CHAPTER 2

LITERATURE REVIEW

2.1 Definition of Computer Literacy before the Nineties

The term computer literacy has been in use since the introduction of computers into school activities. Many attempts to clarify the meaning of computer literacy have not gained worldwide acceptance (Robin, 1990). In the early stage of computers in the 1970s, computer literacy was meant to be some understanding of hardware and software development. A user must know internal and external parts of a computer, i.e., central processing unit, keyboard, motherboard, monitor, joystick, floppy drive, hard disk, printer, etc. A user must also be good in one or more programming languages. Leuhrman (1982) suggested in his articlethat "computer literacy must mean the ability to do computing", which requires hands-on experience and personal experience. Programming became the key word for computer literacy. Thus, a person was said to be computer literate if he was knowledgeable about hardware and software. (Higdon, 1995. p.1).

In the mid-eighties, there was a movement away from emphasing on hardware knowledge and programming towards the use of or familiarity with computers (Rowe, 1993). Computer educationists defined the term with some variation. McWilliam (as cited in Curtis, Gardner, and Litzenberg, 1986) defined computer literacy as familiarity with computers, that is, a sense of ease around computers and the knowledge that personal computers are powerful tools. Scher (1984) also viewed computer literacy as familiarity with a device that enhances one's ability to live in and cope with the modern world, the ability to manipulate computer technology. The idea was supported by Schlobin (as cited

in Curtis at al., 1986). He felt that computer programming was not a top priority of computer literacy.

The third definition of computer literacy is an expansion of the second definition. Some educationists have expanded the second definition to include both a level of understanding about computers, as well as skills in their use. (Geisert & Futrell, 1990 ; Papert, 1993). According to Luehermann, computer literacy means understanding what a computer is and what makes it do what it does... One must be able to communicate with it. (Luehermann, 1982). According to Hunter (1983), computer literacy is the skill and knowledge needed by all citizens to survive and thrive in a society that is dependent on technology of handling information and solving complex problem. This comprehensive approach is more clearly defined by Anderson, Klassen, and Johnson (1981). They suggested that computer literacy should mean " an understanding of computers that enables one to evaluate computer applications as well as to do things with them " (p. 687). They stressed that "computer literacy should be thought of as the knowledge and skills an average citizen needs to know or do about computers" (p.688). They believed that computer literacy should include the following: (i) hardware; (2) programming and algorithms; (3) software and data processing; (4) applications; (5) impact; and (6) attitudes and motivation.

The definition given by Anderson, Klassen and Johnson (1981) was supported by Gawronski (1981) and Watt (1982). Watt's concept of computer literacy went beyond its common definition as a body of information primarily about computers, how they work, how they are used, and their impact on society. Rather, he defined computer literacy as: " a cultural phenomena which includes the full range of skills, knowledge, understanding,

values and relationships necessary to function effectively and comfortably as a citizen of a computer-based society " (p.37).

2.2 New Definition of Computer Literacy

The definitions above have not gained universal recognition. In the late eighties, word-processing , spread-sheet, and database programs were introduced to the curriculum and hardware construction knowledge was deemphasised (Office of Technology Assessment [OTA], 1988).

In early nineties, educationists started to redefine the term. Duckette (1993) refined Moursund's definition of computer literacy as :

In global terms, to be computer literate a person should have comprehensive skills, knowledge and understanding of computers and their use as they relate to technical, ethical, social and educational issues of the day, as deemed appropriate to the skills, knowledge and understanding required (p.134).

Later, Duckette (1994) carried out an investigation of various aspects of computer literacy from responses of computer educators from over 12 countries. He concludes that there is a need to redefine the term computer literacy from its original programming basis to a more user-defined basis. He points out from the results of his study that computer literacy must now be defined in terms of competencies, i.e., how the individual uses the computer.

