

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter contains a review of relevant literature related to the need for ICT literacy in secondary schools. Studies cited were related to (a) the development of computer in education, (b) the role of ICT in education, (c) the benefits of ICT in education, and (d) other related studies.

2.2 Development of Computer in Education

The introduction of computer education in Malaysian schools can be traced approximately fifteen years ago with the formation of computer clubs in schools. Even though it did not receive an official support from the Ministry of Education but its tremendous positive impact on education was felt by educators, students and educational authorities.

According to Zoraini Wati (1991) an authority in computer related education, there were about 800 schools with computer clubs in early 1990. In

order to meet demand as well as to provide computer education, the Ministry of Education (MOE) in April 1986 formally introduced the Computer Literacy Pilot Project (CLPP). A total of twenty schools received computers and application software. This project was later halted by lack of fund and other reasons.

Chong (1999) highlighted that the MOE started the Computer in Education (CIE) policy together with the Malaysian Institute of Microeletronic System (MIMOS) in January 1989. Among others, the policy recommended the development of a national policy for Computer in Education (CIE), formulate an integrated computerization plan, set up a National Education CIE network and to establish a National Database.

Zoraini Wati (1995) also noted that MOE had implemented the CIE project in 60 rural secondary schools in 1992. The main purpose of this project was to expose Form One and Form Two students to Information Technology. A total of RM4.8 million was channeled to provide computers with software application, trained teachers apart from the formulation of computer literacy syllabus. This project was discontinued due to lack of infrastructure in many rural areas.

In view of the importance of ICT literacy among students, Siti Hawa (1998) highlighted that the MOE introduced two internet related projects. The Pusat Sumber Ilmu project was aimed at providing student with information through the use of internet and CD-ROM. While the Electronic Resource Centre or *Rangkaian Munsyi* was created to increase the rapid ability of data management and storage, faster retrieval process, and dissemination of information. With this project, many schools can share Information using the Local Area Network, Wide Area Network and Internet.

Currently, MOE has introduced computing in form six as a pilot project involving 14 schools and plans are also underway to introduce ICT as a choice subject in form 4 and form 5. (Chok, S.C. 1998). Beginning 2002, ICT will become an optional subject for Sijil Pelajaran Malaysia (SPM) examination. (Kurikulum Bersepadu Sekolah Menengah, 1998)

Tengku Md. Azzman (1989) stated that the education system needs to adapt itself to the changing environment. He sees the need for education system to improve the quality and productivity of teaching and learning by making use of modern technology. This may be achieved by training people with suitable skills

that is required by the job market which is moving towards information technology. He further reiterated that the handling of vast collection of information and knowledge by computers would set new modes of intellectual discourse. (Yong, 1994)

2.3 Role of ICT in Education

ICT had a tremendous impact on many education institutions in United Kingdom. ICT has been increasingly acquired for administration, instruction and research purposes in these institutions. Akumanyi in his article stated that

It is becoming increasingly clear that, as this millennium progresses, teachers and pupils will rely on a combination of books, the Internet and a range of ICT products.

He illustrates further by observing how a London primary school uses an array of electronic teaching aids like Electronic Whiteboard (EWB) and personal computers linked to the internet and the school's computer network. James Allen's Preparatory School's headmaster Piers Hayworth said the initiative is "a boost to the government's policy of equipping all British schools to ensure that children acquire ICT skills for tomorrow's job market". (Akumanyi, 2000)

Interestingly, Intel has started "Teach-to-the Future" programme with the collaboration of the MOE. This programme aims to go "beyond infrastructure and basic skills to help teachers learn how to fully exploit technology resources to achieve measurable advances in education". The "Teach-to-the Future" programme was to be implemented for 292 teachers and 108 teacher training college lecturers nationwide. It includes training that incorporates the Internet, web page design and multimedia software into current lesson plans in line with national standards. Mohd Azam Ahmad who took part in the programme noted that "an ordinary class can become more interesting when the teacher uses animation and music". He had been using "new skills such as Powerpoint to prepare lessons and to link with relevant websites on the Internet". He also feels students may improve their command of English as many relevant websites were in English. He further reiterated that students can learn skills like writing and basic computing when they search for information to write their essays through the Internet. (Hanizah, 2000)

Yourucova (1999) in her article "Computers are Language Teachers of the 21st century" acknowledged that there is a need for the acquisition of both foreign language skills and ICT to operate in the 21st century. ICT can be most effective when teachers incorporate it with their existing teaching approach by carefully matching it to the learner's needs.

