1992

Learning achievement related to the use of microcomputers

Yolanda Anderson
University of Northern Iowa

Learning achievement related to the use of microcomputers

Abstract

This research paper will examine variables regarding the relationship of microcomputers and learning achievement It will examine view points from the businessperson and academic perspective. It also explains serious problems relating to the use of microcomputers in school settings. It will detail experiments evaluating intentional learning, word processing, and mathematics programs associated with learning achievement aided by microcomputers. The paper concludes with theories that support learning achievement in association with microcomputers.

Learning Achievement Related to the Use of Microcomputers

A Graduate Research Paper

Submitted to the

Department of Curriculum and Instruction

In Partial Fulfillment

of the Requirements of the Degree

Master of Arts

University of Northern Iowa

By Yolanda Anderson

November 15, 1991

This Research Paper by: Yolanda Anderson

Entitled: Learning Achievement Related to the Use of Microcomputers

has been approved as meeting the research paper requirement for the Degree of Master of Arts.

January 13, 1992
Date Approved

Sharon E. Smaldino
Director of Research Paper

January 13, 1992
Date Approved

Robert R. Hardman
Graduate Faculty Advisor

January 13, 1992
Date Approved

Robert R. Hardman
Graduate Faculty Reader

January 13, 1992
Date Approved

Peggy Ishler
Head, Department of Curriculum and Instruction

Abstract

This research paper will examine variables regarding the relationship of microcomputers and learning achievement. It will examine view points from the businessperson and academic perspective. It also explains serious problems relating to the use of microcomputers in school settings. It will detail experiments evaluating intentional learning, word processing, and mathematics programs associated with learning achievement aided by microcomputers. The paper concludes with theories that support learning achievement in association with microcomputers.

TABLE OF CONTENTS

LIST OF FIGURES

Figure page

CHAPTER 1

Introduction

Due to most recent microcomputer trends, questions regarding values of usage have arisen. How should microcomputers be used once we have them in schools? How will they change our educational system? How can we ensure equal access by all students, regardless of socioeconomic factors? Are microcomputers a craze or are they the educational genies we have been awaiting? Do microcomputers benefit or contribute to learning achievement among students? Are we creating another technological tool? Are we fooling ourselves? Some of the concerns of parents, educators, and administrators are represented in these questions. Educators, scientist, and philosophers have expressed various view points about educational technology. According to Seymour Papert, the father of the reformulation of Piaget in the light of the computer presence, we should view microcomputers as new cultural objects; rich materials with which children can build different kinds of thinking and create new relationships to knowledge (Bonner, 1984). But, according to T.F. Gilbert, "If you don't have a gadget called a teaching machine don't get one. Because if you begin with a device of any kind, you will try to develop the teaching program to fit that device" (Fletcher, 1983, p. 103). Researchers believe that Gilbert was partially correct in his philosophy. Not only have we developed

and revised the teaching program to fit computer technology, but we continue to alter teaching programs to fit any popular brand or style of technology created (Fletcher, 1983). General attitudes would agree that each author is partially correct, the reality and outlook of microcomputers in the classroom are positive and encouraging for the future. In 1981, the number of computers used in American public schools was 31,000. In 1983, it increased to 325,000 and is expected to double by 1990. In 1985, the approximate number of computers used in American public schools reached a height of 1.6 billion (Bonner, 1984). This number is still growing, fortunately more than half of the nation's public schools have at least one microcomputer.

Reality of Microcomputers

Currently educators and scientists believe the most promising use of technology in the future is the microcomputer. These laboratory tools called microcomputers are finally making their way into the classrooms. Microcomputer based science laboratories consist of probes attached to a computer. The probes interact with designed software and measure various phenomena such as light, temperature, brain waves, pulse rates, and distance. Students working with microcomputers can measure pitch, wavelengths, and produce graphs.

