

THE INTEGRATION OF COMPUTER-AIDED INSTRUCTION
INTO THE CLASSROOM AT THE OKLAHOMA
STATE UNIVERSITY SCHOOL OF
TECHNICAL TRAINING

by

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PREFACE

This study is concerned with identifying reasons instructors might have for not using CAI in the classroom at OST and constructing a program based on those reasons for facilitating the use of CAI in the classroom at OST. Results of questionnaires given to departments who have access to a computer and results of successful CAI programs at other schools were reviewed and a program was then constructed for providing CAI to the students at OST.

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

The use of computers to aid instruction in the classroom is something educators have been slow to embrace. Due to advanced technology in electronics in the size and quality of printed circuits, the capabilities of calculating or computing equipment have increased at a rate almost inversely proportional to that of the cost of the equipment. Hand-held calculators costing one hundred dollars six or seven years ago can now be purchased for under ten dollars. The cost of minicomputers has been lowered enough that small businesses employing only a half-dozen people are using the computers for payroll processing and keeping track of inventory while larger businesses have cash registers capable of "talking" to the company's main computer each night with each store's sales total for that day.

The lowered cost of computers and the use of time-sharing (several businesses or schools sharing the same computer) have enabled many school systems to use computers as an aid to their classroom instruction. Judy Edwards (1979), former director of the Northwest Regional Educational Laboratory, in an address to the National Educational Computing Conference, cited National Science Foundation statistics which show that thirty-six percent of public schools (k-12) have

computers for instruction and that, by 1982, fifty-eight percent will have them. However, as with anything new in the educational instructional process, any changes in current teaching methods seem to be slow in gaining teacher acceptance.

Statement of the Problem

After being disappointed by past changes supposedly made to aid students reach new educational heights (such as the "new" math) which have, in fact, resulted in new literacy lows, and having listened to the cries of the general public for a return to the basics (with the implication of avoiding anything new), educators are more reluctant than ever to embrace any change in current educational practices. This reluctance to change is even characteristic of the instructors in many technical-occupational schools. Even though industry is becoming more computerized each day and technical schools seem to pride themselves on keeping their instruction commensurate with industry requirements, the involvement of computer-aided instruction in the technical classroom has been met with strong resistance from many faculty members, perhaps caused in part by fear, ignorance, or maybe laziness. The reasons for this lack of teacher involvement in computer-aided instruction is the problem with which this study will deal.

Need for the Study

A commitment to computerized instruction at the Oklahoma State University School of Technical Training (OST) has already been made by the administration and several departments through the purchase of three TRS-80 Radio Shack minicomputers by the Business and General

Education Departments, a new computer graphics lab in the Drafting Department, An Apple II minicomputer with dual mini-disc drive in the Electronics Department, new computer-controlled machinery in the Machinist Department, and a new IBM 4331 system for the data processing section of the Business Department. Computers have literally invaded every technical field. In spite of this, many instructors are still refusing to involve themselves in using the computer as an aid to their classroom instruction. The need to identify those reasons for noninvolvement is essential to constructing a program for the integration of computer-aided instruction into the classrooms of the Drafting, Electronics, Business, and General Education Departments at OST.

Purpose of the Study

The purpose of this study is to identify those reasons for noninvolvement by OST faculty members in the use of computer-aided instruction in the classroom and to construct a program based on that identification to aid in the integration of computer-aided instruction into the classroom.

The research questions this study will deal with are:

1. For those departments having computers that could be used as an aid in the classroom, what reasons do the instructors give for not using the computer as an instructional aid?
2. Is there a program that could be constructed to eliminate the barriers preventing instructors from using computer-aided instruction in the classroom.

CHAPTER II

REVIEW OF THE LITERATURE

The inclusion of the computer in many areas of American industry has brought with it a change in required employee knowledge and skill levels. What used to be done by hand or with hand-operated equipment is now being done, in many instances, by computer-controlled machinery. This change has brought about a need for the technician who can work with his mind as well as with his hands (although here at OST we have always prided ourselves on providing both types of education). Since some men have actually been replaced by the computers, there is an understandable fear on the part of employees whenever an employer brings new computerized equipment into the shop. Even though the equipment may have been purchased simply to aid the employees, to make their jobs easier, and to increase both the quality and quantity of their production, many employees still feel negatively about the computerized equipment simply out of ignorance or fear.

The same negative feelings exist in education where computers are now being used as an aid to instruction in the classroom. Many teachers share the fear of many industrial employees of being replaced by the computer. However, because of the individualized approach and design (one person working with one machine) of computers, the high cost-per-student incurred, the plurality of computer languages involved, and the lack of sufficient programs available to take care

of the individual class needs across the country, the computer can only realistically be viewed as an aid to, and not a replacement for, the classroom teacher. Lopez (1968) cites a good operable definition of computer-aided instruction (CAI) as a man-machine relationship in which the man is a learner and the machine is a computer system with the objective of human learning and retention. Operating under this definition, with its expressed objective, many technical educators would probably not object to the use of CAI in their classrooms.