“ The use of ICT in the language classroom enables teachers to reduce their activity in certain areas of the teaching and learning process and to increase it in others such as time spent with individual learners”.

Additionally the use of ICT in the Foreign Language Classroom can bring foreign people and their culture into the classroom, “virtually”. Clifford, 1992; Clifford and Miles 1993, 1994, Cox 1997, (as cited in Yourucova 1999) agreed that “children taught with ICT showed a raised level of attainment and skills, and improvement in self-esteem and confidence”.

Byron and Gagliardi (1998) presented an important research on the state and potential of ICT in education and developing countries into the formal and non-formal education sectors. In paper entitled *Communities and the Information Society: The role of Information and Communication Technology in Education*, they noted that ICT’s use in “ both formal and non-formal education has performed implications for the traditional role of the teacher and the states of the student”. ICT is regarded as a potential tool to enhance the teaching-learning experience through various ways. For example, simulations that allow students to experiment with virtual situations which may be impossible to represent in real life within the school environment. They also use creative designs and productions using various media in one product. Students are given the opportunity to develop questioning and research skills, a tool to link with other individuals and communities which in turn “ expose students to many new socio-

cultural perspective", and "as a support mode" that help raise students self-esteem and confidence. (<http://www.idrc.ca/acacia/studies/ir-uses4.htm>)

Byron and Garliardi (1998) also pointed out that ICT hold a great potential for improving access to education by way of "increasing the chances of equal educational opportunities among populations". They found out that through technology, distance learning, home schooling, and informal and lifelong learning can be achieved. Thus, "reducing the dependence on traditional formal structure of schooling and permitting the development of more community – based learning facilities". Also, the use of electronics networking is regarded important to foster "more democratic educational processes".

(<http://www.idrc.ca/acacia/studies/ir-uses4.htm>)

Ward (1999) conducted a case study on the use of ICT at a secondary school in England. He identified three factors that have contributed to the growth of ICT in secondary schools:

1. *Technological advances that have affected the delivery and potential of networked computer system.*
2. *The hope that ICT may become a panacea for a number of operational and practical ills.*

3. The implementation of plans for the National Grid For Learning (NGFL).

The study was conducted in Sir Thomas Boughey High School which is situated in a rural setting. The students there comprise of 11 and 16 years old girls and boys. The school has installed a single integrated curriculum network controlled by a Windows NT based server. This facilitates access to the Internet, maintain the school's own website and e-mail facilities. There is approximately 1 computer to every 8 pupils in this school. (Ward, 1999)

Students at lower secondary level in this school are taught IT as a core subject. Topics covered include Word Processing, Desk Top Publishing, Internet, Graphics, Spreadsheets and Database. At upper secondary, every student is required to take GSCE in IT. Students were also given the opportunity to either choose a short or long course in IT according to their capabilities. (Ward, 1999)

Sir Thomas Boughey became one of the first schools in United Kingdom to give the "Internet curriculum legitimacy by making it an exam subject". Students were allowed to take the brand new RSA Internet Technology (Stage 1) certificate. The exam modules include producing websites, browsing websites and using electronic mail. (Ward, 1999)

The school decided to teach the subject as an extra-curricular lesson comprising 14 one hour per week sessions as the demand for the course increased dramatically. The subject was very popular and in a matter of weeks it became “not only an enjoyable pastime but also an academic discipline”. (Ward, 1999)

According to Ofsted inspection many students became “competent and confident users of IT application utilising advanced features to good effect”. The school's Intranet enabled teachers and students to become effective users of ICT. Teachers create their own websites in the Intranet and use these sites to create homework tasks, advice and add related information needed by the students. The researcher concludes that “ICT empowers its users by involving them”. It is also evident that ICT is essential in producing students with “mature and learned stance” (Ward, 1999)

2.4 Benefits of ICT in Education

Much is being done to promote the ICT awareness in schools. Davis (1998) describes the possibilities of “pupils gaining access to the school computer-based resources directly from their home PC”. This means pupils can obtain a variety of information like school events dates, schools basic information and sports results. Even homework assignment can be sent via email to

teachers. Parents will also have the opportunity to consult the teachers through emails to check their children's progress.

