers (1995) adoption categories. Based on Rogers (1995) Technology Adoption Life Cycle, it found that teachers in the three schools could be put into three categories, the early adopters, early majority and late majority. School C teachers showed they were among the early adopters. In their teaching record books it was found that they had all integrated ICT throughout their teaching. Interviews and observations data also revealed that they had integrated ICT in their teaching. Being early adopters, they were the first to adopt innovation. This might be because their school was new and equipped with ICT infrastructure with two computer labs as well as six computers in classroom.

School B teachers could be categorized as early majority who adopt the innovation after early adopters group. Their rate of integrating ICT in their teaching was slower than School C. The school ICT infrastructure was partly the reason for the slow integration. Insufficient hardware had caused teachers not to integrate ICT aggressively in their teaching.

Rogers stated that late majority are more sceptical and will only adopt the innovation after early majority. School A teachers could be categorized as late majority. Data gathered from School A revealed that teachers would like to the results of those schools that had high academic performance by using ICT. They also had suggested that they wanted to see how other teachers integrated ICT in classroom situation before they could do it in theirs.

The study has also discovered that the teachers in School C and School B integrate ICT in four levels of ICT integration approaches. The highest level is Level 4 where teacher integrates ICT by using the combination of ICT as hands-on activities, ICT as printed resources and verbal resources. While Level 3 sees teacher integrated ICT as hands-on activities. At this level, the students handle the computer individually or in pair and do the given task during the teaching and learning period. In Level 2, teachers integrated ICT as printed resources to enhance their teaching. The teacher distributed handouts to students as part of the group work exercise. The lowest level is Level 1 where teacher in this level integrated ICT as verbal resources. At this level the teacher gave the website address verbally and the name of related CR-ROM to students for further reading or information.

Teachers in School C are found to be in Level 4 and 3. While, some teachers in School B are in the Level 3, 2, and 1. None of the teachers in School B are in Level 4. School C teachers are found to be actively implementing ICT integration in their teaching unlike School B and School A. School C teachers are very committed to the technology. Their commitment is evident from the interviews, classroom observation and document reviews. They were very enthusiastic when they shared their experiences during the interviews. The differences in the level of integration might be because of the absence of certain conditions in schools.

## 6. Implication and Conclusion

From the data put forward from interviews, it has clearly shown that the teachers lacked knowledge on integrating ICT in classroom. Therefore, schools and Ministry of Education should improve their course outline in teaching teachers "when" and "how" to integrate ICT. The course should be more focused on how ICT is used as a tool that assists and motivates teachers and students in teaching and learning. Teachers' experiences also revealed that when attending the course, they had to learn software, which was not found in the school setting. Teachers should be exposed to whatever hardware and software found in the school so that they could be applied in their teaching.

There are many articles in the net and journals written on how teachers can integrate ICT with one computer in the classroom. There are also suggestions and online forum for teachers that enable them to integrate ICT in their teaching. Some teachers in this study were not aware or inform ed of it. Knowledge on "when" and "how" to integrate ICT in the curriculum need to highlighted in the teachers' training course outline.The teachers in this study preferred first hand information. They wanted to see more examples on how the technology is used not just in theory. These teachers practicing consequently, they need real life examples. It is recommended that experienced teachers should conduct ICT integration courses. This move would enhance teachers' confidence, motivation and commitment.

Implementation of any innovation needs to be introduced one at a time. For example, in getting the teachers to integrate ICT in their lessons, they must be confident and comfortable with the technology first. The SSMS should come later. The teacher should also be given a choice of using the courseware bought by the schools.

The present society is increasingly dependent on electronic information and communications. Large quantities of information are available and transaction can take place remotely. The ICT has become part of the society for communication between people, searching for entertainment and education, virtual meeting place, shopping and many more. Thus education plays a very important role to provide the platform and strong foundation to people. This study contribute to the implication for theory and practice of practitioners who want to implement ICT integration especially in Malaysian Smart School. The findings might also be useful for other school who plan to implement ICT integration in classroom.

## 7. References

Anderson, M.S. (1995). Technology changes curriculum: or does it? Retrieved on August 1, 2005, from http://curry.edschool.virginia.edu/aace/dowload/site/html1995/2011.htm

Bielefeldt, T. (2001). Technology in teacher education. *Journal of Computing in Teacher Education*, 17(4), pp. 4-15.

