IMPACT OF A COMPUTER INTEGRATED LEARNING ENVIRONMENT ON STUDENTS' ATTITUDES, KNOWLEDGE, AND USE OF COMPUTERS

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CHAPTER I

INTRODUCTION

Late in the 18th century an industrial revolution model of public schooling began to evolve. "Public schools increasingly resembled factories. Students were batch processed through standardized classrooms under the supervision of a principal" (Jones & Maloy, 1991, p. 45).

Since education reflects the larger society from which it stems, the factory model is becoming obsolete, and a new model is currently emerging. Obviously, schools were greatly influenced and transformed by the Industrial Age just as they will be greatly influenced and transformed by the Information Age (Toffler, 1980). Times are changing and schools are being forced to accommodate those changes.

It has been argued that the intended function of an educational system is to further the growth and development of the total individual (Silver, 1983). The computer revolution in the past few decades has had, and will likely continue to have, a tremendous impact on America's educational philosophies and systems. The United States has been transformed from an industrial society into an information society that relies heavily on computers and their related information systems (Naisbitt, 1990). It is inherently crucial, therefore, for students to at least understand the nature, features, and importance of computers in the society of today and of tomorrow. Students need to know how and when to use the computer as a tool to process information, and they need to realize both the capabilities and limitations of computers. School districts, if they are to survive, must respond to the need to incorporate computer technology into their existing programs in a manner which enables them to be successful.

Today, some educators are identifying potential uses of computer and other technologies as viable solutions to existing instructional problems. Many of these same individuals have realized that the computer is not just a delivery system for drill-and-practice exercises or games, but a tool that can assist students with differing abilities and experiences to move at their own rates through learning achievements (Tashner, 1991). The computer is thus becoming an essential tool of students and teachers. Its proper application will likely continue to improve instructional conditions. Unfortunately, the potential for using computers in educational endeavors has barely been tapped in schools.

Significant computer trends in education have been (1) teaching computer literacy, (2) assisting the instructional process, (3) integrating computers in education, and (4) communicating via computers (Roberts, 1983). Usually educators are faced with the decision to either use the computer as a tool for teaching other subject matter or as the subject matter itself (Geisert & Futrell, 1990). In making this decision, educators do not agree on either the value of, or the role to be played by, computers in education.

> Schools with computers either taught classes in computer literacy or computer programming. Such uses did not tap the power of computers as tutors or tools much less as tutees. They did not change the way teachers teach and students learn. That need remains (Young, 1991, p. 144).

> Over the past several years, many schools have begun to teach with and about computers. Teaching with a computer involves using a computer to present part or all of the instruction materials covered. Teaching about computers means presenting materials about the history of computers, how they work, and what can and should be done with them. There is some debate, however, as to whether teaching with and about computers should be done at all (Brownwell, 1987, p. 11).

Geisert and Futrell (1990) aptly demonstrated that

> it might be simpler to teach about computers than to employ them to teach. A computer-using teacher must be able to integrate a computer into an existing curriculum--judging when it will do a task well and matching the computer's capabilities with the instructional program for which the teacher is responsible (p. 11).

Some educators have vehemently disagreed with efforts to integrate computers into the instructional process by labeling this trend as just another educational fad soon to diminish like all the others. The Everest Syndrome is used by those who resist using computers to explain

> those who fall prey to believing computers should be brought into education because they are there. We do not agree. Placing a child and a computer in the same room is no more likely to yield benefits than placing a child and a book in the same room. . . . We must guard against the belief that computerization always represents progress. Convenience, speed, and accuracy are not necessarily tied to validity and importance (Johnson & Maddus, 1991, p. 9).

Educators in the Jenks (Oklahoma) public schools, like those in countless other school systems across America, are faced with the dilemma of how and when to use computers in the school environment in a way that may bridge the many philosophical and pedagogical differences. By offering options in the manner in which students utilize computers, the Jenks High School programs provided three such choices for the incoming ninth grade class of 1989-90. Students could select a traditional computer science department elective, avoid formal class instruction in computers totally, or volunteer for an experimental program sponsored and partially funded by a National Science Foundation grant.

Project Transformed Learning Center (TLC) provides a computer-based educational environment for 120 randomly selected secondary students.

> This environment offers self-paced, individualized instruction through the use of integrated technologies. . . . Students and teachers will have access to 25 Memorex-Telex workstations, 40 Apple Macintosh Computers, CD-ROM, laserdisc, hardware and software, and on-line retrieval capabilities (Schoenefeld, 1988, p. 20).

A more detailed description of the TLC is provided in Appendix A.

Statement of the Problem

> Researchers are generally optimistic about the future of the computer in education. They feel that the hardware problems are being dealt with and that future advances in technology can only result in the Educator's Dream Machine. However, it is also generally accepted that the problem of ensuring an adequate supply of quality courseware and of training teachers how to use the computer in an effective manner will continue to impede the widespread integration of computer technology into the school system . . . computers should naturally find their place in the educational system (Forman, 1982, p. 49).

While the prevailing view is that computerization is essential and that change is inevitable, there is as yet no clear evidence existing that a given model will accomplish the necessary type of change. The question of how computers should be introduced and incorporated into student learning becomes the focus. Should educators concentrate their efforts on developing and presenting separate computer literacy course offerings or should educators concentrate on utilizing computer technology as a tool for enhancing student experiences within the various content areas? Should these two extreme views be combined in some fashion or should computers be ignored altogether as merely a fad? The need, therefore, is to determine the best and most efficient manner of incorporating computers in education so that students can become effective users and consumers of computer technology.

The specific purpose of this study was to identify the impact, if any, of the different means by which students interact with computers within the educational setting. Specifically, the variables of computer literacy, attitudes, and use were assessed as affected by an integrated computer curriculum. The following research questions provided a focus for the study.

1. Are students in a computer-integrated setting more knowledgeable regarding computers than students who are in the traditional classroom environment?

2. Do students in a computer-integrated setting use computers differently than do other students?

3. Do students in a computer-integrated setting have a more positive attitude toward computers?

4. Does the gender of the computer user affect the degree of computer knowledge, actual use of computers, or attitudes toward computers?

Significance of the Study

After completing two years of high school, Jenks students in both the Project TLC and the traditional setting may be evaluated on how they differ. This study was designed to compare the student groupings and to measure significant differences, if any exist, between the students' knowledge, attitudes, and use of computers. The benefit of this study may be for teachers and administrators who will be required to make decisions concerning computer implementation practices in the future. Consequently, this study will attempt to accept or reject the claim that "the notion of integration into the curriculum not only enhances learning, but demonstrates the use of computer tools in functional settings and leads to computer literacy as well" (Roberts, 1983, p. 66).