Higdon (1995) also holds the same view as Duckke to stress for a new definition of computer literacy to incorporate society's changing expectation of computer literate. She pointed out that by the nineties, when hypermedia languages for education such as Hypercard, Linkway, Toolbook, and Authorware were introduced into the market, many pre-service teachers could learn to develop courseware for educational purposes. These authoring programs were being espoused and taught in college courses. Thus, programming languages such as BASIC, FORTRAN, or C+ to develop software were slowly replaced. The new authoring systems lent itself to "hypermove" or jump from one area of the program to another and back. It was no more restricted to linear progression.

Another evolutionary change in computer literacy is the shift from stand -alone computing to networked communications. The Information Super Highway lends itself to enormous resources to be explored. Technology educationists ushered in the use of telecommunications in pre-service education (Kearley and Lynch, 1992). What we need is a computer, a modem, and a telephone line to connect to the world to obtain the vast resources of information and to communicate with others all over the world. Schrum (1989) suggested that pre-service teachers could acquire skills with the use of e-mail and on-line databases via Internet. As a result of this new field, many new terms and skills arose among Net users. They learnt how to "surf the Internet", i.e., networking with other professionals, telneting, file-transfer-protocol, downloading, uploading and gophering.

With the advancement of computer technology, the presentation of a program is no more limited to a simple static diagram or graphics. A CD-ROM will contain large and sophisticated programs, which make use of interactive video, digital sound, text, and

pictures. A computer equipped with such capabilities is termed a multimedia computer. Today, pre-service teachers are receiving training for courseware writing using multimedia authoring tools such as Hypercard, Linkway, Authorware (Vess & Aleander, 1993) and in Malaysia, ComIL (Hashim, 1996a).

2.3 Computer Literacy in Malaysian Context

Educationists in Malaysia have suggested new meaning to the condition of computer literacy in our educational system. Mohamed Khalid and Wan Mohm. Salleh (1986) suggested that computer literacy in the Malaysian context required a person to know less about the technical aspects of computers, but more about how to use it effectively. They stressed that priority should be given to application of software package such as word-processing, spreadsheet, etc. However, they did not deny that some programming skills should be taught in schools because it helps the development of problem solving skill and logical thinking.

The definition adopted by Mohamed Khalid and Wan Mohd. Salleh (1986) concurs with Watt and Duckette's definitions above. It implies that Internet and multimedia should be treated as parts of computer literacy.

2.4 Development of Computer Literacy in Malaysia

The Ministry of Education has played an important role in promoting computer literacy in schools and teacher-training colleges. It has introduced a number of computer projects in schools and teacher-training colleges during the last two decades. The

government is also playing its important role in promoting computer projects in schools and private sectors in order to bring Malaysia into the information technology era.

2.4.1 Computer Projects in Schools

Computer activities in schools are either established by school computer clubs with the assistance of private computer companies or government educational authorities. By 1989, it was estimated that there were about 900 schools with computer clubs in the country, according to a survey conducted by the Ministry of Education. During the period of 1981 to 1986, computer education was largely promoted through computer club activities which have become part of the school co-curriculum activities ("Panduan Penubuhan", 1986).

School clubs were mainly funded by various sources like the Parent-Teacher Associations (PTA), Alumina Associations , School Boards, and through private donations.

Computer activities were also aided by a professional body, the national management committee of the Malaysian Council for Computer-in-Education (MCCE). MCCE comprised educators from both the government sector and non-government professional bodies. MCCE is responsible for organising EDUCOMP (National Educational Computing) symposiums once every two years to help teachers and educators to know more about the latest computer technological developments in the fields of education. It also organises seminars, workshops for teachers, Computer Software Writing

Another project called the Computer-Assisted Instruction/Learning (CAI/L) was introduced in early 1994 by the Ministry of Education. All 15 schools under this program were selected within the rural areas in the state of Selangor. The main aim was to use CAI to improve the standard of Mathematics and English Language in rural schools. It was reported that the preliminary evaluations of the CAI/L project showed that the students scored better in their achievement tests after using the course (Zoraini 1994).