At this point a literature research is necessary and appropriate to answer questions concerning future problems of microcomputers. The scope of

literature concerning these problems is vast. Commercial media and publications flood library shelves, book stores, and news stands with articles concerning computer efficiency. Past educational research regarding microcomputers' association with learning had been scarce. In the past, researchers had not found any substantial proof regarding microcomputers' association with learning achievement. In the past five years research has revealed evidence that microcomputers provide individual instruction, motivation, recall, and immediate feedback. Lately, research results show that learning is accomplished (Gagné, 1985).

Potential for Microcomputers

The potential for microcomputers improving learning is enormous. James Rutherford, of the American Association for the Advancement of Science, stated that the major concern must begin with adequate planning and funding of computer purchases through curriculum development and teacher training. He also stated that if one link in the chain is weak then the potential success of computer program in schools will be less efficient (Evans, 1984). This is stressed because of the lack of communication and cooperation between educators, government, and private sector companies. He stressed the point that these same factors create a lack of precedent and policy in the need assessment, purchase, and implementation of computer technology. According to Evans (1984) there are four potential major instructional applications for

microcomputers: (a) the microcomputer's potential for computer programming and problem solving skills; (b) its potential as a tool that helps in task of statistical analysis, word processing, control of laboratory instruments, data base manipulation and searching, communication network, and graphic use in the arts; (c) the potential as a teacher or tutor in drill and practice, tutorials, learning games, simulations and logic solving problems; (d) as a manager with student schedules, academic and attendance records, and finally student test scores.

Statement of the Problem

The purpose of this research was to examine the reality, potential, and success of microcomputers in an instructional setting. As with all technological advancement problems exist. This research examines issues regarding efficiency and effectiveness of microcomputers in instructional settings, and issues concerning whether or not microcomputers increase learning levels of students.

CHAPTER 2

Literature

This review of literature reveals evidence that learning is achieved when the microcomputer is implemented as the learning tool. All of the components of the learning process are present and the microcomputer fosters a positive approach to learning. The learner is in control, the learner receives immediate feedback and review, it also promotes reading, and some programs match the learner's characteristics. Evidence also suggested that several problems exist in the areas of realistic needs assessment, training, utilization, and availability. Evidence continues to reveal promising results in experiments regarding computer supported intentional learning, word processing, and mathematics programs, all of which are supported by highly recognizable learning theories.

Reasons for Microcomputers

Academic Reasons

Educators, as well as administrators, have different reasons to support their philosophy of microcomputers in classroom settings. Educators support microcomputers for these reasons; (a) microcomputers utilize a processor to control its other components to run programs; (b) the capabilities and power of the microcomputer are actually superior to those of large computers on the bases of price vs performance, special capacities, sound, color, and size; (c)

microcomputers provide diversity in terms of content and subject matter; (d) they provide students with a diverse amount of courses far beyond what is feasible (Office of Technology Assessment, 1989). The sense of individualization can be achieved by computer-assisted instruction, both in terms of actual rate or progress of the student and also in terms of convenience of time and place for the student. Educators, as well as administrators, support microcomputers because they are productive in the face of declining budgets, especially in the light of faculty sizes (Office of Technology Assessment, 1988). The most important asset of the microcomputer in a classroom setting is that it incorporates and accents both the internal learning process and the external instructional events needed in an instructional setting to achieve learning (Figure 1) (Gagné, Wagner, & Rojas, 1981).

Figure 1
INTERNAL PROCESS OF LEARNING & THE EXTERNAL INSTRUCTIONAL EVENTS THAT SUPPORT COMPUTER ASSISTED LEARNING

INTERNAL PROCESS	EXTERNAL EVENTS
1. Alertness	1. Gaining
2. Expectancy	2. Informing learner of lesson objective
3. Retrieval of working memory	3. Stimulate recall of prior learning
4. Semantic encoding	4. Presenting stimuli with distinctive features
5. Selective perception	5. Guiding learning
6. Reinforcement	6. Eliciting performance
7. Retrieval and responding	7. Providing informative feedback
8. Cueing retrieval	8. Assessing performance
9. Generalizing	9. Enhancing retention and learning transfer

Note: From Internal process of learning and the external instructional events. (p. 233). by Gagné, Wagner & Rojas, 1981. Copyright 1981. Printice Hall. Reprint.