Becker, H.J. (2000). Findings from the teaching, learning, and computing survey: is Larry Cuban right? Education Policy Analysis Archieves 8(51). Retrived on July 26, 2004, from http://epaa.asu.edu/epaa/v8n51

Combs, K.A. (2000). Factors influencing the implementation of technology in a Magnet High School. Unpublished PhD Dissertation, Baylor University, Texas (UMI Number 9961474)

Creswell, J.W. (2002). *Education research: Planning, conducting, and evaluating quantitative and qualitative research.* Upper Saddle River, New Jersey: Pearson Education

Economic Planning Unit (2001). *Eight Malaysian plan 2001-2005*. Kuala Lumpur: Percetakan Nasional Malaysia Berhad

Ely, Donald P. (1999) Conditions that facilitate the implementation of education technology innovations. *Educational Technology*, 38(6), 23-26.

Forcheri, Molfino & Quarati (2000). ICT driven individual learning: new opportunities and perspectives. Educational Technology & Society 3(1) 2000 ISSM 1436-4522 Retrieved January 2004 from http://ifets.ieee.org/periodical/vol_1_2000/forcheri.html

Fullan, Michael (2001) *The new meaning of educational change.* (Ed. Ketiga). New York: Teachers College Press.

Gomez, G. (2002). Is technology working in the classroom? Sunday STAR, June 30, 2002, pp. 2-3.

Hall, G.E., Hord, S.M., Rutherford, W.L., Huling-Austin, L. (1987). *Taking charge of change.* Texas: ASCD.

Lebrun, M. (2000). Does information and communication technology require a specific pedagogical approach? Retrieved December 18, 2005 from http:/www.ipm.ucl.ac.be/marcel/art4. English.html

Juliussen, Egil (2001). Internet users will surpass 1 billion in 2005: wireless Internet users reach 62% in 2005, eTForecasts. Retrieved February 11, 2005 from http://www.etforecasts.com

Malaysian Government (2001). Malaysian taxletter. Retrieved on November 30, 2001 from http://www.epu.jpm.my/RM8/front-RM8.html

Merriam, S.B. (1998). *Qualitative research design: an interactive approach*. UK: Sage Publication, Inc.

Ministry of Education Malaysia. (2000). *Report: Collaborative monitoring of the implementation of smart school pilot project year 2000*. School Division, Ministry of Education Malaysia.

Ministry of Education Malaysia. (1998). *Sekolah Bestari policy paper*, Unpublished, Curriculum Development Center, Malaysia.

Ministry of Education Malaysia. (1997) *Smart school flagship application: The Malaysian smart school a conceptual blueprint*. Kuala Lumpur: Ministry of Education.

Ministry of Education Malaysia. (2001). *Education development 2001-2010*. Kuala Lumpur: Ministry of Education

Minister of Education, Malaysia. (2006). A speech at monthly assembly of Ministry of Education Malaysia, 2 April 2006, Putrajaya

Patton, M.Q. (1990). *How to use qualitative methods in evaluation*. USA: Sage Publication, Inc.

Rogers, E.M. (1995). *Diffusion of innovasion* (4th Ed). New York: The Free Press.

Sathiamoorthy Kannan (2001). Intergration of computer into teaching-learning: A study of concerns and the managing ability among smart school teachers. Proceeding *International Conference on Technology and Vocational-Technical Education: Globalization and Future Trend*, 12-13 November, vol. 1 & II, Universiti Kebangsaan Malaysia, Malaysia.

Simonson, M.R., & Thompson, A (1997). Educational computing foundations. New Jersey: Prentice-Hall Inc

Smith, G. (1998). *Lesson in school and classroom change*. Unpublished River Oaks Public School, Canada.

Taylor, G. (2000). Does ICT really improve learning? *Education Today Journal of The College of Teachers*. 50 (4)

Yin, Robert K. (1989). *Case study research: design and methods*. USA: Sage Publication, Inc.

**New Achievements in Technology Education and Development**

Edited by Safeeullah Soomro

Since many decades Education Science and Technology has an achieved tremendous recognition and has been applied to variety of disciplines, mainly Curriculum development, methodology to develop e-learning systems and education management. Many efforts have been taken to improve knowledge of students, researchers, educationists in the field of computer science and engineering. Still many problems to increase their knowledge on daily basis so this book provides newly innovations and ideas in the field of computer science and engineering to face the new challenges of current and future centuries. Basically this book open platform for creative discussion for future and current technologies to adapt new challenges in education sector at different levels which are essential to understand for the students, researchers, academic personals and industry related people to enhance their capabilities to capture new ideas and provides valuable contribution to an international community.

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