Chapter Two

Review of Related Literature

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2.0 INTRODUCTION

This chapter presents the review of related literature on CAI. The review has been presented under Microcomputer Use and Student Achievement, Learning Rate, Retention of Learning, CAI and Students' Attitude, Effectiveness of CAI, and Implications of the Review of Related Literature for the Present Study.

2.1 MICROCOMPUTER USE AND STUDENT ACHIEVEMENT

The single best supported finding in the research literature is that the use of CAI as a supplement to traditional, teacher-directed instruction produces achievement effects superior to those obtained with traditional instruction alone. Generally speaking, this finding holds true for students of different ages and abilities and for learning in different curricular areas. As summarized in Stennett's 1985 review of reviews, "Well-Designed and Implemented Drill and Practice or Tutorial or CAI used as a supplement to traditional instruction produces an educationally significant improvement in students' final examination achievement "

(Research support: Bahr and Rieth 1989; Bangert-Drowns 1985; Bangert-Drowns, et al. 1985; Batey 1986; Bracey 1987; Burns and Bozeman 1981; Braun 1990; Capper and Copple 1985; Edwards, et al. 1975; Ehman and Glen 1987; Gore, et al. 1989; Grimes 1977; Hawley, Fletcher, and Piele 1986; Horton, Lovitt, and Slocum 1988; Kann 1987; Kulik, Kulik, and Bangert-Drowns 1985; Martin 1973; Mevarech and Rich 1985; Mokros and Tinker 1987; Office of Technology Assessment 1988; Okey 1985; Ragosta, Holland, and Jamison 1982; Rapaport and Savard 1980; Rupe 1986; Samson, et al. 1986; Stennett 1985; Way 1984; White 1983; Woodward, Carnine, and Gersten 1988.)

Some writers also reported on research, which compared the effects of CAI alone with those produced by conventional instruction alone. Here, results are too mixed to permit any firm conclusion. Some inquires have found CAI superior, some have found conventional instruction superior, and still others have found no difference between them.

(Capper and Copple 1985; Edwards, et al. 1975; Rapaport and Savard 1980.)

Other researchers and reviewers compared the achievement effects produced by all forms of computer based instruction (sometimes alone and sometimes as a supplement to traditional instruction) as compared with the effects of traditional instruction alone. While the research support is not as strong as that indicating the superiority of CAI, the evidence nevertheless indicates that Computer Based Education approaches as a whole produce higher achievement than traditional instruction by itself.

(Bangert-Drowns 1985; Bangert-Drowns, et al. 1985; Braun 1990; Hasselbring 1984; Kulik 1983, 1985; Kulik, Bangert, and Williams 1983; Kulik and Kulik 1987; Roblyer, et al. 1988; Swan, Guerrero, and Mitrani 1989.)

This group of findings supports the conclusion drawn by Dalton and Hannafin in their 1988 study to the effect that "while both traditional and computer-based delivery systems have valuable roles in supporting instruction, they are of greatest value when complementing one another" (p. 32).

Researchers concerned with student writing outcomes have determined that writing performance is superior when the teaching approach emphasizes "writing as a process," rather than focusing only on the end product- the finished composition. The writing-as-a-process approach encourages students to engage in prewriting activities, followed by

drafting, revising, editing, and final publication, with each step receiving considerable attention and often feedback from teachers or peer editors.

Word processing programs, with their capability to add, delete, and rearrange text, are seen as being far more congruent with the writing process than more laborious pencil-and-paper approaches. Most research in this area indicates that the use of word processors in writing programs leads to better writing outcomes than the use of paper-and-pencil or conventional typewriters. Specific positive outcomes associated with the use of word processors in writing include:

- Longer written samples
- Greater variety of word usage
- More variety of sentence structure
- More accurate mechanics and spellings
- More substantial revision
- Greater responsiveness to teacher and peer feedback
- Better understanding of the writing process
- Better attitude toward writing
- Freedom from the problem of illegible handwriting.

(Batey 1986; Bialo and Sivin 1990; Collins and Sommers 1984; Dickinson 1986; Kinnaman 1990; MacGregor 1986; Office of Technology Assessment 1988; Parson 1985; Rodriguez and Rodriguez 1986; Sommer and Collins 1984.)