Likewise, Young (1991) asserted that "it is ineffective to separate content and process . . . the use of technology must be a part of content courses" (p. 144). The National Assessment of Educational Progress report on computer competence (1985-86 survey) found that

> computers were seldom used in subject areas, but were used almost exclusively to teach about computers . . . attaining more fully integrated use of technology across the curriculum is a desirable goal (Geisert & Futrell, 1990, p. 248).

Obviously, the integration of computers and related technologies is a controversial issue in schools today. It is hoped that the information contained in the following pages will reflect research that may result in helping educators ultimately decide what students need to know about and how students need to use computers within the secondary school structure. Educators must advocate sound instructional practices as well as informed recommendations for implementation of present and future computerization.

There are a limited number of empirical studies whose methodological treatments provide objective findings to help educators formulate opinions on whether to incorporate and integrate computers or separate their study as an elective skill. Furthermore, most previous computer studies have focused on either computer literacy or computer-assisted instruction applications only, rather than on a holistic, integrated approach in schools to measure computer knowledge, attitudes, and use as exhibited by the students themselves.

Limitations of the Study

1. This study was confined to Project TLC and the control group of students already enrolled in Jenks High School.

2. No attempt was made in this study to control or monitor computer exposure outside the school environments.

3. Since the TLC Project began in 1989, no attempt was made to conduct a pre-test of participants for computer knowledge, usage, and attitudes prior to their TLC experience.

Definition of Terms

Computer literacy is "whatever a person needs to know and do with computers in order to function competently in our information-based society" (Hunter, 1987, p. 1).

Computer use is the amount of time and the manner in which a person incorporates a computer into routine tasks.

Computer attitudes reflect "an individual's feeling about the personal and societal use of computers in appropriate ways" (Simonson, 1984, p. 41).

TLC program refers to the "Transformed Learning Center" which is located within Jenks High School. An eight-year quasiexperimental study sponsored by the National Science Foundation, the program was originally designed to investigate how possibly to restructure and, hopefully, improve educational opportunities for students within the public school framework. The program utilizes emerging technologies to transmit knowledge in a flexible, student-centered, self-paced environment; the traditional state mandated Carnegie units were waived for an initial four-year period. A multidisciplinary team approach in the core areas of mathematics, science, language arts, and social studies provides an alternative to the traditional instructional delivery system. Four program goals were stated: 1) to integrate technology throughout the core subject areas, 2) to shift the teacher's role to that of facilitator, 3) to encourage students to take responsibility for their own learning by utilizing technology in the individualized learning environment, and 4) to provide a school-within-a-school social setting.

Summary

Educators must be prepared to recognize the crucial role of computer technology both today and in tomorrow's world by adapting teaching techniques and educational environments to effectively incorporate computers. Therefore, attempts must be made to identify the best methods of introducing and using computer technology. Should students be taught computer skills as a totally separate discipline or should computers simply be integrated as learning tools regardless of the discipline being presented? By investigating whether or not the specific educational approaches resulted in significant differences in student outcomes as measured at Jenks High School, the primary intent of this study was to examine two programs with different ways of introducing and incorporating computers in education.

Chapter II contains a review of the literature focused on the increasing importance of computers in education. The remaining chapters were designed to address the unresolved question of how educators should present computer technology to students. Chapter III, consequently, is used to describe the research instruments and specific methods used in the collection and analysis of data for this study. The findings are reported in Chapter IV while Chapter V contains an interpretation of the research results by providing summary, conclusions, recommendations, and commentary.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter contains a review of relevant literature concerned with the role of the computer role in the restructuring of the educational environment. The chapter is divided into three segments, the first of which is focused on the historical development of computers, growing prevalence of computers within schools, educational computing trends, the effectiveness of computer use within the educational realm, and the role of computers in the educational setting of the future. The second portion of the chapter is focused on literature dealing with school restructuring and computers. Since gender was included as a variable for analysis in this study, the final segment contains a review of gender issues related to education.

Computers in Education

Historical Perspective

Although computers may be relatively new, the human desire to count and calculate is thousands of years old. "Computers are the result of a long history of mathematical explorations and innovations" (Bitter & Camuse, 1988, p. 25). Thus, the development of the abacus over 4,000 years ago was a precursor of today's computer. The first mechanical calculator was built in 1642 by

Blaise Pascal, "the famous French mathematician and philosopher for whom a modern computer language is named" (Brownwell, 1987, p. 28).

Late in the 17th Century, Gottfried Wilhelm von Leibniz developed a machine that performed complex addition, subtraction, multiplication, and division functions; in addition, it could also derive square roots. Nevertheless, Charles Babbage, an English mathematician during the 19th Century, is most often referred to as the father of the computer since his experiments resulted in the Analytical Engine which "incorporated many of the ideas realized in the computers of today" (Brownwell, 1987, p. 29). Babbage's assistant, Ada Augusta Byron, was the only daughter of the poet, Lord Byron. Her meticulous records of his procedures, formed the basis by which later scientists retraced his early efforts. Because, "in fact, she sometimes suggested alternative hypotheses and methods," Lady Byron has also been remembered with a programming language, ADA (Bitter & Camuse, 1988, p. 27).

Herman Hollerith, working for the U. S. Census Bureau, was frustrated with the seven and one half years it took to complete the manual processing of the 1880 census. He subsequently developed a punched card system on which data could be recorded and analyzed. "Hollerith's version of the punched cards was the forerunner of the punched cards used in the twentieth century computer" (Brownwell, 1987, p. 30).

The Mark I, also known as the IBM Automatic Sequence-Controlled Calculator, was created between 1937 and 1944. It was followed by many other computer prototypes. The first practical applications of the computer began in 1950 when scientists at the Massachusetts

Institute of Technology (MIT) introduced the Whirlwind. Originally designed as a flight simulator for training combat pilots, it occupied three floors because of its tremendous size and power consumption.

Beginning with the Mark I and the Whirlwind of the 1940s and 1950s, demarcation of periods of computer developments have come to be referred to as generations, in each of which components became relatively smaller, less expensive, and capable of faster computation.