Administrative Reasons

According to David Lancaster (1985), reasons for microcomputer usage in an administrative setting are based on the planning and management objectives. He believes that there is a need to relate education to the needs of the growing economy. Parental pressures and student expectations are weak

reasons he recommends for the use of microcomputers. He supports these economic reasons with the premise that learning is increased and becomes more efficient. He stressd that there is an administrative need to facilitate data processing for reporting to external groups and a great need for better information and decision making in all administrative and educational areas. Finally, he believes that there is a serious demand for increased efficiency in school systems as a whole. Lancaster's reasons for microcomputer in school settings are based on competitive management and planning issues. Unlike Lancaster, business persons view microcomputers as ordinary technology that may be obsolete in a few years (Barden, 1981).

Attitudes Concerning Microcomputers

Commercial Attitude

Commercial persons view microcomputers as an investment in technology with double edged advantages and limitations. The vendor of a microcomputer package makes his profit by selling to as many users as possible. Vendor packages provide large profits for suppliers, but there is a great risk in selling them. This means that there are a large number of firms selling software and hardware. Some firms develop package offerings of similar brands and functions. These units may not be originals or from the same brand line, therefore, the quality may be poor. Some packages are poorly maintained and are supplied with little documentation if any. According to one survey these

companies go bankrupt within a year (Avison, 1983). The low cost of microcomputer hardware and some software could possibly be an advantage because of price. On the other hand, if the purchaser buys cheaper hardware he may discover poor printing quality, frequent failures on disk, poor security and backup, video display unit screens may be difficult to read, and slow processing problems could occur. In addition, microcomputers may not be easily upgraded to meet the increasing demand of the user. Storage devices may be added, but increasing speed is difficult and compatibility poses a problem. Consumers should not neglect the fact that free maintenance and technical advice only last a few days after the purchase. Longer warranties may be purchased for organizations buying large quantities (Barden, 1981). Evidence also reveals that some schools are simply targets for sales persons. Therefore, school closets are packed with noncompatible computer software, hardware, and other learning tools administrators and staff ordered without technical knowledge or plans for usage in classroom instruction. Hardware and software are rapidly improving which makes it difficult to keep up with the growing technology of microcomputers. The perspective buyer should be concerned with whether or not the system will soon be out of date (Barden, 1981).

Educator's Attitudes

Educators have many different attitudes about microcomputers. Keith

Smelser (1979), stated that with each new teaching tool excitement builds, and consequently educators and administrators assure the public of its success. Although, he stressed it is public knowledge that some teaching tools were highly successful and others were absolute failures. Smelser raised a major question, "Is the micro just a passing fad or will it become an integral part of the American education system?" (Smelser, p. 94, 1979). He pointed out the fact that educators are aware of many classrooms and storage closets full of unused overhead projectors or self paced learning machines. Smelser believes that the impact of the microcomputer will have a sweeping significant effect on education in a few years, only if we determine how to best use them. In his guidelines for microcomputer functions he suggested that faculty, curriculum, and instructional designers develop an instructional delivery system that utilizes the microcomputer and does not pose a threat to the teacher. He insisted that a comprehensive curriculum for use on microcomputers be developed in an orderly manner. Educators should use accepted research techniques to test methods of delivery, and be sure the school board and the district administration make the financial and personnel commitments necessary to support microcomputer systems. Finally, educators need to inform the community, provide inservice, design pilot tests, evaluate, implement then re-evaluate (Smelser, 1979).