Researchers are careful to point out that these desirable outcomes are obtained when computers are used as part of a holistic, writing-as-a-

process approach. Only using computers for drill and practice on isolated sub-skills, such as grammar and mechanics, is not associated with improved writing achievement. As expressed by Sommers and Collins in their 1984 article on computers and writing, "Microcomputers are counterproductive when used in a theoretical vacuum" (p. 7).

2.2 LEARNING RATE

As well as enabling students to achieve at higher levels, researchers have also found that CAI enhances learning rate. Student learning rate is faster with CAI than with conventional instruction. In some research studies, the students learned the same amount of material in less time than the traditionally instructed students; in others, they learned more material in the same time. While most researchers don't specify how much faster CAI students learn, the work of Capper and Copple (1985) led them to the conclusion that CAI users sometimes learn as much as 40 percent faster than those receiving traditional, teacher-directed instruction.

(Batey 1986; Capper and Copple 1985; Edwards, et al. 1975; Grimes 1977; Hasselbring 1984; Kulik 1983, 1985; Kulik, Bangert, and Williams 1983; Kulik and Kulik 1987; Rapaport and Savard 1980; Rupe 1986; Stennett 1985; White 1983.)

2.3 RETENTION OF LEARNING

If students receiving CAI learn better and faster than students receiving conventional instruction alone, do they also retain their learning better? The answer, according to researchers who have conducted comparative studies of learning retention, is yes. In this research, student scores on delayed tests indicate that the retention of content learned using CAI is superior to the retention following traditional instruction alone.

(Capper and Copple 1985; Grimes 1977; Kulik 1985; Kulik, Bangert, and Williams 1983; Kulik, Kulik, and Bangert-Drowns 1985; Rupe 1986; Stennett 1985; Woodward, Carnine, and Gersten 1988.)

2.4 CAI AND STUDENTS ATTITUDES

Much of the research that examines the effects of CAI and other microcomputer applications on student learning outcomes also investigates effects upon student attitudes. This line of inquiry has brought most researchers to the conclusion that the use of CAI leads to more positive student attitudes than the use of conventional instruction. This general finding has emerged from studies of the effects of CAI on student attitudes towards:

- Computers and the use of computers in education **(Batey 1986; Ehman and Glen 1987; Hasselbring 1984; Hess and Tenezakis 1971; Kulik 1983, 1985; Kulik, Bangert, and Williams 1983; Roblyer 1988; Way 1984)**
- Course content/subject matter **(Batey 1986; Braun 1990; Dalton and Hannafin 1988; Ehman and Glen 1987; Hounshell and Hill 1989; Rapaport and Savard 1980; Roblyer, et al. 1988; Rodriguez and Rodriguez 1986; Stennett 1985)**
- Quality of instruction **(Kulik, Bangert, and Williams 1983; Kulik and Kulik 1987; Rupe 1986; White 1983)**
- School in general **(Batey 1986; Bialo and Sivin 1990; Ehman and Glen 1987; Roblyer, et al. 1988)**
- Self-as-learner **(Bialo and Sivin 1990; Mevarech and Rich 1985; Robertson, et al. 1987; Rupe 1986).**

2. 5 EFFECTIVENESS OF THE CAI

Adhikari (1992), conducted a study "Development of Computer Aided Instructional Material on Cell Reproduction for class 9". The Computer Aided Instructional material was found to be effective in terms of achievement of students. Also, the CAIM was found effective when both groups were matched on intelligence.

A case study by **Crews (2003)** investigates the effectiveness of a CAI reading tutorial in helping poor N30 readers improve their ability to read. The study was undertaken with three objectives: (1) To scientifically investigates if poor readers using the CAI significantly improved their reading abilities, and assuming the CAI was effective, (2) To identify the instructional methods and strategies implemented in the CAI design, (3) To theoretically explain the effectiveness of the CAI theory provided information on effective methods of designing effective CAI for poor readers. The study was conducted at a Title I elementary schools in a large city in the southwest. Title I schools serve a high concentration of students living in poverty, and as a result, receive funds to provide special educational services for low-achieving and at-risk students. The 13 participating students were fourth and fifth grade students with poor reading abilities as determined by the independent assessments and observations of their homeroom teachers. The multimedia CAI program investigated supports the active cognitive participation of the learner, delivers multisensory instruction, provides timely, directed feedback, teaches phonics skills, and implements 100 percent mastery learning. The instruction is individualized and self-paced. Results of pre-post reading comprehend tests and interviews indicates that poor readers completing the CAI tutorial significantly improved their reading skills and the students and their teachers felt that using the CAI tutorial helped the students become better reader.