The invention of the transistor, as well as the developing use of magnetic tape and disks for auxiliary storage space, marked the second generation, during the years 1959-1964. During that same period, the introduction of authoring languages allowed educators who had no knowledge of the more complex computer languages to develop courseware. An early example was "Tutor," the language associated with the PLATO project at the University of Illinois (Hallworth & Brehner, 1980). In 1963, the most general computer language developed for the microcomputer was Beginners' All Purpose Symbolic Instruction Code (BASIC) which proved to play a major role in instructional use since it made the task of programming much easier (Hofmeister, 1984).

The development of the integrated circuit allowed for the further reduction in computer size and storage space, thus leading to the production of the third generation of computers, from 1965 through 1971. Stanford University established a research center for the design and development of programs in computer-assisted instruction (Callison, 1985). Throughout the 1960s, various educators conducted field experiments in computer-assisted instruction (CAI) and identified difficulties with incorporating computers into the classroom. These included cost, a limited number of terminals available for student use, resultant time limitations, poor instructional quality of programs, and prolonged amounts of down time (Tashner, 1991, p. 1). Computer literacy by school children was recommended by the President's Science Advisory Committee in 1967.

The development of the microchip in the early 1970s introduced the fourth generation of computers, the desktop microcomputers. The desktop computer significantly altered educational possibilities. Although the first three generations of computer educational applications had witnessed improvements in speed, cost, and storage capacities, the computer had still been a centralized machine having many terminals, thus linking the one computer to many separate users. The personal computer afforded the user freedom from the centralized machine and the necessity of sharing it with hundreds of other users. Ragsdale (1982) commented that, "in the fourth era, we presume that computers will be at least as common as cassette recorders in the elementary classroom" (p. 13).

Recent technological advances involving computer peripheral devices have allowed microcomputers to be used more effectively in schools. These include networking, telecommunications, and videodiscs.

Networking typically involves one central microcomputer, used by the teacher, linked to simpler and less expensive personal computers for students. The central computer has greater computing power and more features, most prominent of which is a hard disk on which is stored all of the instructional programs. Through the network, students use their computers to tap the information from the central computer while operating independently at their individual stations. The evolutionary concept of networking has tremendous educational implications of a much broader nature than merely connecting computers within the school setting (Geisert & Futrell, 1990).

Computer manufacturers have devised means of intercommunication among different brands of computers via modems, networks, inserted circuitry boards, or multi-system disk drives. For example, Apple computers may be adapted to work compatibly with those manufactured by IBM. Software choices for the teacher are thus greatly increased and enhanced.

As educators decide to use telecommunications, classroom computers achieve the capacity to link students with the outside world (Geisert & Futrell, 1990).

> By using telecommunication between computers in different locations, one classroom can be networked with other classrooms, other schools, some state level repository of information, national data bases, and even foreign countries (Geisert & Futrell, 1990, p. 310).

"With a personal computer and a modem connected to the phone line, communications possibilities explode" (Heller, 1990, p. 95).

Another technological advancement at the disposal of educators today is the integration of the computer with video images stored on a laserdisc player. With this technology, teachers have the power to select, recall, and view still and/or motion pictures with their students, enhancing daily lessons on virtually all subjects. A related trend is the ability to store and use graphic images.

> Facsimile machines, which allow a computer to import any type of picture or graphic image, have become everyday tools . . . Being able to receive and publish images . . . is a present-day reality (Geisert & Futrell, 1990, p. 311).

<u>Prevalence of Computers</u>

<u>in the Schools</u>

At the first Technology and Teacher Education Conference held in Greenville, North Carolina, Apple (1991) attempted to describe the role of technology.

> The growth of the new technology in schools is definitely not what one would call a slow movement. In one recent year, there was a 56% reported increase in the use of computers in schools in the United States and even this may be a conservative estimate . . . nor is this phenomenon only limited to the U. S. France, Canada, England, Australia, and many other countries have recognized the future (Apple, 1991, p. 59).

In the 1980s, American schools acquired just over 300,000 microcomputers, and the number of purchases continues to increase annually (Geisert & Futrell, 1990). The fastest growing segment of the personal-computing market was for education, according to Bell (1984).

> Henry Becker found, in his 1983 national survey of school uses of microcomputers, that almost half of the schools in the United States did not yet have their first microcomputer (Cory, 1991, p. 28).

In 1985, a survey of the 50 states indicated that Alaska led the nation with one computer per 17 students, while Hawaii had the poorest ratio of one computer for every 86 students (Geisert & Futrell, 1990). The United States Office of Technology Assessment completed a study in 1988, indicating that the average school provided one computer for every 30 students (Buerry, Haslan, &

Legters, 1990). A Fall 1990 Quality of Education study for U. S. schools reported that, "in 17% of the schools, there are 90 or more students for every computer" (p. 98). However,

> virtually all United States schools have at least one computer, and the acquisition of computers by schools is continuing. Teachers have recognized what the devices have to offer (Geisert & Futrell, 1990, p. 3).

Learning Theories Associated with Computers

When a student is observed working on a microcomputer, either alone or with peers, and seems totally absorbed for long periods of time, educators may openly inquire about the psychology of this new electronic learning device. Three basic educational theories may help explain the role of computers and their practical applications in learning: (a) reinforcement theories, (b) developmental theories, and (c) information processing theories (White, 1983).

Skinner (1958), an advocate for reinforcement theory, believed that,

> The teaching machine, like the private tutor reinforces the student for every correct response, using this immediate feedback not only to shape his behavior most efficiently but to maintain it in strength in a manner which the layman would describe as holding the student's interest (p. vii).

Children, regardless of their ages, seem to be enthralled with computers. This may be created by programs "stemming from the appropriate level of challenge" (White, 1983, p. 55).

Piaget's theories were based on stages of learning in the child's natural development. White (1983) asks,

> Is it possible that the developmental stages of learning are different for a child entering a print

> world of information vs. a child with access to an electronic learning world (p. 56).

Papert argued that true learning involves active participation and individual discovery. A computer scientist, as well as an educational technology researcher, he found that children as young as three years of age are capable of interacting successfully with computers. He categorized learning with technology into "constructionism" and "instructionism" realms. The aim of constructionism would be to give control over learning to children instead of to the computer or the teacher. "The role of technology should be to help children express themselves more creatively and to satisfy their fascination with how things in the world work" (Hunter, 1987, p. 112). The opposing instructionism, or technocentrism, was seen by Papert as incorporating technology merely for passive activities such as math drill and practice (Hunter, 1987).

> Papert has pointed out that learning to work with a computer is analogous to learning a foreign language. Children seem to learn foreign languages with relative ease while adults find this task considerably more difficult. The earlier children are introduced to the world of computers, the more comfortably they will adjust to it (Bitter & Camuse, 1988, p. 25).