The present emphasis on knowledge needs to be changed, Davis (1998) believe that sharing of the same knowledge base will only create students with the same "Standpoint". As such interpretation skills, research, study and access skills need to be taught. Children need to examine information, analyse research findings critically and thoughtfully. "They must not blindly accept everything they find but cross check it, question the source.... present objective summary...spot subjectivity and bias in the work of others...".

Children should be able to make informed decisions and this can be achieved if they "develop thinking and problem solving abilities...to tackle difficulties logically, sensibly and without panic". Davis (1998) also encourages children to be active in creative arts. Creativity, innovation and appreciation of the aesthetic side of life is essential. In this way the "thinkers of tomorrow" will not be dominated by the "efficient" and "utilitarian" values. He concludes that without good understanding of ICT's core concepts and basic techniques, the "citizen of tomorrow could become the slaves of new technologies rather than the masters of them".

Baten (1995a) shares similar view with Davis in recognising that computer-mediated communications as a new "paradigms" in education. Computer-mediated communication (CMC) involves three elements, the technology that includes networking and services, access and teaching functions. *Networking* is important as it incorporates desk-top computers with the telephone network. Next, *services* which constitutes electronic mails, bulletin boards, computer conferencing, databases and off-line editing. *Access* is also vital to ensure data and voice is transmitted through telephone lines which in then converted to digital signals using modems. CMC can also act as the primary teaching medium. One aspect of this is the computer conferencing.

Baten identified a number of education benefits of computer conferencing.

- i) Computer conferencing can be used to develop academic discourse. Students learn skills in analysis, constructing, defending, assembling, evidence, critiquing an argument.
- ii) It facilitates group based project work where students work together on a project contributing information collectively. In this way knowledge building is developed through idea generation, idea linking and idea structuring.
- iii) Computer conferencing allows participants to be judged solely on the value of their contribution and not by other issues like gender, race, physical appearance, status or experience.

- iv) It also allows cross-cultural participants where students are made more aware of other cultures and perspectives while eliminating any form of stereotype. The development of reflective writing skills is further enhanced through interaction and written exchanges with many different people.
- v) Bates also notes that computer conferencing enables "discussion and informal communication between learners and teachers". The open-ended and social form of learning facilitates students to choose, interpret and negotiate certain subject areas. It allows integration of subjective knowledge such as intuition approach to learning". (Baten, 1995a)

In the context of education and training in the twenty-first century Baten reiterated that developed countries like Canada, USA, Britain, Australian and Sweden have placed more emphasis on the use of technology for education and training as means for continued economic development. (Baten, 1995a)

Labour market in developed and developing countries are showing a changing trend from resource-based to knowledge-based employment. This means a school leaver today will need to be "re-trained at least five times in their working life". Thus, there is a need to develop a set of curriculum model which reflects and "exploits the potential of new technologies". Among the technologies highlighted are work-station linked by telecommunication, classrooms linked by telecommunications technology, interactive information banks, and work-station

with stand-alone or down-loaded instructional software or Artificial Intelligence-enhanced or linked to remote databases. (Baten, 1995b)

Instructional multimedia is an application that can be designed to target "specific learning objective". It combines interactivity with realistic audio and video. Among the benefits of instructional multimedia are increased effectiveness on learners, self-confidence or a positive student perception, reduced training time, decreased cost, active learning through physical and cognitive involvement, multi-sensory and multilingual delivery, encourage students to explore different perspectives which in turn "help students develop rich mental models", and lastly inspire or motivate students by making learning interactive and relevant. (Barron & Orwig, 1995)

Barron and Orwig (1995) further added a few more attributes of technology in education. These include increased self-expression, critical thinking, cooperative learning, enhanced communication skills, multicultural education and self-paced learning that allows students to progress appropriately.

Sage (2000) studied how problem-based learning (PBL) helps in the investigation and resolution of complicated problems. PBL incorporates various technologies to assist in locating, organizing and presenting information. Students are required to present factual information about an issue or problem.

Information regarding a subject is collected using various technological means. It includes using the internet to contact experts and create websites and use "Inspirations" software to organize their current understanding of the problem. Next, they use specialized software such as RAMAS Eco Lab to create a model.

Students are also encouraged to contact and work with other students, as well as with related experts using the e-mail. Word processor and Spreadsheets help in writing report and calculations while Powerpoint or HyperStudio softwares helps in the organization and presentation of data. PBL help students become critical thinkers, problems solvers, collaborate with colleagues, and technology literate students" (Sage, 2000).