Since the goal of the programs at OST is to prepare students for direct entry into technical career positions with a strong enough background to enable them to adapt to whatever job requirements arise, the use of computers as an aid to instruction would seem a logical step in the process of keeping the OST curriculum up-to-date with the needs of the current technician in industry. The reluctance to use CAI or to make any change in teaching methods is accurately assessed in the following quote from B.F. Skinner cited by Lopez (1968):

Scarcely has any area of human activity been more resistant to scientific analysis and technological change than education. The methods whereby a teacher is supposed to impart knowledge to a room full of pupils have changed scarcely at all . . . teacher effectiveness has not kept up with industrial effectiveness (p. 40).

Since industry has used CAI to update employee knowledge and skills with fairly good success in increasing employee effectiveness, perhaps technical educators should give CAI a closer look.

The negative reactions to the use of CAI in the classroom could be changed if instructors were made aware of what has been, and is being done, at other schools that have tried CAI. This chapter is a review of the research that has been done with the use of CAI at other schools, with particular attention given to the areas of instruction for

remedial level or disadvantaged students, CAI versus conventional lecture methods, CAI and the physically impaired (blind and deaf), student attitudes toward CAI, and a compilation of various computer conference reports that have dealt with the faculty training in the use of CAI.

Remedial Instruction--Disadvantaged

After reviewing studies done in the area of using CAI with those students classified by their schools as remedial level or disadvantaged one could conclude that the results show significant increases in basic arithmetic skills and in motivation of these students.

Shaw (1968) studied remedial level junior high school students using CAI for learning basic arithmetic skills and concluded that there were significant increases (at the 0.05 level) in the skill level of the students. Durward (1973) came to the same conclusion in a study of CAI with sixth and seventh graders, while Blakeway (1976) in a study of the effects of 120 packaged math programs found that even reluctant learners were motivated with the use of the CAI system. In a 1969 study of the McComb, Mississippi, school system, Prince (1969) used the Suppes-Stanford CAI math drill-and-practice program (developed at the University of Stanford by Dr. Patrick Suppes, one of this country's leading proponents of CAI). Prince found a significant difference existing between CAI and traditional instruction, especially among disadvantaged Negro children, and concluded that CAI was a good way of closing the educational gap. The main problem he found was one which still exists more than ten years later: that of prohibitive cost-per-student for the program.

Most of the studies seemed to show an increase in basic skill levels among both remedial and disadvantaged students, although in some cases the difference was not shown to be significant. The advantages pointed out by most of the studies seemed to be in the ability of the teacher to provide individualized instruction for these students without sacrificing attention needed by the other students, higher student interest and motivation, immediate feedback to the student on his progress, and the providing of the constant drill and practice needed by the remedial level and disadvantaged students. The disadvantages, mentioned earlier in the chapter, were the cost incurred per student, the plurality of computer languages involved (a program written for one computer system usually has to be rewritten for use with another system), lack of sufficient programs available, and the inappropriateness of computer design for classroom use. Most of the studies concluded with a favorable response toward CAI because of the potential they see in it.

CAI Versus Conventional Lecture Methods

One of the areas of resistance to CAI is in trying to get teachers away from the traditional way in which a course has been taught. Many teachers view the computer as only a tutorial aid for the slower learners and fail to involve themselves in finding out if the computer could be useful to them in the classroom or if they could be obtaining higher levels of achievement from their students by using CAI. Murphy and Appel (1977) found this to be the case when they found that for the areas of accounting, biology, chemistry, English, and math the extent of actual usage in the classroom was less than projected. They stressed

that the critical factor for high acceptance and usage of CAI was the control instructors had over its use.

The idea that many teachers have of CAI being only a tutorial device and not useful for instructional purposes was proven wrong by Demb (1974) when she studied the instructional uses of computers in higher education in Massachusetts. She found more computer power being devoted to instruction in the physical and social sciences, business, and math (using drill-and-practice, problem-solving, games, and simulations) and very few instances of tutorial or inquiry and retrieval uses. An interesting comparison can be made here when one compares the areas that Massachusetts higher education institutions favor in applying CAI (the physical sciences and math) and the typical student Hall (1967) describes as follows:

[He is] work oriented, pragmatic, has an unquenchable sense of curiosity, and comes to school with clearly established career goals. The technical student will show a strong aptitude in the mathematical, scientific, and mechanical areas, but will show little interest in English and social studies (n.p.)