Harel (1990), a colleague of Papert's at the Media Laboratory at Massachusetts Institute of Technology, interpreted their perspective as follows.

> We believe that the role of technology should be to facilitate this process of excitement in electronic schools--making children fall in love with learning--of helping them think about their own thinking, and of helping them care about the complex products they can create, and will create as productive adults in the 21st Century (p. 113).

Kolb (1984), who based his findings on the observations of Piaget, defined learning as the process whereby knowledge is created through the transformation of experiences. Since he maintained that knowledge is continually created and recreated by learners. Kolb viewed learning as a process rather than a product.

Information processing theories of learning imply that learning is a goal-directed behavior (White, 1983). Frisbie (1991), in discussing Keller's Personalized System of Instruction (PSI) model, noted that "it moves the locus of control for student learning from the teacher to the student" (p. 135). Five key elements surfaced in Frisbie's study: (1) learning is self-paced, (2) achievement is mastery oriented and sequential, (3) learning is augmented with lectures and demonstration, (4) the written word is stressed as an information source, and (5) proctors are needed to assist instructors' efforts.

Keller's primary criticisms of the traditional classroom structure were that learning is an individual, not a group, phenomenon and that learning in that structure is too passive. Also, Keller believed that the units of instruction in the traditional classroom are too large. Keller's learning principles closely resemble those embraced today by CAI proponents (Chance, 1984).

Educational Realities and Computer Trends

Two primary strands of computer-focused curriculum exist in schools: computer literacy and computer programming.

> Computer literacy is ill-defined and so much debated. It is recognized that at all levels of educations, starting perhaps as early as eight or nine years old and continuing through the school system, university, and adult education . . . Few full-scale computer literacy courses exist . . . what often passes as computer literacy is vague history or learning to program in a simplified way (Bork, 1981, p. 11).

Within the last 10 years, nearly every state has enacted legislation mandating that computer literacy, in some form, be included as an essential component of teacher training (Frisbie, 1991). Computer literacy, which may have as many definitions as there are practitioners, "may gradually be de-emphasized as students automatically acquire this knowledge through their other computer experiences" (Dede, 1986, p. 16).

Geisert and Futrell (1990) attempted to define computer literacy by identifying five criteria: (1) knowledge of the history of computing, (2) understanding of how computers work and can be programmed, (3) awareness of the use of computers to aid learning and to solve problems, (4) insight into business and industrial applications, and (5) awareness of the present and possible future effects of computer technology on society. Brownwell (1987) merely stated that computer literacy for students consists of two components: knowledge (information) and performance (skills). Perhaps the simplest and most encompassing definition of computer literacy is "whatever a person needs to know and do with computers in order to function competently in our information-based society" (Hunter, 1987, p. 1).

Computer literacy definitions, and related educational programs, vary widely with both the value and the implications hotly debated by parents, educators, and others. Some educators argue that most aspects of computer literacy can be taught using only a textbook without the presence of a microcomputer at all; others insist that a "hands-on" approach is not only necessary but is the key to such instruction. Other educators go so far as to reject computer literacy as merely an outdated or obsolete holdover from computer sciences. They assert the position that "such instruction is not only unnecessary, but, in many cases, undesirable in that it may produce an aversion to computers with some students" (Geisert & Futrell, 1990, p. 8).

The only thing about which educators seem not to argue on concerning the topic of computers is that society is undergoing a rapid technological revolution and no one knows the ultimate effects of this technology on lifestyles in general or specifically on the educational process.

Brownwell (1987) used an analogy that computers will eventually be an integral aspect of Americans' daily lives, much as electric motors in the multitude of appliances now used by many. Just as people do not need to understand the electrical motor in order to use the appliances successfully, so too will they be able to use the computers without technological understanding. If that is true, should educators even bother to teach computer literacy skills as a separate course of study?

Computer programming is the other common computer science content course taught in most schools. Again, the technological lag time is perhaps creating potential problems for educators who continue to teach out-of-date practices. Over a decade ago, Bork

(1981) pleaded, "if I could leave you with one message . . . stop teaching BASIC. . . . BASIC is the junk food of modern programming" (p. 12).

Computer Assisted Instruction

In a national survey, Becker (1987) sought to determine how students were actually using computers. He found that CAI constituted about one half of all educational computer activities.

The earliest CAI applications simply included using the microcomputer "as electric chalkboards" (Lancaster, 1985, p. 9) now CAI includes drill and practice, tutorial, simulation, demonstrations, and game formats (Bell, 1984).

When discussing the three application programs of word processing, spreadsheets, and data bases, Geisert & Futrell (1990) differentiated the barriers and powers which these CAI application programs possess for classroom usage. They predicted that

> a classroom revolution might take place if and when teachers recognize that these programs can provide the means to do something all too rarely accomplished in schools--teach students how to create, organize, store, and manipulate data (p. 108).

Microcomputers are multipurposeful classroom tools with capabilities in (1) imaging, (2) sound, (3) information storage, (4) logical decisions, (5) computations, and (6) other technological linkages to enhance learning such as the CD-ROM, video disc player, and telephone lines (Roberts, 1983). Increased access to information through data bases can be illustrated in Alaska's use of telecommunications and computers to connect the rural and urban areas resulting in "greater educational benefits with less duplication of efforts" (Roberts, 1983, p. 67).

Some of the most promising uses for interactive technology via computers in the classrooms are drill and practice, developing writing skills, problem solving techniques, understanding abstract mathematical and science concepts, simulations, manipulation of data bases, access and communications in remote locations, individualized learning, cooperative learning, and classroom management systems (Geisert & Futrell, 1990). While these technological tools can be of great assistance in creating diverse learning environments, noteworthy changes are not happening (Wilburg, 1991).

> Little change has occurred in individual classrooms. More often than not, computers came into schools not as means but as an end. The commandment seemed to be thou shalt have computers, not thou shalt use computers in appropriate, effective ways (Young, 1991, p. 144).

Why have educators been slow to incorporate computers and the other associated technologies into daily practice? Teachers who expressed reservations about using computers tended to have personal reasons underlying their discomforts or distastes. Others reported unpleasant classroom experiences using computers in the past. Too often, teachers have experienced claims that innovative devices or programs would allow teachers to dramatically improve techniques. Since the results have usually been considered only a passing trend, some teachers have ignored computers as just another fad. Some teachers have avoided technology, perceiving it as threatening to their very livelihood, while others simply lack sufficient exposure and training (Geisert & Futrell, 1990). "A meaningful approach to computer education must emphasize teaching as much as computing" (Budin, 1991, p. 24).