Teachers are beginning to understand the computer's potential for

helping students solve problems, think logically, and collaborate with other students. They have seen student's enthusiasm build towards computer usage and want to capitalize and channel this energy to expand learning. Surveys are revealing that teachers want to develop professionally, learn the computer to do their jobs better, and help their students. On the other hand, some teachers are still apprehensive because of parent, school board committee, and administrative pressure (Fletcher, 1983). Administrators and parents want teachers to use computers because of the job market skills students can receive. Students can better prepare themselves for future employment and some are creative enough to open doors of opportunity through their computer skills. Administrators have found that microcomputers are very efficient in avoiding cutbacks by switching and deleting clerical positions. Dr. Fletcher (1983), stated that changes from human resources to computers added extra pressure to teachers who still fear that they will be replaced by computer technology.

Not surprisingly, some teachers without computer experience view them as distractors. As one teacher stated in the Office of Technology Assessment document (1988):

> They rolled this thing into my class and said, 'Here it's yours for a month.' What did I want with it? I let each kid have a half hour on it and the other 23 would be looking at the clock the whole time saying 'is it my turn yet?' By the end of the week I just used it as a place to throw the kids' coats on (p. 89).

There are still negative attitudes and fears that students could neglect important

skills such as penmanship or computation. Some fear that this lack in brain usage and reliance on the computer's brain will influence students to cease using their memory and become forgetful.

Business persons and educators have different attitudes about microcomputers. Each attitude varies because of each individual's perception of the new technology. Business persons view it as a commercial product that turns over profits and commission (Avison, 1983). Educators, who accept the microcomputer as a learning tool, are positive individuals usually concerned with any tool that achieves or aids learning. On the other hand, the different attitudes of educators who view microcomputers as distractors, or fear that they will replace them and turn students into robots, are hindering the opportunity for students to learn and experience a new technology (Fletcher, 1983).

Problems with Microcomputers

Realistic Needs Assessment

The first problem arises in the realistic evaluation of the need for microcomputers. Administrators and educators agree that an assessment of need is important to determine the long range utility and clarification of the microcomputer's contribution to the goals and objectives of the school. A complete assessment is vital in determining the required skills and knowledge necessary for mastery of the microcomputer as a learning tool. According to Dr. Robert J. Evans (1984), of Troy Sate University in Alabama, if the use of

microcomputers does not promise increase learning potential, then the use of microcomputers may not be warranted in the fulfillment of a curricular need. He believes that microcomputers should only be purchased if they help to solve educational problems. He stated that educational goals and objectives need to be clearly determined and, if used, the results in improved instruction should be higher than results obtained from traditional instructional. He stressed that well developed objectives must be determined. These objectives need to be accented with activities that will help determine duties of the teacher, students and instructional media necessary for both the teacher and students. These objectives and issues concerning the assessment of microcomputers should be given top priority before implementation of any computer program.

Teachers of writing have become concerned with the value of computers in classroom settings (Stumhofer, 1988). Reports of problems that arise when incorporating computers and word processors are emerging frequently. Reports reveal computer instruction at the high school level tends to be more about computer programming rather than using the computer to teach content. Teachers and administrators need to collaborate issues concerning pedagogical applications of the computer. Teachers need to discuss individual student needs concerning computer based writing classes. There is a great need to understand and teach with computers. Teachers must decide the role of the computer in the classroom for drill and practice or as a composing tool. Teachers should

consider whether to use other writing software, in addition to word processing, such as outlining, spelling, and style of software. Administrators need to create on-going inservice programs designed to be responsive to computer using English teachers. Educators can choose to view change caused by using computers as liberating rather than threatening.

Teacher Training

Training teachers is another problem that exist with microcomputers. Training is a long and expensive process in education. Presently, higher education institutes have incorporated computer-assisted labs and courses devised to educate the perspective teacher in all accredited educational programs. Teacher training is one problem that can not be solved instantly. There are various repercussions that follow lack of teacher training. If a teacher is not trained nor has knowledge or expertise in the computer as an instructional tool, neither the students nor the teacher is using the tool to its full potential which creates the problem of underutilization. According to Hugh Mehan, (1987), there are specific problems associated with computer use in schools. Underutilization of the computers' capabilities is a serious problem that exists in many schools. In schools the teachers' over emphasis on basic skills instruction can be a problem. Therefore, if the computer is used only to teach basic skills, its capabilities are not being used to full potential. This type of underutilization of the microcomputer prevents the student from learning.

