

## CHAPTER TWO

### REVIEW OF LITERATURE

#### 2.1 Brief History of CAI

Nievergelt, Ventura Andrea and Hinterberger (1986) in their book titled *"Interactive Computer Programs for Education"* stated that CAI began in the 1960's. The computer-based instructions (CBI) was first initiated by the Stanford University in the United States. The first CAI project was the Stanford CAI Project focusing on arithmetic drill and practice program. The IBM 1500 CAI system followed soon after that.

CAI projects of the 1970's improved on approaches and more experimentation (Nievergelt, Ventura Andrea and Hinterberger, 1986). The Learning Research Group at the Xerox Palo Alto Research Center developed Smalltalk, a programming language used for painting, drawing, animation, music and other activities.

Besides that, Microsoft Corp. had also contributed significantly to the CAI industry. The company created the BASICS programming language which was widely used in the 1970's and 1980's. Other programming languages such as FORTRAN was used to perform advanced calculations, COBOL in business data processing and others like 'C' and PASCAL also made their debut in the software industry.

Early computer programs focused on administration and business purposes rather than education. However, a computer software technology breakthrough came in 1991 when Microsoft Corp. launched the world's first Windows operating systems version 3.0. It allows the computer to operate a few programs simultaneously. Windows

environment also supports more graphics. This technology advancement led many programmers to create windows-based applications ranging from computer games to learning modules.

With Microsoft Corp leading the world in windows technology, it continued to improve its existing operating system. This led to the launching of Windows 95 in 1995 and the Windows 98 recently. These new versions of the operating system enhanced multimedia capabilities as well as the smooth surfing of the Internet (Loh Kok Beng, 1998). With this new technology, the IMI era has begun. Multimedia programming tools such as Microsoft's VISUALBASICS and authoring tools like Macromedia Authorware were created to enable more user-friendly programming of the IMI. Thus, CAI researches increased tremendously. In the 1970's and 1980's, CAI researches focused more on software applications (DOS-based) whereas now the focus is on IMI which is individualised.

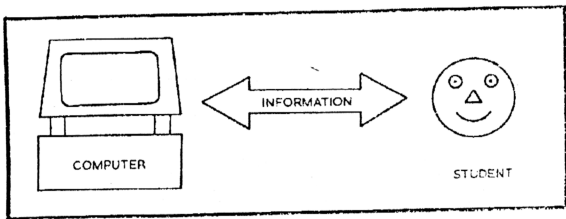
## 2.2 Past Researches on CAI

CAI is defined as the computer storage of instructional materials, the presentation of a part of them to the learner and the evaluation of the learner's responses (Kropp, 1970). Through the IMI program, the knowledge is imparted to the learner. It allows him to learn according to his own pace and ability. It must be interactive with responses and guidance from it (Schwier and Misanchuk, 1993). Learning will only be

possible if he is able to communicate with the program. In other word, he must possess computer literacy to be able to communicate with it fully (Luehermann, 1982).

Figure 2.2

A human-computer dialogue (Barker, 1985)



As Barker (1985) pointed out, to engage in a dialogue with the PC, a multimedia interaction environment has to be created (Refer Figure 2.2). When students use the operational courseware with the computer, an interaction takes place. An evaluation will be necessary to assess whether the human-computer interaction has produced any gain in achievement.

Is learning individually better than learning in pairs in a CAI sessions ? Kok (1989) revealed in his study that students in pairs learned just as much as individual students using CAI. In the same way, cooperative pairs in CAI also yield similar result (Brush, 1997).

CAI is able to provide individualised instruction (Cleary, Mayes and Packham, 1976). It allows slow learners to learn slower according to their cognitive abilities. Students who are brighter will find that IMI program allows them to proceed further and faster without having to wait for the slower ones to reach a higher level. This special characteristic of the CAI method gives more advantages for individualised learning (Cleary, Mayes and Packham, 1976).

## **2.3 Development of CAI in Malaysia**

### **2.3.1 Computer Project in Schools**

In the 1980's, selected urban schools in Malaysia had been encouraged by the Ministry of Education to set up computer clubs. This directive had been sent to all urban and rural schools in the 1990's. School principals were advised to heed this directive. Despite this, most computer clubs were found only in urban schools especially those schools which were equipped with a computer laboratory.