Mandates in 23 states, plus the District of Columbia, have required at least some type of preservice training in the use of computers for teachers to qualify for certification (Norvak & Berger, 1991). In a speech prepared for the Technology and Teacher Education Conference, Johnson and Maddus (1991) supported these efforts. "Until preservice and inservice efforts improve, it is unrealistic to expect the average teacher to make profitable use of instructional computing" (p. 11).

No doubt the added financial expense on already financially burdened educational systems is a primary factor hindering the integration of computers in the schools. Even if the individual teachers wanted to incorporate innovative classroom computer practices, they would likely be told that the money is simply unavailable. Computer technology continues to be viewed by many as a luxury not a necessity. Computers are here to stay, however, and forces outside the school arena are beginning to demand their use in the educational processes (Roberts, 1983).

Effectiveness of Computers in Education

Just how effective have computerized educational efforts been? Do students learn more? Is there any evidence that technology really results in more learning? According to Geisert and Futrell (1990), "research is rather clear on the question of students learning with computers" (p. 76). Their meta-analysis of the major research on computerized learning resulted in four major conclusions.

1. Computer-based instruction proved effective in improving student achievement at all education levels, elementary, secondary, and college. Heuston (1989) declared even different learning styles are accommodated by using computers.

> In the high school algebra course, for example, materials are presented in standard equations, but also in X-Y coordinate graphic format [which] allows both right and left brain dominant students to learn the materials more easily (p. 85).

2. Computer-based instruction was most effective on improving academic achievements as measured by traditional grading as well as by various standardized instruments. "When Kulik and his colleagues compared the finding . . . our analysis showed . . . raised final examination scores. . . from the 50th to the 63rd percentile" (Bell, 1984, p. 4). Jelden (1980) also found that the incidence of computerization correlated positively with students' grades.

3. Computerization resulted in positive effects on student attitudes toward both instruction and teachers.

> All studies that looked at student attitudes report a significant positive change, improved attendance, increased motivation and lengthened attention span . . . implications of these findings are enormous. Rather than focusing narrowly on subject area drill [the integration of computers] could be viewed as part of an intervention strategy to change anti-social behaviors and outlooks (Fisher, 1983, p. 84).

> In some schools, access for pupils to computing facilities is provided before and after school and at other times outside the normal school day; in such cases [we have] many reports of pupils arriving at school very early or staying very late to make use of the equipment. Most surprisingly, perhaps, the motivating effect . . . of pupils who have previously responded negatively to the

> educational provisions which schools make (Lancaster, 1985, p. 27).

> For the first time since we could afford individualized tutoring for all education, we now have the possibility that learning can be an active experience for almost all students. This factor alone established the importance of the computer for education (Bork, 1981, p. 1).

> Passive students who saw school as a series of events outside their control, became more active, and began to feel they had some control over events. The individual nature of computer use, researchers, concluded, seems to encourage independence (Fisher, 1983, p. 84).

4. Computer-based instruction yielded savings in instructional time. Bell (1984, p. 4) agreed that "the computer substantially reduced the amount of time that the students needed for learning.

Research findings regarding computers and education are very robust, emerging consistently in study after study, in spite of the methodological differences and diverse educational settings (Geisert & Futrell, 1990). For example, Bell (1984) found that in-school computer use was positively related to students' academic achievement and to better study skills. In 1985, Callison reported that computer use increased and encouraged social interaction. Another 1985 study, by Lancaster, indicated that the immediate feedback provided by microcomputers enhanced learning. Other studies included those by Fisher (1983), Heuston (1989), and Geisert and Futrell (1990).

Future Computer Technological Implications

In the book <u>Megatrends 2000</u>, Naisbitt (1990) indicated that the shift from an industrial economy to an information economy will easily be as profound as society's previous shift from the agricultural to industrial. Likewise, Toffler (1980) echoed that prediction of societal metamorphosis. He urged people to make deliberate choices about the kind of society they wished to structure in the coming era. The question is no longer whether educators want to move into the information processing age, but how they can use technology that is, and will be, available. Johnson and Maddus (1991) stated that

> computers are guaranteed a place in tomorrow's schools. They have permeated every aspect of modern life to the point that we no longer have a choice about whether or not they will permeate education. There are currently more computers in the world than there are people. Computers are here. They will not go away. We will make a place for them (p. 13).

Bitter and Camuse (1988) pointed out that the demand for trained computer professionals is likely to double within this decade and most people will find themselves working with computers in some way or another. "Computer literacy is fast becoming a vital job skill as basic as reading" (p. 24).

Cetron (1989) declared that, by 1995, 80% of all managers will be knowledge workers. Jones and Maloy (1991) stressed the same theme. "The emerging information age has two hallmark features: workers provide impersonal services to others, and they deal in information" (p. 46). Agreeing with the assumption that almost all areas of life will be affected by these changes, Roberts (1983) reported that "today's world and our children's future is recognized as having technology embedded in it" (p. 64).

> The salient characteristic of a knowledge society will be choices. Its economy will rely on schools for information technologies to enhance well-being; but more importantly, regaining a sense of social choice concerning scientific and technological advances is a first step toward

> reintegrating education, work and personal values (Jones & Maloy, 1991, p. 47).

Dede (1986) contended that true transformation of the schools depends on three criteria: (1) how quickly America moves to a knowledge-based economy, (2) how much educators resist changing their roles and school structures, and (3) how many resources society commits to producing quality courseware and retraining educators for its use.

Like other social institutions, schools naturally resist change as a means of maintaining equilibrium (Levinson, 1990). So how will change occur? According to Johnson and Maddus (1990), educators must be bold and visionary, with the recognition that successful educational approaches of the past will not suffice in the future. According to Cetron (1989), computers will become increasingly cheaper, more prevalent, and more significant. Portable computers will allow wireless access to data. Uniform characteristics of the learning environment will not be as important in the future since individuals will learn more on their own with the location and time being more flexible. Even the chronological ages at which things are learned will depend more upon the individual and less upon traditional, arbitrary guidelines.

> One of the principal difficulties in talking about the electronic learning environment of the future is that it will not be a single environment [but] will consist of many flexible combinations of electronic devices and services (Gibbon, 1983, p. 3).

> Computers, electronic databases, simulations, on-line communication, video, CD-ROM, satellites, and other such technologies can make school work more interesting, teachers more capable, and students more engaged, and--not to be overlooked--schools managed more efficiently (Mecklenburger, 1990, p. 23).