Thus, the areas found to be favorable to CAI application in Massachusetts are the very areas Hall describes as being areas of strong aptitude for the typical technical student.

Another study comparing CAI with conventional instruction was done by Durward (1973). He concluded that CAI, in addition to regular classroom instruction, is superior to an equivalent amount of classroom instruction in improving arithmetic skills.

Long and Riedesels's (1967) study of the in-service education of elementary school teachers where both CAI and conventional lecture methods were used showed no significant difference in the post-test

results, but they did conclude by mentioning that CAI showed greater promise because of its individualized instruction capabilities. A similar project in Connecticut in 1966 using three high school groups showed comparable results, but also indicated the increase in respect the students obtained for logic and order in problem-solving. A 1969 study by Hall (1969) in California and Pennsylvania of a similar in-service math education program for elementary school teachers using CAI resulted in favorable teachers' attitudes toward math with both high and low achievers expressing favorable opinions toward CAI. He stated that the content of the course was probably learned faster using the CAI format than by using the former conventional method. So even though no significant differences have been shown to exist between CAI and conventional methods in many of these studies, as a result of their trial involvement with it, many instructors' attitudes toward involving CAI in those areas where adaptability is possible have been positive.

CAI and the Physically Impaired

(Blind and Deaf)

Almost all of the studies done on CAI have stated its advantage over conventional teaching methods in providing individualized instruction to the student and it is this advantage that makes the outlook promising for using CAI in working with physically impaired (blind and deaf) students. Morgan's (1975) study obtained good results using CAI in math and reading with four hundred blind and deaf students in Cincinnati, but he stated that further hardware and software development was needed for the visually impaired.

Suppes (1973) ran a test using his own drill-and-practice math program on 385 students selected from over 2000 in 15 schools for the deaf from four states and the District of Columbia. The major results of his pretest and posttest indicated that CAI enabled these students to achieve gains expected of normally hearing students, that greater numbers of sessions on the computer were beneficial for all students, and that these gains could be achieved in short sessions of six to ten minutes per day.

One could conclude from these studies that CAI does show great promise in providing the individualized instruction needed by the physically impaired without any extra burden being placed on the instructor.

Student Attitudes Toward CAI

Most of the reports showed a strong positive attitude from the students involved in these studies toward CAI. A significant aspect of this favorable attitude demonstrated by students is that a great many of the reports dealt with low achievers, remedial level students, and reluctant teachers. A majority of the studies also showed that the students seemed to be more highly motivated using the CAI method than they did using conventional methods. These two areas of positive student attitude and high motivation should be considered before any instructor discards CAI in the classroom as an alternative to conventional lecture methods (which usually do not receive high marks from the slower learners in the areas of student attitude and motivation).

Computer Conference Results

Lockard (1967) reported on the National Science Foundation's Office of Computing Activities Conference which stated that:

Computers will alter the curriculum of tomorrow in fundamental ways if educators reexamine the goals of the existing curriculum and begin to actively experiment with this new technology (p. 70).

Two of the keys here seem to involve the reexamination of the curriculum by the instructors and the active experimentation in the use of the computer in the classroom, neither of which most instructors seem willing to do.

Five years later, the 1972 Conference on Computers in Undergraduate Curricula came up with some good ideas on faculty training and exchanging of software between institutions (which would help alleviate the problem of lack of sufficient programs which currently exists at most institutions).

More recently, the 1979 National Educational Computing Conference in Iowa City, Iowa, reiterated the need for schools to have sufficient programs available and proper faculty training in the use of CAI in the classroom. All organizations involved in getting computer-aided instruction into the classroom do recognize the need for better organization among themselves in making current software available to schools whose objection to CAI has been the lack of relevant programs for their students. Several examples of the use of computers as aids to instruction were given in smaller group sessions and the emphasis throughout all the sessions was the involvement of the instructor in developing good CAI programs for his own classes.

In March, 1980, the IBM Corporation offered a conference on authoring concepts for users of the IBM Interactive Instructional System. This conference was held at the University of Akron's CAI center, which has had considerable experience in developing CAI software for education and industry using the IBM Interactive Instructional System.

Conclusions

The review of literature has shown that, although computer-aided instruction may not be significantly better than conventional lecture methods as far as obtaining better achievement results, student attitude seems to be more positive and motivation seems to be higher, the physically impaired (blind and deaf) can be taught more easily because of the individualized instruction involved, and slower learners and disadvantaged students have shown more positive results after using CAI than they did using conventional lecture methods.

The main point made throughout the studies was the necessity of teacher involvement in having a successful computer-aided instructional setup. This is what is lacking at OST; and positive teacher involvement is expected to be an important result of this study.