According to John Hopkins survey there is a substantial inequality in the access of new technology among schools and school children (Bonner, 1984). The survey also supports the statement, "Public schools in districts with a high percentage of poor families are much less likely to be microcomputer-owning schools" (Bonner, p. 7, 1984). On the other hand Ken Brumbaugh, executive director of the Minnesota Educational Computing Consortium (MECC) disagrees (Bonner, 1984). He does not agree that the inequality is the problem. He states, "If you look at computer accessibility in Minneapolis, New York City, Los Angeles, Dallas, and Houston you will find that computers went to these cities lower economic areas" (Bonner, p. 7, 1984). He stressed that computer access is not a socio-economic issue, but one of teacher awareness. He also stated "perhaps lower socio-economic school districts have a weaker set of teachers (Bonner, p. 7, 1985). Stratified access to computer or inequitable access based on race, sex, and income, results in controversy. In schools, access *to computers may be based on these variables: gifted, normal, or special* students, lower or higher income students, and male or female gender. Some schools have access to microcomputers as a result of these reasons: federal government programs based on requirements and qualifications, private establishments, and school board goals for the year. According to National Education Association's (NEA) Linda TarrWhelan, there is substantial amount of inequality in the access of technology among schools. "In simple terms, the

poorer a school is, the less likely that school is to have any new technology" (Bonner, p. 7, 1984).

Software

The final problem that exist with microcomputers is the poor quality of software. Educators agree that software is the most troublesome aspect of the microcomputer. According to Troy Esbensen, coordinator of elementary curriculum and instruction in Edina, Minnesota, "Most of the software on the market is "Star Wars" junk that computer hobbyist design not educators" (Billings, p. 22, 1980). Karen Billings (1980), director of the Microcomputer Resource Center at Columbia University Teachers College, resents that statement and assures the public that quality educational software does exist for the Apple II, Commodore PET, and the Radio Shack TRS-80. She recognized the fact that other problems exist such as software that does not fit with the teachers' needs, incompatibility, and the mere fact that software is expensive. Billings pointed out that this problem is being addressed by the Minnesota Educational Computing Consortium (MECC) to set up a software dissemination network and to endorse a single manufacturer's microcomputer equipment for use in schools. Today many schools can purchase software from MECC and receive it through telephone communication immediately.

Experiments that Support Learning Achievement

There are several approaches to studying the effects of computers in the

classroom. Researchers focus on the intellectual processes that are inhibited by the computer. Their focus is often on the cognitive level of the individual student engaged in a problem solving task. Research in cognition has been successfully explored and many aspects of teaching and learning, has contributed to some of the developmental work with computers. The results from this research can tell us how computers work and why they effect learners (Gagné, Wagner & Rojas, 1981). Cognitive skills such as self learning, remembering and thinking, techniques of thinking, ways of analyzing problems, and approaches to problem solving are enhanced and encouraged through the interactive nature of the computer environment. These results also reveal that students learn at different stages and have individual learning styles (Gagné, 1985). These research results highly suggest that microcomputers assist in student learning achievement.

Other studies consider how the technology or the software is used by individuals, small groups of students, or by entire classrooms. This type of research has three purposes. The results can be used to improve the software computer application, and to determine the extent and type of training needed to support teachers in their use of computers. The third purpose examines and improves the contextual factors that influence how computers are used in school settings.