But, in order for these technologies to be utilized, four interrelated conditions must exist: (1) teacher training on how to use the computer technology, (2) an understanding of the developments and capabilities of computers, (3) support for experimentation and innovation, and (4) time (Geisert & Futrell, 1990).

The classroom scenario for the future was predicted by Sturdivant (1987). She forecast that, by 1990, there would be a student-computer ratio of 10:1, a videodisc player in each classroom, local network connections, and the availability of new peripherals for handicapped students. By 1993, she foresaw the widespread use of portable computers in schools, home schooling linkages, large computer screens for display, and voice input rather than keyboard input computers. By 1995, Sturdivant predicted the use of both integrated instruction and management systems and artificial intelligence and expert systems.

School Restructuring and Computers

"Restructuring is risk taking, a behavior not traditionally reinforced in public school systems" (Polin, 1991, p. 6). Not withstanding such risk, adding computers to education has definitely nurtured an environment for change in school systems. The new dilemma of just how to utilize computer technology effectively in the learning environment has enormous repercussions. What may initially seem like a simple question of how to utilize computer technology ultimately becomes focused on how to restructure and/or revitalize the educational process. However, "there has been surprisingly little written about how technology and restructuring interrelate" (Ray, 1991, p. 10).

On the one hand, computers are praised by some for revolutionizing education. "Technology is a powerful change agent" (Thomas & Knezek, 1991, p. 49). "Technologies can act as a catalyst in school reform" (Hopkins, 1991, p. 30). "Technology does have an important role to play . . . computer based technology has been called an essential ingredient in restructuring" (Polin, 1991, p. 7). The lofty claim has even been made that "technology acts to dissolve boundaries traditionally imposed on curriculum" (Thomas & Knezek, 1991, p. 50). Finally, Gillespie (1992) boldly declared that "modifying any one part of the educational process affects the whole system" (p. 20). Furthermore, proponents of technology are quick to point out successful school transformations such as the University Terrace Elementary School in Baton Rouge, Louisiana (Bruder, 1992); St. Vrain's School District in Longmont, Colorado (Dervarics, 1991); the Independent School District of La Joya, Texas ("Learning Systems Even the Odds," (1991); and Greece Central School District in Rochester, New York ("Restructuring Elementary Education," 1991).

On the other hand, in a recent study of 14 schools identified as "restructured," the role of computer technology was investigated only to find that

> only a few of them are using it as a tool to support educational and organizational changes. Often, technology use is isolated rather than school-wide. In most schools the technology is perceived as unrelated to the school's restructuring efforts (Ray, 1991, p. 10).

Even though computer technology is expensive, it seems that some administrators

> have decided that the problems of education can be solved by simply spending enough money. We have watched school districts spend vast amounts of money on technology, only to discover the faculty and staff don't know what to do with it. . . . Money alone does little to contribute to a restructured classroom environment (Rudowski & Hofmeister, 1991, p. 25).

Bruder (1992) cited Michael Walters, Superintendent of the Tupelo School District in Mississippi, who asserted that many educational reforms fail because the administrators have failed to recognize the teachers' power and influence. He insisted that schools cannot apply technology first and just expect change to happen. Leaders of Washington's Bellevue School District concur that computer integration requires other systemic changes or "all the fancy technology is a waste of money" (Held, Newson, & Peiffer, 1991, p. 21). Hopkins (1991), lead teacher of the Saturn School of Tomorrow in St. Paul, wrote that

> change is driven by vision. Appropriate tools are selected to bring about the vision. . . . I believe that it is not sufficient to reform schools; we must transform them. It is simply not enough to do what we already do in traditional schools more efficiently or more economically (p. 30).

> The story of the relationship between technology and restructuring schools is being written by two authors. One is the technology itself. The other is the social organization of schooling . . . examining the effect of technology on schools (or the lack of effect) eventually leads to the study of the social organization. . . . There is an intimate and dynamic reciprocity possible between restructuring schools and technology, but it is a relationship that has not been nurtured or exploited. Technology, by itself, clearly will not restructure schools; but schools cannot restructure successfully without using technology in education. . . . Just as it is impossible to explore the ocean floor at any length without the use of underwater apparatus, it

> is impossible for schools to venture very far into the future without the tools for survival in that environment (Ray, 1991, p. 12).

Gender Issue in Education

Numerous examples in the literature provide evidence that females have been and continue to be discriminated against in American society, especially in obtaining both educational and career opportunities which historically have been viewed as traditionally male.

Gutman (1987) challenged educators to evaluate the hidden gender messages being sent to students when staffing patterns within schools perpetuate discriminatory practices and stereotyping. Why, she asked, in the female-dominated profession of teaching are most administrative positions held by males? If male administrators dominate women teachers, do children perceive and internalize gender roles which are repressive and undemocratic (Gutman, 1987)? Reasons given to explain this phenomenon included blatant discrimination, an increase in the number of men entering teaching, society's attitude toward appropriate male/female roles, and women's lack of aspirations (Whitaker, 1990). Regardless of the reason, women are less likely to be hired for the higher paying positions within schools and, in this regard, no significant differences were found to exist between public and private educational institutions (Konrad, 1991).

Although the focus in Murphy's 1990 study was primarily on the formation of teacher organizations, gender issues permeated. It was noted in the introduction that "it is about a union movement in which gender differences had to be confronted" (p. 1). Murphy provided historical perspectives concerning women struggling to obtain recognition and leadership within the field of education, hoping for equality of pay and status. "They were women, so their story was one of the powerless empowering themselves" (Murphy, 1990, p. 46).

Shakeshaft (1989) investigated five educational administration theories: Jacob Getzel's and Egon Guba's Social Systems Model, John Hemphill and Alvin Coon's Leader Behavior Description Questionnaire, Andrew Halpin's Organizational Climate Description Questionnaire, Fred Fiedler's Theory of Leadership Effectiveness, and Abraham Maslow's Theory of Human Motivation and Self-actualization. She concluded that "all theories in educational administration suffer from this one-sided view of the world . . . theory is constructed in a way that leaves women out" (p. 151). Three explanatory models were supplied by Shakeshaft. The first focuses on the individual woman possessing internal, psychological barriers concerning socialization and sex stereotyping issues, thus blaming the victim for her own lack of achievement. The second concerns behavior of women as perpetuating the male hegemony. "Women behave in self-limiting ways not because they were socialized as females, but because they are locked into low-power, low-visibility, dead-end jobs" (p. 82). The third model portrays a male-dominated world that weakens or eliminates women's advancement efforts. "Among human beings, though, there is clear evidence that although individual men may love individual women with great depth and devotion, the male world as a whole does not" (Shakeshaft, 1989, p. 94).