CHAPTER III

METHODOLOGY

The purpose of this study is to identify those reasons for non-involvement by Oklahoma State Tech (OST) faculty members in the use of computer-aided instruction (CAI) in the classroom and to construct a program based on that identification to aid in the integration of computer-aided instruction into the classroom. Specifically, this study is directed toward those instructors who, for whatever reason, do not use their department's computer as an aid to their classroom instruction, with the expressed purpose of constructing a program to help those instructors become involved in CAI.

Population Surveyed

Questionnaires were distributed to those four departments which have computers that could be used as an aid to instruction by all the faculty members within those departments. This specifically included the Business, General Education, Drafting, and Electronics Departments' faculty members.

The Machinist Department was excluded from this study since only those instructors involved with the Numerical Control Program would be involved with the use of the computer. The data processing section of the Business Department was also excluded since all its faculty members presently use the computer in the classroom.

Methods and Procedures

Research Question One: For those departments having computers that could be used as an aid in the classroom, what reasons do the instructors in each department give for not using the computer as an instructional aid?

To answer this question, a questionnaire was given to those departments mentioned in the population surveyed. The questionnaires were given to the department heads, who then passed them out to the instructors with instructions to return them within the week to the department secretary. Sixty-seven questionnaires were sent to the departments and forty-four completed forms were returned. A compilation was made of the reasons given by the instructors for nonuse of the computer as an instructional aid, with special emphasis given to those reasons repeated most often.

Research Question Two: Is there a program that could be constructed to eliminate the barriers preventing instructors from using computer-aided instruction in the classroom?

To answer this question, a study was done of the CAI programs used at other educational institutions on the problems they encountered in instituting CAI into their classrooms and the steps they took to eliminate those problems. In particular, the methods they used in developing a positive attitude in the instructors toward CAI and how they were able to involve their faculties in CAI in their classrooms were examined.

A program was then constructed for eliminating the barriers currently preventing OST instructors from involving themselves in CAI.

Those techniques from different institutions that applied to the specific barriers obtained from research question one and how those barriers were eliminated were used.

CHAPTER IV

ANALYSIS OF DATA

The purpose of this study was to identify those reasons for non-involvement by Oklahoma State Tech (OST) faculty members in the use of computer-aided instruction in the classroom and to construct a program based on that identification to aid in the integration of computer-aided instruction into the classroom. The reasons for noninvolvement were given by the instructors on a questionnaire identified in chapter three. The program construction to aid in the integration of computer-aided instruction into the classroom was based on CAI programs established at other schools, obtained through a review of literature.

Research Question One

Research Question One: For those departments having computers that could be used as an aid in the classroom, what reasons do the instructors in each department give for not using the computer as an instructional aid?

Sixty-seven questionnaires were sent out to the departments mentioned in chapter three with forty-four of them returned. The results of the questionnaires, tabulated in the following five tables, were used to answer research question one. Tables I-IV represent the questionnaire answers from the Business Education, Drafting, General Education, and Electronics Departments, while Table V is a total of all four

TABLE I
SURVEY RESULTS FOR THE BUSINESS
EDUCATION DEPARTMENT

Reason for use (nonuse) of CAI	Percent Yes	Percent No	Percent No Answer
1. Do you use the computer as an aid to any of the classes you teach?		100	
2. Reasons for not using the computer as an aid:			
a. do not know how to use the computer	44		
b. do not want to use the computer as an aid	11		
c. cannot see any use for the computer as an aid	44		
d. not enough free time to plan for using the computer as an aid	11		
3. If any of the following opportunities were available, would you take advantage of them:			
a. short course in how to run the computer (running available programs)	56		
b. short course in programming the computer	33		
c. free time to work with the computer	44		
d. free time to design programs for your class	33		
4. Do you plan to use CAI in any of your classes in the future?	44	44	11
5. If computer programs were available for you to use as an aid to your instruction, would you use them?	44	11	44

Note: 15 questionnaires sent out, 9 questionnaires returned

TABLE II
SURVEY RESULTS FOR THE DRAFTING DEPARTMENT

Reason for use (nonuse) of CAI	Percent Yes	Percent No	Percent No Answer
1. Do you use the computer as an aid to any of the classes you teach?	78	22	
2. Reasons for not using the computer as an aid:			
a. do not know how to use the computer	11		
b. do not want to use the computer as an aid	0		
c. cannot see any use for the computer as an aid	0		
d. not enough free time to plan for using the computer as an aid	44		
3. If any of the following opportunities were available, would you take advantage of them:			
a. short course in how to run the computer (running available programs)	67		
b. short course in programming the computer	67		
c. free time to work with the computer	78		
d. free time to design programs for your class	78		
4. Do you plan to use CAI in any of your classes in the future?	89	11	
5. If computer programs were available for you to use as an aid to your instruction, would you use them?	89	11	