The general excuse for not setting up the proposed club was the lack of fund to buy computers. This was quite true in rural schools where computers which were sent by the Ministry of Education were purely used for administration purposes. As a result, many rural schools were unable to set up computer clubs.

However, the Ministry of Education is right on suggesting the setting up of the club. A ministry's circular titled "*Panduan Penubuhan dan Pengurusan Kelab Komputer Sekolah*" (1986) revealed that the purpose of setting up the club was to promote computer literacy among the students. These activities were regarded as co-curriculum activities.

The Parent Teacher Association (PTA) played a role in aiding the students financially. The PTAs subsidised most of the activities that were being carried out. Most of them were on learning computer applications (DOS, Windows, Word Processor, etc). Some computer clubs even held logo-designing competitions.

The Malaysian Council for Computer-in-Education (MCCE) also helped schools to conduct club's activities. This council comprises professional educators from the public and private sector. The activities included seminars, teachers' workshops and various computer-based competitions.

The Ministry of Education also launched the Computer Literacy Pilot Project in April 1986 involving 20 schools. It was taught in schools by two specially trained teachers. It involved only selected Form Four students.

MIMOS (Malaysia Institute of Microelectronics Systems), in collaboration with the Ministry of Education, had developed an authoring system called Computer-Integrated Learning (Sistem ComIL) in 1991. The aim was to help teachers who were CAI developers to create teaching courseware in Malay language.

In 1992, a project named Computer-in Education (CIE) was launched by the Ministry of Education in collaboration with MIMOS. Sixty rural secondary schools were selected for the pilot run. The aim was to promote computer literacy among Form One and Form Two students.

The CAI project was finally approved by the Ministry of Education in 1994. It was piloted in 15 rural schools in Selangor for the subject of Mathematics and English Language. Zoraini (1994) reported better achievement scores for the students.

With the Internet launched in the mid-1990's, the Ministry of Education again carried out the "Pusat Sumber Ilmu" (PSI) Project in 1996. The pilot project involving 14 schools selected nationwide (one from each state) was carried out. The aim was to study how students get information from Internet and the problems they faced ("Dasar Komputer Kementarian", 1996)

### **2.3.2 Information Technology Training for Teachers**

As educational technologies progressed rapidly in the late 80's and early 90's, In-service teachers at present must also acquire the neccessary skills and competency. The use of telecommunication equipment in education is of utmost importance (Kearley and Lynch, 1992). Teachers can acquire the much needed skills through the frequent uses of E-mail and on-line databases through the Internet (Schrum, 1989).

The computer literacy projects for teachers were carried out mainly by the Teacher Education Division (TED) of the Ministry of Education. Beginning 1992, all trainee teachers were required to take the subject "Computer Literacy" in their respective Teacher Training Colleges (TTC).

In 1993, this subject had been renamed as "Information Technology" (IT). IT was offered to teachers nationwide as a 14-week in-service program (Kursus Dalam Perkhidmatan - KDP). According to Hajah Maznah Jamaluddin, the current Director of the In-service program Unit of the TED, TTCs that will offer IT will be equipped with at least thirty sets of computers each. All the computers are accessible to the Internet.

Hajah Maznah also said that TTC will train all teachers throughout the country to be computer literated by the year 2020. Hashim (1996), also quoted that many teachers will be trained to create interactive multimedia materials especially through the ComIL program.

### **2.3.3 The SMART School Project**

The Smart school project was launched in 1994 by Malaysia's Prime Minister, Dato' Seri Dr. Mahathir Mohamed. MIMOS was being asked to formulate the idea of setting up the Multimedia Super Corridor (MSC). The Smart school project is one of the seven flagships of the MSC Project.

The proposed Smart school will be a high-tech school which will use the IMI or the CAI method in teaching and to replace existing traditional textbook method (Book titled "MSC", 1998). The use of high-tech communication platform like the Electronic Mail and Internet to gather information or learning materials are of top priority.

According to the "*Menuskrip Rangka Tindak Konsep Sekolah Bistari*" (1997) (Smart School Concepts' Manuscript), the definition of a Smart school is :

"Institusi Pendidikan yang mana aktiviti pengajaran dan pembelajaran serta kaedah pengurusannya disusun semula dengan sistematik untuk membolehkan pelajar-pelajarnya bersedia menghadapi era maklumat."

(an educational institute where the teaching and learning activities and its management methods are rearranged in a systematic way to enable its students to be prepared to face the information era.)