According to a 1992 report issued by the American Association of University women, girls are victims of gender bias in their textbooks, tests, and teachers. The authors concluded that girls do not receive equality in American schools today, neither in the amount nor quality of teachers' attention (Sadker, 1992). The report claims that gender bias undermines girls' self-esteem and achievement. Furthermore, major findings in the AAUW report indicate that girls are not pursuing math- and science-related subjects in schools nor as careers in anywhere near the same proportion as boys. This is a major problem since as Adelman (1991) pointed out, "more math means more money--for women, in particular" (p. 23).

The male domination in subject areas such as math and science have been well-documented in the past. More recently, similar gender differences have been noted in regard to computers. Males had a more positive expectation that computer knowledge and ability would be necessary in their future occupation than did females (Nickell, Schmidt, & Pinto, 1987).

> As for women's move into the fields of . . . computer science . . . given the fact of weaker mathematics backgrounds, the efforts women make in these fields are notable . . . the vast majority studied general computer science and computer programming. . . . Women's aspirations are less inflated than men's, their plans more realistic, their focus on goals more intense. . . . To varying extents, they transcend the expectations of parents and communities and develop their own destiny in ways that men do not. Further education is the fulcrum of this development, and further education and training--along with realistic plans and determination--are the basic currency of the world economy of the 21st century (Adelman, 1991, p. 17).

Summary

Since the 1900s, both educators and the general public have considered the primary purpose of education to be helping the individual student with the acquisition of basic skills needed to enter society. Such learning is being revolutionized by computer technology.

> At its root, the technological revolution . . . puts learning and education on a collision course. The essence of education is instruction--something some people do to other people, usually with required discipline. The essence of the coming integrated, universal multimedia, digital network is discovery--the empowerment of human minds to learn spontaneously, without coercion, both independently and cooperatively (Perelman, 1990, p. 18).

However, the notion that some innovative practice or new form of computer technology will magically transform the school system is not a new one. Educational technologies have been introduced in classrooms before as the ultimate solution to the educational problems. While some of these technologies were soon assimilated, the existing structures changed very little.

> The only widely surviving element of the instructional technology movement of 50's and 60's is the overhead projector, a useful, but not a revolutionary instructional aid (Johnson & Maddus, 1991, p. 8).

Computers and directly-related technologies may be quite different. The world is different.

> We no longer live in an age where it is possible to know all the facts, even just the important ones . . . our future students, face an information explosion that is so extensive that the most valuable skill in the future will involve managing not memorizing information (Wilburg, 1991, p. 116).

The question remains, "twenty years from now, will educators again be touting technology as the wave of the future? Or can we manage to achieve substantive change now?" (Levinson, 1990, p. 123).

CHAPTER III

PROCEDURES

This study was designed to examine two groups of students within Jenks High School in an effort to determine if the integration of computer technology into an educational program results in significant differences in the students' knowledge of computers, attitudes toward computing, and/or computer use.

The research questions used to guide the study are those listed below.

1. Are students in a computer-integrated setting more knowledgeable regarding computers than students who are in the traditional classroom environment?

2. Do students in a computer-integrated setting use computers differently than do other students?

3. Do students in a computer-integrated setting have a more positive attitude toward computers?

4. Does gender, or other demographic variables, affect the degree of computer knowledge, actual use of computers, and/or attitudes toward computers?

Population

Jenks High School is located within the city limits of Jenks, Oklahoma, although much of its 38 square mile school district is within the Tulsa city limits. The entire student body composes the population, while the samples consist of two groups of 120 students each.

Project TLC students were selected from the pool of students who originally volunteered to become part of an experimental "school within a school" group, stressing computer technology. Based on a stratified random sampling of those who indicated an interest in the TLC, 120 incoming ninth grade students were chosen to mirror the characteristics of the Jenks High School population at large. Likewise, a control group of incoming ninth grade students was established with 19 variables used to match the two groups of students:

1. General Intellectual Ability
2. Grade Point Average
3. Thinking Skills Scores
4. Vocabulary Achievement Scores
5. Reading Comprehension Achievement Scores
6. Math Concepts Achievement Scores
7. Math Computation Achievement Scores
8. Math Problem Solving Achievement Scores
9. Spelling Achievement Scores
10. Language Achievement Scores
11. Science Achievement Scores
12. Social Studies Achievement Scores
13. Resource Skills Achievement Scores
14. Total Reading Achievement Scores
15. Total Mathematics Achievement Scores

16. Total Language Achievement Scores

17. Basic Battery Achievement Scores

18. Complete Battery Achievement Scores

19. Scholastic Aptitude

Students' scores from the January, 1989, administration of the Otis-Lennon School Abilities Test (OLSAT) were utilized as the measure of ability. Students were selected to represent proportions of low, average, and high ability students. "The two groups were divided . . . lower third OLSAT scores below 105.3; middle third with scores between 105.3 and 118; higher third with OLSAT scores above 118" (Burden, 1990). Students categorized as educably or trainably mentally handicapped and those who require the study of English as a second language were not included in the TLC and were thus also excluded from the traditional control group. Statistical analyses conducted by Jenks school personnel indicated that students were evenly matched on general ability test scores. Since there was no statistical difference between the two groups on any of the 19 pre-experimental measures, it was assumed that, for all practical purposes, the Jenks High School student groups were equal with regard to achievement and academic aptitudes at the beginning of the project in the fall of 1989. Further variables used to match students included race, gender, geographical location, and handicapping conditions. The identities of control group members remained strictly confidential.

Instruments

Separate instruments were used to measure students' knowledge of computers, students' attitudes toward computers, and the manner in which students use computers. The "Computer Anxiety Index" (CAIN) and the "Standardized Test of Computer Literacy" (STCL) were both developed at the University of Iowa under the supervision of Dr. Michael Simonson. The standardized tests were tested and copyrighted. The reliability is .94 for the CAIN and .86 for the STCL (Montag, Simonson, & Maurer, 1984). Dr. Simonson granted permission for this research project to be conducted using his instruments.

When developing the CAIN, results were collected from 1,943 students in six states for norming the instrument. High school, college, and non-student scores were obtained. The mean was 60.23 with a standard deviation of 18.50. The lower the scores, the less anxiety or the more positive the person's attitude is regarding the use of computers; the higher the score, the more negative the person's attitude is regarding the use of computers (Montag et al., 1984).