Note: 9 questionnaires sent out, 9 returned

TABLE III
SURVEY RESULTS FOR THE GENERAL
EDUCATION DEPARTMENT

Reason for use (nonuse) of CAI	Percent Yes	Percent No	Percent No Answer
1. Do you use the computer as an aid to any of the classes you teach?		100	
2. Reasons for not using the computer as an aid:			
a. do not know how to use the computer	70		
b. do not want to use the computer as an aid	10		
c. cannot see any use for the computer as an aid	25		
d. not enough free time to plan for using the computer as an aid	45		
3. If any of the following opportunities were available, would you take advantage of them?			
a. short course in how to run the computer (running available programs)	70		
b. short course in programming the computer	65		
c. free time to work with the computer	40		
d. free time to design programs for your class	30		
4. Do you plan to use CAI in any of your classes in the future?	50	30	20
5. If computer programs were available for you to use as an aid to your instruction, would you use them?	75	10	15

Note: 32 questionnaires sent out, 20 questionnaires returned

TABLE IV
SURVEY RESULTS FOR THE ELECTRONICS DEPARTMENTS

Reason for use (nonuse) of CAI	Percent Yes	Percent No	Percent No Answer
1. Do you use the computer as an aid to any of the classes you teach?		100	
2. Reasons for not using the computer as an aid:			
a. do not know how to use the computer	50		
b. do not want to use the computer as an aid	0		
c. cannot see any use for the computer as an aid	17		
d. not enough free time to plan for using the computer as an aid	67		
3. If any of the following opportunities were available, would you take advantage of them?			
a. short course in how to run the computer (running available programs)	100		
b. short course in programming the computer	50		
c. free time to work with the computer	50		
d. free time to design programs for your class	17		
4. Do you plan to use CAI in any of your classes in the future?	50	33	17
5. If computer programs were available for you to use as an aid to your instruction, would you use them?	100		

Note: 11 questionnaires sent out, 6 returned

TABLE V
SURVEY RESULT TOTALS FOR ALL DEPARTMENTS

Reason for use (nonuse) of CAI	Percent Yes	Percent No	Percent No Answer
1. Do you use the computer as an aid to any of the classes you teach?	16	84	
2. Reasons for not using the computer as an aid:			
a. do not know how to use the computer	50		
b. do not want to use the computer as an aid	7		
c. cannot see any use for the computer as an aid	23		
d. not enough free time to plan for using the computer as an aid	41		
3. If any of the following opportunities were available, would you take advantage of them?			
a. short course in how to run the computer (running available programs)	70		
b. short course in programming the computer	57		
c. free time to work with the computer	50		
d. free time to design programs for your class	40		
4. Do you plan to use CAI in any of your classes in the future?	57	30	13
5. If computer programs were available for you to use as an aid to your instruction, would you use them?	75	11	14

Note: 67 questionnaires sent out, 44 returned

departments. Additional comments given by the instructors were included in Appendices B-E. Questions two and three may each total more than 100 percent since respondents were allowed to check more than one answer for each of those two questions. All responses were figured as percents, rounded to the nearest percent.

An analysis of Table I showed that, among the respondents, no one presently uses the computer as an aid to instruction. The primary reasons seemed to be lack of knowledge in how to use the computer and the inability to see any use for the computer as an aid. Over half expressed a desire to learn how to run available programs, but only one-third wanted to learn how to write programs. There was an even split among those planning to use CAI in the future and those who have no plans to involve themselves in it. One observes a positive note on question five when only person was definite about not using available programs.

Table II from the Drafting Department showed a strong contrast to the Business Department results. Since all faculty members returned their questionnaires, a more complete analysis was obtained. The Drafting Department is the only one of the four departments which has people using CAI in the classroom (with seven out of the nine faculty members doing so). Of the two instructors not using CAI, one stated he did not have enough time to plan for implementing CAI into the classroom while the other stated he simply did not know how to use the computer. Three of the instructors who do use CAI also expressed a desire for more free time during the day to better implement CAI into their classrooms. Two-thirds of the instructors indicated an interest in the two short course offerings, while seven out of the nine wanted

more time to work with the computer. All of the instructors, with one exception, plan to use CAI in their classes and are willing to use available programs as an aid to instruction.

An analysis of Table III from the General Education Department shows a strong parallel to Table I from the Business Education Department. Neither department has anyone currently using the computer as an aid to instruction. However, the General Education Department instructors' lack of use of CAI appears to be from lack of knowledge of the computer with a smaller percentage of instructors seeing no use for it than did the Business Education Department instructors. A good majority of the instructors appear to be willing to take advantage of any short course offerings in learning how to program the computers or in running available programs. Only half expressed a desire to use CAI in their classes in the future, but three-fourths said they would use CAI if programs were available.