Smart schools in Malaysia will incorporate high-tech learning methods. All learning modules will be IMI-based (CAI-based). The usage of Internet will be increased greatly. The Smart school curriculum is planned by the Curriculum Development Center (CDC) of the Ministry of Education. It was proposed that primary school children would follow the CAI method in the subject of Bahasa Melayu, English, Mathematics and several other subjects (Ang, 1996).



The Ministry will select a total of 90 schools nationwide for the pilot launching scheduled for implementation in January, 1999. The selected Smart school teachers will have to undergo a 14-week in-service training in 1998 conducted by the TED. Initially, the Smart school will start on 4 main subjects namely Malay Language, English, Science and Mathematics. Other subjects will be implemented in stages. In conclusion, CAI-based method will make an impact on the academic performance of Smart school students.

## **2.4 Past Researches on Achievement**

CAI had been planned by the Ministry of Education, Malaysia to be implemented in 90 selected pilot schools throughout Malaysia beginning January, 1999. However, its effectiveness depends on a variety of factors like the availability of PCs and the CAI software (IMI).

Kok (1989) revealed in his study on 192 Form One students using CAI that it improved academic achievement in Geography. Brush (1997) in his study on Integrated Learning System (ILS) for Mathematics also made similar findings. Other researchers also confirmed positive findings on achievement using CAI. (Maverach, 1985 ; Zoraini, 1994 ; Kulik, Kulik and Cohen, 1980).

Crowl, Kaminsky and Podell (1997) quoted that the key to achievement is motivation. The created IMI must be able to capture students' attention and motivation to learning. When the students answer questions, the program must be able to response constructively.

The program must be programmed to behave intelligently and can learn from experience and therefore evaluate the learners' performance and give suitable solutions (Schwier and Misanchuk, 1993). For example, if a student gives a wrong answer, the program must response with a guideline or advice on how to achieve the desired results. However, if he answers correctly, he should be praised (E.g. "Congratulation", etc) accordingly.

In contrary to positive findings on CAI by other researchers, Mevarech and Sigal (1989) in their research on children's Mathematics anxiety and achievement, found that CAI did not improve achievement. The reason was that the students faced difficulties in mastering Mathematics skills within short periods.

The present study uses CAI method for a group of Malaysian Form Four Geography students. It attempts to assess the gain in achievement after they complete the CAI sessions.

## 2.5 Gender Differences

Sigelman and Shaffer (1995) in his book titled "*Life-span Human Development*" quoted that females have greater verbal abilities than males. However, males outperform females on test of visual or spatial ability. They also have greater Mathematics ability compared to females. They are also more physically and verbally aggressive compared to females.

On computer usage, generally boys' attitude towards computers were more positive (Nickel, 1987). Yong (1998) found that boys had higher computer competency than girls. It will be interesting to know whether boys achieve more in the achievement test compared to girls in this CAI experiment.

In short, there are some contrasting views on gender differences in regard to achievement. Although boys may perform better in Mathematics, do they also perceive better than girls in this CAI experiment? As far as achievement is concerned, motivation in learning is a far stronger factor than gender differences (Crowl, Kaminsky and Podell, 1997). This study will shed us some light on gender differences and its influence.

## 2.6 CAI Research on Perception

Apart from achievement using CAI, another variable to be studied is the students' perception (attitude) towards CAI. In this study, it is expected that most students will perceive positively towards computer. It is especially true for students who have never been exposed to a CAI learning method before.

Kok (1989) who studied 192 Form One students who used CAI in Geography, found that they developed positive attitude towards CAI. Tham (1995) who studied CAI on AsaStats program (statistical program) also reported similar findings. Brush (1997), also reported similar positive students' perception using CAI in an Integrated Learning System.

Therefore, this study will also expect similar findings of the past researchers. A negative perception will not be expected because preliminary interview with the Principal proved that the students of this school have never participated in any CAI study before.

## 2.7 Summary

Many CAI researchers had found that CAI was effective in improving academic achievement. Some of them had shown that students' developed positive perception towards computers. However, not many of them studied the influence of gender in achievement and perception of CAI.

This indicates that this CAI study on gender influence in achievement and students' perception towards CAI is needed. Malaysian curriculum planners need to know the result of this study so that they can plan suitable learning materials for different cognitive levels of the students. It is of utmost importance to create interesting CAI-based softwares to enable students to perceive CAI positively. A good quality CAI software will also contribute positively towards academic achievement.