Das (1998), conducted a study entitled "Exploring Effectiveness of Computer Assisted Learning Materials on Rhymes in Different Modes". Objectives of the study were (1) To develop computer software on rhymes in Text (T), Text Music (TM), Graphics-Text-Music (GTM) and Graphics-Text-Music-Recitation (GTMR) Modes. (2) To study the Effectiveness of Computer Assisted Learning Materials (CALM) prepared in different Modes for teaching the rhymes in terms of (a) word learning by the students (b) Analytical understanding of students (c) Comprehensive understanding of students (d) Writing ability of students (e) Recitation ability of the students.

The sample consists of second grade pupils which was selected randomly from one section of a school. The design of study was developmental cum experimented in nature. The tools used were treatment tool and testing tool. The study revealed that Composite Modes of Teaching may not always ensure higher learning in all areas of language.

Eakkata (1999), conducted a study titled, "Construction of Computer Assisted Instruction in Mathematics for Prathom Suska 3 Students". The purpose of this study was to construct and to examine the effectiveness of Computer Assisted Instruction in Mathematics on the topic "Fraction" for Prathom suksa 3. They were given the pre-test before they studied the Computer Assisted Instruction program which was constructed by the author. At the end they were given the post-test. Data were analyzed using Item by objective analysis. The results indicated that the subjects were able to master learning objectives of the study.

Gupta (1987), conducted a study titled, "Computer Assisted Instruction in Chemistry". Objectives of the study were, (1) To design two strategies of Computer Assisted Instruction (CAI) in Chemistry. (2) To study the relative effectiveness of two strategies of CAI in Chemistry. (3) To compare the mean relation score of two strategies of CAI in Chemistry.

(4) To know the opinion of student towards CAI. In this study the Researcher has employed the pre-test, post-test, Experimental design. Under incidental sampling technique, Class XI students were selected and two groups of students in each were formed. The students of two groups were matched with respects to their mean age, sex, aggregate marks and marks in Science in the current school examination. One group received instruction under strategy – I of CAI and another under strategy – II of CAI. Four criterion tests were prepared by the researcher based on the contents of software packages, which were used as pre-test, post-test and retention test. An opinionative of statements pertaining to the opinion of students towards CAI was used. The study revealed that the girls of both the strategies scores significantly higher than the boys in terms of their mean scores and mean retention scores. Also the students of both the strategies revealed highly favorable opinion in terms of percentages of favorable response.

Himani (1990), conducted a study "Development of computer Aided Instructional Material on Microbes for class VIII." The developed CALM material proved quite effective which was evident through the significant gain of the students. Also the students were found to have positive reactions towards the CAIM.

HSU (1994) conducted a study on Computer Assisted Language Learning (CALL). The objectives of the study were. If second language student request modification of the input they hear while working on computer based listening exercise, and If this international computerized modifies help second language students listening comprehension and languages acquisition. Data were collected from 15 elementary second language students by using a single group pre-test, post-test research design. The findings revealed that second language students use the tools made available by the computer technology to make the inputs comprehensible.

Jeyamani (1991) developed a CAI in Physics for class XI Students. The experimental group received CAI and after the experiment it was found that the experimental group performed better on the post-test. The difference was significant in terms of sex and medium of instruction.

Khirwadkar (1998), conducted a study titled "Development of Computer Software for learning Chemistry at Standard XI". The objectives were:

- To develop CAI package in subject of Chemistry for standard XI Science students studying GSHEB syllabus.
- To study effectiveness of the software package in terms of instructional time and achievement of students.
- To study effectiveness of the software package on students' achievement in relation to students' intelligence level, motivation level and attitude towards the package.
- To study attitude of the students and teachers regarding effectiveness of CAI.