An analysis of Table IV from the Electronics Department revealed no real discrepancies from the other departments as far as barriers to using CAI; those being the lack of knowledge of computers and lack of available programs, with no free time to acquire either. All respondents did indicate a willingness to take a short course in running available programs and all stated they would use computer programs as an aid to instruction if the programs were made available.

In reviewing Table V, all departments combined, one could conclude that the primary reason for nonuse of CAI on the OST campus appears to be lack of knowledge of the computer by the instructors. Seventy percent of those answering the questionnaires expressed a desire to learn how to run available programs with well over half wanting to know how

to program their computers with a plan to use CAI in the future. Three-fourths said they would use available programs. From these questionnaires, it appears that the main restraints on the OST campus on using CAI seem to be lack of knowledge of the computer and lack of free time to plan for CAI. There also appears to be a willingness on the part of most instructors to use CAI if these two problem areas could be eliminated. An analysis of how these two problems could be resolved is given in the analysis of research question two.

Research Question Two

Research Question Two: Is there a program that could be constructed to eliminate the barriers preventing instructors from using computer-aided instruction in the classroom?

To answer this question the literature of other schools which have instituted CAI into the classroom was reviewed and an attempt was made to find out what similarities might be apparent in those programs where the introduction of CAI was successful. Some of the programs reviewed were those at the Oklahoma School for the Deaf, the Texas School for the Deaf, the University of Illinois, an elementary school for the blind, and several other public school and college programs in New York, Pennsylvania, California and Texas.

The program at the Texas School for the Deaf was set up with several terminals hooked up to a main computer which was linked via telephone lines to the Stanford University Institute for Mathematical Studies in the Social Sciences (IMSSS). The system was set up with a curriculum structure that classified problems appropriate for the math level of each student, a set of rules determining problems to be

presented to each student, and a set of rules to define progress of a student through the structure.

The results have been better than expected with grade level abilities improving much faster than normal.

The Oklahoma School for the Deaf used a setup that used ten terminals linked to a Micro 800 computer on the South Campus of the Texas School for the Deaf. The results there showed a math level average improvement of almost one grade level in five months.

The Overbrook Elementary School for the Blind in Philadelphia used three terminals with keyboards that they leased through Time-Sharing, Inc., of Philadelphia with the math programs used on the terminals coming from the Hewlett-Packard Company. The results were similar to those achieved at the Oklahoma and Texas Schools for the Blind.

All of these programs involving blind students provided better results than were being achieved with conventional methods.

The University of Illinois used the PLATO computer system using a large storage capacity/capability computer with a large number of terminals (that can even be set up hundreds of miles from the base unit). The system has the capability of handling up to 4000 students at one time with a cost of only 12 cents per student contact hour.

Other programs examined used a similar setup (terminals hooked up to a large main computer) with disadvantaged and minority students and achieved similarly successful results.

There did seem to be a consistent pattern to the successful CAI programs that were reviewed. That pattern seemed to involve in each case a series of terminals linked to a large main computer that was

capable of handling several students, each of whom may or may not be working for the same programs as the other students. Another pattern in the successful CAI programs seemed to be the positive attitude on the part of the instructors, even though most had a very limited knowledge of the computer.

Essential to constructing a program for integrating CAI into the classroom at OST was the incorporation of these same successful elements other schools' CAI programs contained, as well as elimination of the two main barriers OST instructors stated as being their chief reasons for nonuse of CAI; the lack of knowledge of the computer and lack of free time to plan for CAI.

OST will have received by the summer of 1980 an IBM 4331 computer with one high speed printer, one tape drive, two disc drives, and five on-line terminals. The five on-line terminals will be used by students in the data processing section of the Business Department. Five more terminals will be added when OST implements its computer enrollment (projected for mid-1981). The computer can handle up to twelve on-line terminals and with the addition of a control unit could handle up to forty terminals. The rental for each terminal is sixty dollars per month; the control unit rental is six hundred dollars per month. Eventually the OST computer terminal system will expand to include a terminal in each department and a few additional terminals in the Learning Resources Center for use by students (besides the five on-line terminals in the data processing facility). Thus, the only additional cost a CAI system would have is the sixty dollar per month terminal rental (provided terminals other than those already mentioned would be used for CAI). This terminal system would be similar to what

other successful CAI programs have been using and eliminate the problem some OST instructors identified as the limited capability and storage capacity of the current available minicomputers that each of the previously mentioned departments has (64,000 bytes of storage compared to 1,000,000 bytes for the IBM 4331). However, the main objective of research question two was to eliminate the barriers (lack of knowledge of the computer and lack of planning time) that are preventing OST instructors from using CAI. This might be accomplished through the use of the IBM Interactive Instructional System. This system is a combination of two previous IBM training and instructional programs; the Interactive Training System and Coursewriter III programming language. This system would provide the capability for instructors to rather easily create and present CAI to their students.