Moursund (1999a) presents several ideas of Information Technology (IT) used in education. IT has played an important role in the development of Global Digital Library and other huge data-bases as well as in communication among people. Problem-solving capabilities using IT has proved to be more effective. IT is also seen as an integral part of content of non-IT disciplines. IT has also introduced new of communication using text, graphics, sound, color and video as well as desktop publishing and presentation, email, video conferencing, and interactive hypermedia. Distance learning, computer-assisted learning, intelligent computer-assisted instruction, and learners-centered software are some of the new dimension in learning brought by IT.

There have been many arguments whether IT has produced significant improvement in education. Moursund (1999b) believes IT has facilitated students through the use of tools like word processors, spreadsheets, graphics, hypermedia, and the internet. The success of distance learning in giving opportunity for many students to learn and the use of computer-assisted learning has helped "student learn faster and better as compared with traditional education". Finally, integration of IT tools with curriculum, instruction, and assessments are showing positive results.

2.5 Other Related Studies

In 1984, California State Department of Education conducted a study on the knowledge, attitudes, and experiences of California's sixth and twelfth grades in the area of computer technology. A survey questionnaire was developed to assess the instructional objectives in the area of computer studies, attitudes towards computer technology and relevant experiences with computers. A stratified random sample of participants from 98 schools, with an estimated 23,395 twelfth grades students and 293,717 sixth grades was drawn to respond to a written questionnaire.

The major findings of this study were as follows:

- i) Seventy-nine percent of twelfth graders strongly agree that computers will someday control many processes, while only sixty-six percent of sixth graders gave similar response.
- ii) Both twelfth and six graders saw a larger role for computers in the future and believed that knowledge of computers will help them get better jobs. They also agreed that computers can help make mathematics more interesting.
- iii) Many twelfth graders considered video games to be the first introduction to computer technology. The study also revealed that video games were more popular among sixth grades than twelfth grades. Also, sixth graders were reported learning about computers most frequently by playing video games.
- iv) Fifty three percent of twelfth graders reported having little microcomputer learning in school compared to thirty two percent sixth graders.
- v) The research also indicated 'sources' students learned about computers. It includes knowledge gained in school during the day, video games at home, at friend's homes, in computer stores, summer programs, at school in the evening, and at museums.

The research concludes that a "majority of students have had programming experiences by the twelfth grade". Programming experiences is closely linked with high test scores among students.

The United Kingdom *Standards Site* indicated that by the end of Key Stage Three, students should be able to master skills like

- i) combining information from a variety of ICT and other sources for presentation to different audience
- ii) identify advantages and innovation of ICT
- iii) select, use and refine information to suit the system
- iv) design ICT models and procedures with variables
- v) consider the result they produce and evaluate it critically
- vi) take part in discussion about ICT and its impact on society.

(<http://www.standards.dfes.gov.uk/schemes>)

The International Society for Technology in Education (ISTE) have emphasized on the need for student to master the "standard" in order to achieve success in learning, communicating, and life skills. Among them are technology as productivity tools, communications tools, research tools, and problem-solving and decision making tools. These standard are also closely associated with the

need for students to acquire basic operations and concepts as well as recognize the social, ethical and human issues. (Bitter & Pierson, 1999)

Mayer, Schustack and Blanton presented an article on the cognitive consequences of learning educational technologies in an informal setting. The study was carried out at three after-school computer clubs to find out what children learn from using education technology. Results from the study showed four kinds of cognitive changes in students.

- i) Significant increases in computer literacy knowledge, as students were able to recognise computer terms and operations.
- ii) Increased comprehension skills in word problems, procedures and game directions.
- iii) Improved game-playing skills where students strategies math game and language arts game.
- iv) Academic skills can be traced in the improved reading and mathematics achievement. (Mayer, 1999)

Downes (1995) investigated children's access to electronic media in the home and their perception of information and entertainment both inside and outside school in Australia. He pointed out that students' computer experiences at home were shaped the view of computer use in school. He also noted that more

electronic information and communication technologies were found in homes today than before in contrast to classroom that still rely on print technology for learning.

A total of 460 primary students were involved in the study. Less than 5 percent of students responded that they used technologies for purposes other than entertainment. Nearly 50 percent of the students used computers to play video games as compared to only 10 percent of students that claimed to use their computers for purposes other than that of games. (Downes, 1995)