Two Internet related projects were announced by the Education Ministry in 1996 which are currently underway. One is called *Pusat Sumber Ilmu (*PSI*)* project carried out in 14 schools, the other pilot project was *Munshi program (Rangkaian munshi),* a computer network project that binds schools together. (Zoraini, 1997a). The PSI project involves 14 selected schools, one from each state in Malaysia and they have been provided with 14 sets of computers with Internet connection. The objective of this pilot project is to get feedback on how students receive information from the Internet and how teachers manage the Internet programs. ("Dasar komputer kementerian", 1996).

2.4.2 Computer Projects for Pre-service Teachers

In 1992, the Teacher Education Division (TED) of the Ministry of Education introduced computer literacy as a compulsory subject within the curriculum for all new teacher trainees ("Three hundred trained," 1992). According to Zalina Yahaya's (1997) report, the subject was modified in 1993 and named Information Technology (IT). The curriculum included computer literacy, application of software in teaching-learning situation, networking system (LAN/.WAN), Internet and introduction to multimedia. This subject was also offered to course participants of the 14-week in-service program (KDP) as Computer In Education since 1995. In early 1996, TED introduced IT as a subject of

also proposed to introduce computer as a subject for upper secondary pupils with the possibility of it being made an examination subject under the Penilaian Menegah Rendah (PMR) [Lower Secondary Evaluation] and Sijil Pelajaran Malaysia (SPM) [Malaysia Certificate of Educatio] examinations. For the primary school children, it was proposed that computer assisted learning (CAL) be introduced to aid in the learning of Bahasa Malaysia, English, Mathematics and several other subjects (Ang, 1996). Under the plan, a computer laboratory with 40 to 45 personal computers was to set up for every 750 pupils in a school. Thus for a school of 1,500 pupils, a total of two laboratories would be set up with 90 computers. ("Dasar komputer kementerian", 1996).

2.4.4 MSC Project

The idea of Multimedia Super Corridor (MSC) originated from MIMOS. The plan was submitted to the Prime Minister, Dr. Mahathir Mohamad in 1994. As a result, it became one of the impor tant projects to bring Malaysia into the telecommunication and information technology era in the Seventh Malaysia Plan. (Hu, Liu, and Chen, 1997). A body called Information Technology Security Council was established to deal with and implement the concept of MSC. On January 16, 1997, The International Advisory Panel (IAP) chaired by the Prime Minister Dr. Mahathir Mohamad met for the first time in Stanford University in California to discuss MSC with international companies. Among the 30 well-known IT figures in IAP were: Microsoft Corp's chairman and chief executive officer Bill Gates and Netscape Communications Corp's president, CEO James Barksdale and others. According to Utusan Melayu Report ("MSC: 30 tokoh IT", 1997) , and MIMOS on-line news ("Malaysia's multimedia super corridor ", 1997), MSC covers an

word processing, spreadsheets, databases, graphics, integrated packages, but also multimedia programs and Internet usage.

Early stage of computer literacy level includes programming, especially BASIC (Beginner All-purpose Symbolic International Code). For example, the Minnesota Computer Literacy and Awareness Assessment (MCLAA) covers the following areas of evaluation in affective and cognitive domains of computer literacy:

For affective domain: 1) enjoyment, 2) anxiety, 3) efficacy, 4) educational computer support.

For cognitive domain: 1) hardware, 2) software and data processing, 3) application, 4) impact, 5) programming and algorithm.

2.6 Computer Literacy Research

There are very few researches done on computer literacy measurement in Malaysia. The earliest study was undertaken by the research team of RECSAM (Regional Educational Centre for Science and Mathematics) which conducted a couple of computer literacy survey on one rural school and one teacher training college in 1986. From the survey results, they found that there were significant differences between computer club members and non- members on all four attitudinal subscales and five cognitive subscales as measured by MCLAA. On the other hand, there was no conclusive evidence to show that boys in the club were higher in score than girls (RECSAM, 1986).

17 year olds while the lowest 37.2 was from 13 year olds. More than 61% of the computer users in this age group have used word processors for assignment purposes.