Basically the system consists of a set of commands that the instructor would need to learn, together with a series of worksheets, where the instructor would fill in the blanks. The computer then takes the commands and worksheets and essentially writes the program for the instructor. Learning how to write and run these programs would take no more than a couple of days and could be accomplished during the week between trimesters at OST. The possibilities for classroom application for each instructor could also be discussed at this time, thus allowing each instructor to integrate CAI into his own classes.

An obvious plus in using the IBM Interactive Instructional System would be the availability of the expertise of the CAI center at the University of Akron, mentioned in chapter two, which has developed a system of helping schools and industry to develop their own software

using the system. Thus, the mechanics of initiating such a system at OST could easily be established with the guidance of this CAI center.

The use of terminals linked to a large storage capacity (1,000,000 bytes of storage) and advanced capability computer, rather than the use of cheaper, less capable (64,000 bytes of storage) minicomputers, combined with the use of the IBM Interactive Instructional System would seem to be a possible solution to the problem of integration of CAI into the classroom at OST. The capabilities of such a system would seem to be limited only by the imaginations of the instructors.

CHAPTER V

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Due to the purchase of minicomputers in a few departments at Oklahoma State Tech (OST), some instructors have attempted to find ways to integrate these computers into the classroom as an aid to instruction. However, possibly because of the limited storage capacity and capability of these minicomputers and perhaps because of lack of enough free time (or interest in some cases) to learn how to write or run programs using these machines, most instructors have not tried to integrate CAI into their classrooms as an aid to their instruction.

The purpose of this study was to identify those reasons for non-involvement by OST faculty members in the use of computer-aided instruction in the classroom and to construct a program based on that identification to aid in the integration of computer-aided instruction into the classroom.

The research questions used to achieve that purpose were:

1. For those departments having computers that could be used as an aid in the classroom, what reasons do the instructors give for not using the computer as an instructional aid?
2. Is there a program that could be constructed to eliminate the barriers preventing instructors from using computer-aided instruction in the classroom?

Significant Findings

Research Question One: For those departments having computers that could be used as an aid in the classroom, what reasons do the instructors give for not using the computer as an instructional aid?

The results of the questionnaires showed that, even though most instructors were not involved in using CAI, a surprisingly positive attitude toward CAI was exhibited in all departments surveyed. A majority of the instructors stated their main reasons for nonuse of CAI were a lack of knowledge of the computer and not enough free time to plan for CAI use. With the Electronics Department's instructors teaching eight hours per day and the Business and General Education Departments' instructors preparing lectures and materials for five and sometimes six classes per day, time seems to be a nonexistent element for these instructors who have the desire to learn about writing and running CAI programs. Many of the instructors commented that the minicomputer in their department simply did not have the capability of achieving some of the objectives they would have for CAI.

However, the most significant finding for research question one was that OST instructors stated a willingness to use CAI in the classroom provided equipment would be available that would have the storage capacity and capability for their CAI program ideas and provided they could quickly and easily be taught how to write and run programs on the computer.

Research Question Two: Is there a program that could be constructed to eliminate the barriers preventing instructors from using computer-aided instruction in the classroom?

The most significant finding here was that those schools that had successful CAI programs were using terminals linked to a large computer rather than using individual minicomputers, although this may have been a reflection of availability rather than preference. For a compatible CAI system campus-wide, this terminal system would probably be preferable to a system involving several different brands of minicomputers, which is what currently exists. This finding changed the CAI program construction approach in this research from restricting programs to those that would fit into the storage capacity of the minicomputers (64,000 bytes) and learning the BASIC language involved to a more restriction-free program based on the large (1,000,000 bytes) storage capacity of the computer terminal system where the computer essentially writes the program for the person using certain commands and worksheets mentioned in chapter four.

Conclusions

There are certain barriers (given on page 30) that are preventing OST instructors from using CAI in the classroom. By the use of a large computer system and the IBM Interactive Instructional System, the specific barriers identified could probably be eliminated and the use of CAI initiated and accepted.

Recommendations

1. The use of a large computer system with terminals would seem to provide better hardware and language compatibility than the use of several brands of minicomputers for providing a campus-wide CAI program.

2. Terminals linked to a large computer system should be made available to OST students and instructors for use in a computer-assisted instruction program. This could be accomplished by use of the data processing terminals and those to be located in the Learning Resources Center.
3. Certain days should be allowed during a week between trimesters at OST for those interested instructors to be taught how to write and run programs on the computer terminal system.
4. Those instructors involved in learning how to write and run programs should be given time during the trimester to develop programs (software) for use in the classroom at OST.