The Researcher had taken the sample of students through randomization for both control and experimental groups. The students of experimental group were exposed to the software package prepared on the Chemistry subject, while the other group was taught through traditional method by the School Chemistry Teacher. The time duration was one month for both the groups. Investigator had collected data on achievement through pre-test and post-test. The data on attitude towards the package were collected through structured and unstructured interviews.

The study revealed that the CAI was effective in terms of academic achievement of students and instructional time. The teachers and students were found to have positive attitude towards the developed CAI. IQ,

academic motivation and attitude affected the achievement of the students.

Nimtrakul (1999) conducted a study titled "Effects of Computer Assisted Instruction on Atomic Structure in Chemistry of Mathayom Suska 4 students". The objectives of the research were (1) to construct Computer Assisted Instruction on Atomic Structure in Chemistry, (2) to investigate the achievements in Chemistry on atomic structure of Mathayom Suska 4 students who were taught through the Computer Assisted Instruction program and (3) to explore the learning attitude towards Chemistry of the students who were taught through the Computer Assisted Instruction Program. The subjects of this study were Mathayom Suska 4 students of Chiang Mai university demonstration school Maung district, Chiang Mai province during the first semester of academic year 1999. A class of students was chosen as the experimental group by cluster random sampling. The research instruments were the Computer Assisted Instruction on atomic structure in Chemistry if Mathayom Suska 4 students, the Chemistry achievement test on atomic structure with reliability of 0.8210 and Chemistry learning test with reliability 0.8276.. The statistics used for the construction of Computer Assisted Instruction on Atomic Structure in Chemistry of Mathoyam Suska 4 students were divided into two parts. One was to find the efficiency of the program by using the mean, and percentage and the other was to compare Chemistry learning achievement on atomic structure in Chemistry of Mathayom Suska 4 students by using t-test in form of paired-test analyzed with the SPSS. The statistics used for the study of learning attitude towards the Computer Assisted Instruction on Atomic Structure in Chemistry of Mathayom Suska 4 students were mean, standard deviation (SD) and mean population estimation (M). The finding were as follows:

The efficiency of the Computer Assisted Instruction on Atomic Structure in Chemistry of Mathayom Susks 4 students was 93.26/92.06, which was higher than the standard criterion 85/85.

The learning achievement in Chemistry on atomic structure of Mathayom Suska 4 students after being taught through the Computer Assisted Instruction on Atomic Structure in Chemistry was higher than that before being taught through the Computer Assisted Instruction on Atomic Structure in Chemistry at the .01 level of significance.

The learning attitude in Chemistry with the Computer Assisted Instruction on Atomic Structure of Mathayom suska 4 students was moderate to satisfactory.

Prabhakar (1989) conducted a study, " Development of software for Computer Aided Instruction (CAI) and its comparison with Traditional Method for Teaching Semi-Conductors at +2 level". The CAI was found to be effective in terms of achievement of students of Class XI and class XII. Also it was found to be effective in terms of reactions of these students. The sex did not influence effect of interaction between treatment and sex on achievement. Both the classes XI and XII students were found to have equally favorable reaction towards CAI material when the groups were matched with respect to pre-test.

Robkob (1999) conducted a study titled "Achievement and Retention in Science of Prathom Suksa 5 Students learned through Computer Assisted Instruction". The purpose of this study was to compare achievement and retention of suksa 5 students in Science studying through Computer Assisted Instruction. The subjects were 40 prathom suksa 5 students from Anubaab Chiang main schools, Muang district, and Chaing Mai province; first semester in academic year 1999. They were divided into two groups; the experimental group and control group. Each group consisted of 20 students. The experimental group studied through the CAI program

themselves while the control group learned by the conventional method. At the end of studies, they were given the post-test. The retention test was administered on both the groups of the students two weeks after the post-test. The data were analyzed using item by objective analysis. The results showed that learning achievement and retention of students who studied through the CAI and the Conventional Method were different.