2.7 Gender Differences

Researchers differ in findings with regard to gender differences in schools' academic performance as well as computer uses. Many educators have found that there are significant gender differences in performance in Mathematics and computers. For examples, Fennema and Carpenter (1981) and NAEP (1983) found that as children continue their schooling, gender-related Mathematics achievement difference occur more favorably for males in higher grades. Gender difference towards computer usage may follow a similar pattern, as generally boys' attitude towards computers are more positive (Nickell, 1987) or more confident (Zoraini, 1995a) . Hativa and Shorer (1989), in a study of the effects of different variables on CBI Arithmatics achievement of junior high school students (N=211), reported that males had higher performance and larger learning gain than females. Shashaani (1995) did a study to examine the extent to which experience with and attitudes towards Mathematics differ for males and females. She found that those students who had more confidence in their ability in Mathematics were more interested in using computers and felt more confident in working with these machines. The results were consistent with the findings of several researchers. For example, Gressard and Loyd (1987) found a significant correlation between math anxiety and computer confidence. Swadener and Hannafin (1987) reported that higher achievement in Mathematics is associated with more math confidence and positive attitudes toward computers. Dambrot, Watkins-Malek, Silling, Marshall, and Garver (1985) found in

their survey of 599 females and 342 male college freshmen that students' computer aptitude was strongly correlated with math ability and math experience, and computer attitude was related to levels of math anxiety and amount of computer experience.

However, other educators hold a different view on gender difference in computer performance. For example, in her study on Teacher Education Students' Attitudes toward Equity Issues in Technology, Padron (1993) found that teacher education students did not view gender or ability level as an issue in terms of students being able to learn and enjoy computer applications. The study of Shwu-yong, Waxman, and Padron (1995) on teacher education students' attitudes toward educational computing not only support her findings, but also reveal that students of greater academic achievement perceived fewer gender-related differences in computer use than their counterparts, although female teacher education students felt less comfortable with computers than male students. Swadenber and Jarrett (1986) are convinced that the inequalities are not due to innate gender differences, but rather come about as a result of a combination of experience and dispositions. Levin and Gorden (1989) challenged findings about girls and computer use stating that they failed to take into account prior exposure to computers. Their claim was that prior exposure had a stronger effect than sex on attitudes toward computers. Girls whose families owned computers were just as motivated as boys to become familiar with computers and felt a stronger need for computers in their lives, in contrast to girls who did not have access to computers in their homes.

In short, there are still two contrasting views on gender differences in computer skills. One group believed that boys generally performce better than girls in computer skills by nature, whereas the other maintains that the differences can be attributed to the

prior experiences with computers rather than sex. However, there is still no conclusive evidence to prove or dispute the gender differences in the use of computers.

2.8 Social Economical Status

The relationship between SES and academic achievement has been studied by several scholars overseas (e.g. Stevenson, Parker, Wilkinson, Hegion, and Fish, 1976; Iverson and Walberg, 1982; White, 1982; Dornbush, Ritter and Steinberg, 1991;) and in Malaysia (e.g. Ishak Haron, 1977; Adnan bin Kamis, 1980). It has been found that there exists a significant relationship between SES and school academic achievement. High SES associates closely with bettet home facilities. Several educators (e.g. Fraser, 1959; Douglass, 1964) have found that home facilities have effects on the children's learning outcomes. Children's explosure to computers is also related to the occupation of their parents. The survey data of Computer Use in the United States (1993) shows that the percentage use of computers by children of ages between years 3 to 17 increases with the educational level of the children's parents. However, there is relatively any study done on the influence of SES on the children's CC in Malaysia.

2.9 Ownership of Computers

There are quite a number of survey data on the number of home computer owners in several countries. For example, the percentage of households with personal computers in U.S was 26.9 percent in October 1993 ("Home Computer Ownership", 1998). According to Olivetti Personal Computers Home Entertainment Market Report, Britain leads the world in home computer ownership in 1995: almost one in every three homes owns a

females. The difference may be attributed to prior computer experience. The ownership of home conputer may also help to increase the CC levels of students.