Traditional computer studies still compared experimental computer-using

groups to students working on the same topics without computers. Results of this type of experimentation reveal whether or not learning was achieved, if the environment was conducive for learning, were the variables of motivation present, and other factors that may or may not have attributed to success or change. Current research methods are relatively advanced in assessing whether or not students have learned the basic content. Although, various methods of experimental research exist there is still a lack of evidence regarding complex thinking skills and changes in attitudes toward learning (Bereiter, McLean, & Scardamalia, 1987).

Computer Supported Intentional Learning Environment

One experiment under the direction of Bereiter, McLean, & Scardamalia, (1987), was Computer Supported Intentional Learning Environments (CSILE). This experiment utilized computer software to promote the constructive processes involved in intentional learning environments. CSILE enable groups of students to build a knowledge base of their thoughts in the form of pictures, color, graphs, written words, and notes. CSILE was developed for university and graduate level students, but the current research focused on two sixth grade classes in Toronto, Canada. The results revealed that CSILE maintained attention to cognitive goals, treated knowledge deficiencies in a positive manner, and provided process relevant feedback. It also encouraged learning strategies other than rehearsal, multiple passes through information,

and maximized use of examination of existing knowledge. CSILE also supported varied ways for students to organize their knowledge, provide opportunities for reflexitivity and individual learning styles, facilitate transfer of knowledge across context, finally it gave students more responsibility for contributing to each other's learning (Bereiter, McLean, & Scardamalia, 1986). Scardamalia believes that these findings support one component of the cognitive theory of learning. The environment was positive and conducive to learning, therefore, some learning must have taken place.

Word Processing

Unlike, intentional learning programs researchers believe that word processing programs offers writers ease in editing, neat printed copies, and tend to make the writing process more public (Hoot, and Kimber, 1989). They identified these as key strategies that seem to be essential for improving a student's written work. These programs incorporate features that hyphenate words, check spelling, and comment on grammar and sentence structure. It must be pointed out that student writing does not necessarily improve by using work processing programs. These programs only influence the student to write more because they enjoy using the computer. A writing program called CATCH has been widely used and accepted because it takes the student's view point as it proofs the content and focuses on the meaning of a passage rather than on its superficial points (Mehan, 1987).

On the other hand, a word processing program was used with beginner writers, whose lack of motor coordination often slows down their competence in written communication (Hoot & Kimber, 1989). The initial intention of their research was to display two microcomputer applications that revealed benefits of learning tools in elementary settings. They concluded that word processing programs provided learners with visual, motor, and even auditory support. It encouraged writers to focus on content rather than form and increased the likelihood of revision. It also encouraged learners to write more by minimizing mechanical drudgery, provided learner with letter quality output, which encouraged sharing of writing, promoted social interaction by making writing visible to passerby, made writing appealing for special need children, finally, it encouraged a positive attitude toward learning.

Mathematics Programming

Fletcher (1983), explored the effects of using programming to teach mathematics at the elementary and middle school level. He referred to two studies that revealed that students who did not use programming out performed those who did, while two other studies found partial and limited support for programming. On the other hand, a high school study revealed that students who received programming in addition to mathematics instruction performed less well than students without programming instruction. The second program was Logo. Logo does not teach the planning skills necessary for programming.

It does in fact develop problem solving skills, facilitate learning of mathematical concepts, encourage collaboration, social development, creativity, and spatial relation development. Some educators view programming as a useless process for many students. J.D. Fletcher (1983), believes it is essential to teach programming because it provides an effective transfer of skills and serves as a key to unlocking an understanding of the computational future students face. He suggested that "we teach students programming for the same reason we teach them Shakespeare" (Fletcher, p. 154, 1983). On the other hand, results from research on mathematical computer programs reveal a correlation among programming and some aspects of cognitive development. Therefore, programming should not be ignored, but incorporated into computer programs (Fletcher, 1983).