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APPENDIX A

COPY OF FACULTY QUESTIONNAIRE

FACULTY QUESTIONNAIRE

Please answer all questions and return to the department secretary as soon as possible.

DEPARTMENT _____ Male _____ Female _____

1. Do you use the computer in your department as an aid to any of the classes you teach? YES _____ NO _____
 - a. If yes, in what way is it used as an aid? _____
 - b. Do the students seem more motivated by your using the computer as an aid? _____
 - c. Do the students seem more interested in the course as a result of using the computer as an aid to your instruction? _____

2. If you do not use the computer as an aid to your classroom instruction, what are your reasons for not doing so? (check one or more below)
 - a. Do not know how to use the computer _____
 - b. Do not want to use the computer as an aid _____
 - c. Cannot see any use for the computer as an aid to any of my classes _____
 - d. Do not have enough free time to spend planning for the use of the computer as an aid in my classroom _____
 - e. Other (please explain) _____

3. If any of the following opportunities were available, would you take advantage of them? (check one or more below)
 - a. Short course in how to use the computer (running available programs) _____
 - b. Short course in programming the computer _____
 - c. Free time during the day to spend working with the computer _____
 - d. Free time during the day to spend designing programs to use in your class _____
 - e. Are there any other opportunities that, if made available, would encourage you to use computer-aided instruction in the classroom

4. Do you plan to use computer-aided instruction in any of your classes in the future? If not, please explain _____

5. If computer programs were available for you to use as an aid to your instruction, would you use them? If not, please explain _____

6. Please summarize below your feelings toward using computer-aided instruction in the future in your classroom

APPENDIX B

COMMENTS FROM BUSINESS EDUCATION QUESTIONNAIRES

"Don't know how CAI would be relevant."

"I need a demonstration on how to use the computer to do what I would want to do."

"I need to know how the computer would be used in teaching shorthand. I don't think our computer is capable of handling it."

"My classes do not lend themselves to CAI."

"I do not see that the time spent in CAI preparation would be beneficial. Too much time would be spent with very little results."

"If applicable, I would use CAI."

"Would use if I could be shown applications."

"See no use in theory classes."

"Management and marketing decision-making problems will be programmed, if they fit into our computer."

"Not applicable to shorthand and typing."

"Would use it if I were acquainted with the function of the computer."

"I would welcome any aid which would help me do a better job."

"I have no idea what the computer is capable of doing, but CAI seems too complicated and too big to use our machine for."

"Don't know how to use the computer."

"Don't have time to use it."

APPENDIX C

COMMENTS FROM DRAFTING DEPARTMENT QUESTIONNAIRES

"As the computer is used in industry, it will be used in the classroom."

"I can see in the future a student reviewing a lesson on the computer to pick up some part or all of a lecture he or she missed."

"I feel CAI is necessary to keep pace with industry."

"CAI is a great aid in instruction and time savings."

"CAI is a great help."

"Time involved in CAI is the only drawback I see."

"I do not know how the computer would fit my courses."

"I do not know enough about the computer to use it."

APPENDIX D

COMMENTS FROM GENERAL EDUCATION QUESTIONNAIRES

"I would use CAI if I had the knowledge and materials."

"I would use CAI if programs were available."

"I would use CAI if I knew how to run the computer."

"CAI too complicated to fit on our computer."

"My knowledge of CAI is too limited to use it."

"CAI is more suitable for accelerated students."

"I need additional training in writing programs."

"I would use CAI if I knew how to run the computer."

"My feelings at this point are positive and favorable toward CAI."

"If I knew how to use the computer, I would use it in the future."

"I see no practical use for it with our computer, however, my knowledge of it is minimal."

"Has good potential."

"Can be effective tool in freeing the instructor of some tasks (such as grade computation)."

"I welcome the opportunity to introduce and experiment with something new."

"I would run available programs if the computer is convenient to use."

"I am skeptical about the practical use of the computer in my classroom."

"I had no idea that computer-aided instruction could be used for grammar classes."

"I teach Business Principles and like to use new methods which are in themselves related to the business world."

"I am in the process of obtaining some individual computers for use in my reading classes, although their capability is rather limited."

"I see no advantage of using CAI. Would take too long to learn to use it."

"I have not yet observed, first-hand, CAI."

APPENDIX E

COMMENTS FROM ELECTRONICS DEPARTMENT
QUESTIONNAIRES

"Would use CAI if it doesn't add to the teaching load and could learn it quickly."

"Do not know how to use computer."

"CAI is here to stay."

"CAI would be useful only as a tutorial aid. Other uses would require too large a computer."

"Could be used in some of my classes."

"Would use CAI if computer were available that would fit my needs and materials can be developed. Would probably motivate students."

VITA

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Master of Science

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