Sharma (2003), conducted a study titled "A Study of the Effectiveness of Computer Assisted Learning in Chemistry for the Students of Standard XI." The objective of the study are (a) to develop Computer Assisted Learning Material in Chemistry for standard XI student (b) to study the effectiveness of the CAL in Chemistry in terms of achievement of standard XI students (c) to study the opinion of the Chemistry students regarding the effectiveness of the developed CAL. The researcher has found that CAL developed is effective for teaching Chemistry at standard XI. It helped the students to learn the topic of organic compound and clarified the concept. Students were found to have a positive reaction towards the developed CAL. Student's reaction towards the CAL was found to be favorable as far as the statements related to the interest, mode of presentation, content, clarity, and the question asked in the CAL. The Chemistry teacher was found to have positive reactions towards the developed CAL regarding content, language clarity, mode of presentation, and clarity in graphics and evaluation procedure.

Suwanma (1999), conducted a study titled "Construction of Computer Assisted Instruction in Science on the Topic "Earth and changing" for Mathayom Susska 2". The purpose of this study was to construct a Computer Assisted Instruction in Science on the topic of "Earth and changing" for Mathayom Suska 2. Subjects were 20 Mathayom Suska 2 Students of the 1999 academic year from Song-Kwae Witthyakom School, King-Amphur Doi-Lol, and Chiang Mai province. The subjects took a pretest and then they were given the posttest. Data were treated using item

by objectives analysis. The result showed the efficiency of the CAI. The students mastered at 84.75 percent criterion of objectives of the study. They were satisfied and appreciated the CAI program.

Vaisopha (1999) conducted a study titled "Construction of Computer Assisted Instruction in Mathematics on topic "adding fraction" for Prathom Suska 5 students". The purposes of this study were to construct a CAI in Mathematics on topics "adding fraction" for Prathom Suska 5 students. Subjects were 46 Prathom Suska 5 students in first semester from Anubaan Chaing Mai School. The subjects took a pretest and then studied the CAI program themselves. After that they were given the posttest. Data were analyzed using item-by-objectives analysis. The result indicated that the subjects were able to master learning objectives of the study. The students were satisfied and appreciated the CAI program.

Yadav (2000) conducted a study titled "A study of the effectiveness of the Computer Software for students of standard I". The study revealed a significant gain in terms of mean achievement through CAL. Also the CAL evoked positive perceptions amongst teachers and students towards Computer Software.

Zyoud (1999) conducted a study titled "Development of Computer Assisted English Language Teaching for VIII Standard. Students" with the following objectives:

- To develop a Computer Assisted English Language Teaching Program for VIII Standard Gujarati Medium Students.
- To study the effectiveness of the Computer Assisted English Language Teaching program on students' achievement in terms of vocabulary, grammar and comprehension.
- To study the effectiveness of the Computer Assisted English Language Teaching program on the experimental group student's

achievement in vocabulary, grammar and comprehension with respect to their intelligence, motivation and attitude. The researcher had randomly taken the sample of students for control and experiment group from the Gujarati Medium School. The tools used were achievement tests, JIM scale and Raven's Progressive Matrices.

The study revealed that the developed package helped the students in vocabulary and grammar. Students were found to have positive attitude towards the package.

2.6 IMPLICATIONS OF THE RELATED LITERATURE REVIEWED FOR THE PRESENT STUDY

A sizable number of studies reviewed revealed that the CAI used as supplement to traditional instruction, produces an educationally significant improvement in students' achievement. Also in a large number of studies the CAI has been found significantly more effective than conventional instruction. Students' learning rate has been found faster with CAI than with conventional instruction. The students have been found to have favorable reactions towards CAI. The CAI has been found effective on various subjects. Some of the studies have found that composite modes of instruction may not always result into higher cognitive learning in languages. Interactive modes of instruction on languages through Computer Assisted Learning Material (CALM) have been found quite effective. CAI on various subjects has been found useful for learners of varied profiles.

The review of Related Literature reveals that the studies conducted on languages particularly Sanskrit are very rare. The investigator has not come across any study on effectiveness of CAI on Sanskrit Poetry.

The Related Literature Reviewed definitely establishes the effectiveness of computer as a medium of educational instruction. The Related Literature motivated the learner to takeup a study on Sanskrit poetry instruction through computer.