One additional study conducted by Elaine Walker and Jann Azumi (1985), examined some of the effects of computer based instructional achievement in association with learning. The research was based on these specific questions: (a) what is the relationship between such attributes as sex, ethnicity, socioeconomic status, ability, and mathematics achievement in computer based educational programs; (b) are there demonstrable differences in mathematics gain that are related to various content standards; and (c) how do instructional factors such as time on task and instructional management impact on achievement? These questions were answered by reviewing the performance

of sample elementary/secondary students enrolled in drill and practice computer-assisted instructional programs. Findings for elementary students in primary grade levels reveals high ability students made greater gains on computer programs. Results for intermediate grade levels did not reveal any significant changes or differences in performance. Findings for junior high school students of lower ability had greater gains. Finally at the secondary level results suggested that computer-assisted instruction maximized individual instruction and had beneficial learning effects for all ability level students. This supported the fact that the instructional and individual nature of computers can facilitate learning at different learning stages or levels depending on the student's individual learning style.

Theories that Support Learning Achievement

Cognitive Learning

Computer based learning has been researched frequently by many groups. The Office of Technology Assessment (1988), results reveal that microcomputers are an effective supplement to traditional classroom instruction. Their results pointed out that elementary students display gains equal to between 1 and 8 months of instruction compared to students who received traditional instruction. Computer-assisted instruction was also effective for low achieving students even when evaluating different student groups (Office of Technology Assessment, 1988). Results also showed that microcomputer

tutoring systems attempt to supply artificial intelligence techniques and theories of human cognition. Some programs provide a variety of teaching strategies that allow more learning through the analysis of student's individual skill, knowledge, and problem solving ability. Microcomputer based laboratories have been accredited with outstanding success in helping students master complex concepts as well as analytical techniques such as graphs, scientific and mathematical equations, and theories. OTA's results also reveal data management programs help extremely successful students upgrade their test taking skills through identification of required information to solve problems and how to efficiently organize information. They found that reading comprehension could be greatly strengthened through computer-assisted instruction. It is believed that the advancement comes from the student dealing with the entire text. Finally, increases were revealed in decoding the word recognition programs, test media programs, and speech analysis programs.

Internal Learning Process

Robert Gagné (1985), stressed that the internal learning process can be influenced by microcomputers. Attention and selective reception is a learning process the microcomputer provides through arousal, enhancement, differentiation, and objective features. Semantic encoding is provided through the computers' verbal instructions, pictures, and diagrams. The internal learning process of retrieval can be achieved through display of cues such as diagrams,

arrays, and rhyme aided retrieval. Response organization is presented though verbal instructions about the objectives for learning. Control processes represented in the internal learning process can be perceived through established instruction sets that activate and select appropriate strategies with the computer. Finally, expectations are achieved through microcomputer usage by informing the learner of the objective established and the specific expectancy of performance (Gagné, 1985).

Interactive Nature of Microcomputers

The interactive nature of microcomputers taps into the internal and external strategies of cognitive theories and assures learning achievement. Internal cognitive strategies are activated through recall (Gagné, 1985). Composing an essay on the computer is one example that demonstrates how internal cognition can be developed. Word processing programs require recall of a great deal of information about the subject. The student must use his recall, and is motivated to continue the writing process with ease and confidence because of the nonintimidating feedback. The microcomputer gives immediate feedback that provides information to students in the format that requires precise answers. This approach breaks learning down into a series of small steps. It provides constant feedback to correct errors and allows the student to proceed at his own pace.

External cognitive strategies of learning are also achieved in computer

assisted learning. For example, various types of learning material may be presented with computer programs. The learner can interact with the microcomputer by typing answers on the keyboard or by touching the display screen with an electronic pencil. In additional to providing immediate visual and/or audio feedback the microcomputer can analyze student answers. An example of external cognitive development can be demonstrated when the learner is faced with decisions about strategies for attending, encoding or retrieval. This example is best displayed through problem solving situations that confront the learner, require timed selection, and use different strategies in a solution. The student is challenged to discover new ways of managing and thinking.

CHAPTER 3

Summary/Conclusion

In conclusion, this research paper has explored the literature that suggests a strong possibility that learning is achieved through computer-assisted instruction. The use of the microcomputer has become very popular with educators and administrators. The popularity has been the results of solid research and fads. Administrators greet microcomputers as handy tools that speed up and alter clerical duties. Some educators welcome them as learning tools that motivate students, therefore, they view the microcomputer as a positive aspect to challenge learning. On the other hand, some still fear the microcomputer because of a lack of training and fear of being replaced by the computer. Further research of the microcomputer reveals a host of problems. The microcomputer as a technological invention is still in its developmental stage. Problems are arising in its application in the classroom setting. Researchers and educators are discovering problem areas of training, utilization, stratified access, availability, and software. Experiments such as CSILE, word processing, and mathematics programming yield results that definitely suggest learning is achieved. These studies are further supported with cognitive theories that suggest computer-assisted instruction is beneficial to students because of the internal and external events of instruction presented in a computer-assisted environment. Although some may disagree, it is highly possible that microcomputers motivate students and stimulate learning achievement.

References

Avison, D. (1983). Microcomputers and their commercial application. London: Blackwell Scientific Publications.

Barden, W. (1981). Microcomputers for business applications. Indianapolis, IN: Howard W. Sams & Co., Inc.

Bereiter, C., McLean, R., & Scardamalia, M. (1987). Computer supported intentional learning environments. (Report No. TM 870 739). Toronto, CA: Ontario Institute of Studies in Education. (ERIC Document Reproduction Service No. ED 288 913)

Billings, K. (1980). Microcomputers in education: Now and in the future. In J. L. Thomas (Ed.), Microcomputers in the schools (pp. 61-90). Phoenix, AZ: The Oryx Press.

Bonner, P. (1984). Computers in education: Promise and reality. In J.H. Tashner (Ed.), Educational microcomputing annual: Vol. 1 (pp. 3-8). Phoenix, AZ: The Oryx Press.

Evans, R. (1984). How school systems should purchase microcomputers: Software evaluation method. In J.L. Thomas (Ed.), Microcomputers in the schools. (pp. 6-19). Phoenix, AZ: The Oryx Press.

Fletcher, J. (1983). Some things they forgot to tell us about educational complying. In J.H. Tashner (Ed.), Educational microcomputing annual: Vol. 1 (pp. 144-157). Phoenix, AZ: The Oryx Press.

Gagné, R. (1985). The conditions of learning and theory instruction (rev. ed.). New York: Rinehart and Winston.

Gagné, Wagner, & Rojas. (1981). Internal process of learning and the external instructional events. In J. Chambers., and J. Sprecher. (Eds.), Computer assisted instruction: Its use in the classroom. Englewood Cliffs, NJ: Prentice Hall Inc.

Hoot, J. and Kimber, M. (1989). Early childhood classrooms and computers: Programs with promise. New York: Rinehart and Winston.

Lancaster, D. (1985). Management and planning issues in the use of microcomputers in the schools. (Report No. TM 870 689). Bangkok, Thailand: United Nations Educational, Scientific & Cultural Organization. (ERIC Document Reproduction Service No. Ed. 281 521)

Mehan, H. (1987). Computers in the classroom: A quasi experiment in guided change. Cambridge, MA: Harvard University Press.

Office of Technology Assessment. (1988). Power on! New tools for teaching and learning (OTA-SET-379). Washington, DC: U.S. Government Printing Office.

Smelser, K. (1979). MicroComputers: Fad or function. In J.L. Thomas (Ed.), Microcomputers in the school. (pp. 87-106). Phoenix, AZ: the Oryx Press.

Stumhofer, N. (1988). The impact of computer-assisted instruction on students. (Report No. JC 880 209). Schuylkill, Haven: Pennsylvania State University, (ERIC Document Reproduction Service No. ED 293 600)

Walker, E. & Azumi, J. (1985). The impact of computer assisted instruction on mathematics learning gains of elementary & secondary students. Presented at the Annual Meeting of the American Educational Research Association, Chicago, Il.