The STCL contains three subtests which may be given separately or in any combination. Results from 341 subjects from six states were obtained in order to determine normative data for the total test and for each of the subsections (Simonson, 1984). Although it was the original intent in this study to incorporate all three sections of the STCL instrument, Jenks school personnel limited access to students involved in the study to only one class period. Therefore, Section I of the STCL was selected as the most representative of literacy skills in general. Section I measures

> knowledge and awareness of computer systems (mainframe, mini and micro computers) including historical development, terminology, identification of computer hardware and software, the relationship between hardware and software, the operation of computer systems, and the relationship between different computer systems (Montag, Simonson, & Maurer, 1984, p. 7).

The mean of Section I of the STCL was 18.62, with a standard deviation of 3.83 and a KR-20 reliability estimate of .64 (Simonson, 1984).

The third topic area, student use of computers, was measured by a survey instrument designed specifically for this study (See Appendix B). Students responded to 14 questions regarding the amount of time and types of computer use they would exhibit in a typical week as well as supplying demographic information and outlining personal preferences on two simulations. After a review of numerous instruments designed to measure student use of computers, it was determined that none were both available and adequate for the purposes of this study. An original survey questionnaire was thus developed. A panel of professors at Oklahoma State University reviewed the initial instrument and their input resulted in the final version. It should be noted that Stephen V. Owen granted permission to use four demographic questions regarding computers which he had developed for an earlier study (Lindia & Owen, 1991).

Data Collection

Permission was granted by the Jenks High School administration to have all three test instruments administered by each student's

English instructor in a regularly scheduled class period during the week of December 16-20, 1991. Tests were given to all juniors enrolled at Jenks High School during these classes. All of the instruments were of paper-and-pencil design and took one hour of total testing time. A total of 530 tests were collected by language arts teachers; only those completed by the TLC students and the corresponding group of students from the traditional school environment were provided for analysis.

Analysis of Data

The data from the instruments were analogized and reported descriptively as raw score results including norms, percentiles, distributions of means, and standard deviations for each sample according to the demographic variables such as gender, computer usage, computer ownership, and computer training. On the STCL and the CAIN data, t-tests and anovas were conducted with findings reported in Chapter IV and results interpreted in Chapter V of this study.

CHAPTER IV

FINDINGS

This chapter contains the findings of the study relative to the research questions, which focused on whether the integration of computers within the curriculum affected students' use of computers, attitudes toward computers, and/or computer literacy. The first portion of the chapter is used to report the demographics of participants while the second section reflects students' responses to the computer usage questionnaire. Data regarding computer attitudes and computer literacy comparisons are reported along with analyses in the final two segments.

Demographics

For the Jenks school district's original TLC project in 1989-90, 60 male and 60 female students were selected to represent a cross-section of ability levels, races, and socio-economic status. They were matched by an equal number of students in the traditional school environment.

> The students who volunteered for TLC were selected by a stratified random sampling method . . . the variables used to match students were: general ability level, race, gender, geographical location, and handicapping conditions. Since there is no statistical difference between the 19 pre-experimental measures, we can assume that for all practical purposes, the groups were equal with regard to achievement and academic aptitude at the beginning of the TLC project. Neither group had a

> cognitive advantage over the other in the initial stages of the project. Statistical analysis was performed on the MAT6 scores from the eighth grade, the Otis Lennon School Abilities Test from eighth grade, and the Differential Aptitude Test taken at the beginning of the ninth grade. This means that differences that show up subsequently can be attributed to the different treatment conditions that the groups experience during their high school years (Burden, 1990, p. 1)

The number of respondents in this study reflects a decrease due to a number of mortality factors, including students who transferred out of the Jenks school district, students who transferred either into or out of the TLC setting, invalid student test responses, teacher error in the collection of data, and student absenteeism on the day test data were collected. Specifically, the TLC group had a total of 24 students who withdrew either from the TLC program or from the Jenks district. Eight other TLC students were excluded either because of absence or because of invalid test data. The control group included 35 students who subsequently withdrew from the Jenks district, 4 who were later admitted to the TLC program, 9 students whose test data were rendered invalid due to teacher error, and 8 who were absent.

Valid data were therefore collected from 88 TLC students and 64 of those in the traditional grouping, for a total of 152 student responses. The TLC group consisted of 44 males and 44 females while the traditional group consisted of 31 males and 33 females.

When students in the TLC and in the traditional group were asked to identify the occupation(s) of their parent(s), the responses of the two groups were quite similar. The five most frequently listed occupations of TLC fathers were engineer, manager, CPA, lawyer, and doctor, while the top five for the fathers of traditional students were self-employed, engineer, sales, doctor, and lawyer. Only one TLC student indicated "no father in the home" compared to six in the control group. Both groups listed identical frequency and order for mothers' occupations: housewife, secretary, teacher, nurse, and self-employed. Parents of the TLC students had higher levels of education than did those of the traditional group: 68% of the TLC parents held a four-year college degree or higher while 56% of the traditional group parents held a four-year college degree or higher. Post-graduate degrees had been completed by 16% of the TLC parents and by 11% of the traditional parents. Fathers in both groups were reported to have received higher levels of education than had the mothers.

Use of Computers

A 16-question survey instrument specifically designed for this study was used to gather data regarding the amount of time students used computers weekly as well as the manner in which they used computers (See Appendix B). On several of the items, students were asked to respond "yes" or "no" to a series of questions related to computer usage patterns including such items as computer ownership, formal computer training, parents' use of computers, and desire to use computers in both the school and home settings. Perhaps the only dramatic difference emerged when students were asked if they desired to use computers more at school. TLC students indicated, by an eight percent higher margin, that they would like to have greater access to computers while at school (See Table I). Only slight percentage differences existed for all of the other questions. For example, the groups differed by less than one percent when asked if they had a desire to use computers more at home. Although students in the traditional group indicated that slightly more had received computer training than had the TLC group, TLC students indicated a similar small margin that they were more likely to own computers than were the traditional students. Nearly two thirds of all students indicated that they did not desire more computer use, either at home or in school.

Students were asked to identify the number of hours per week during which they used computers outside the regular school day for "homework" purposes (See Table II). While the two groups reported nearly equal access to computers at home, over half of the traditional group indicated that they did not use computers at all for this purpose. Only one quarter of the TLC group indicated no computer use for homework purposes. With both groups, approximately one third used computers one-to-two hours per week for homework. Of the five TLC students reporting greater than 10 hours of homework use per week, the actual hours listed were 12, 16, 20, 21, and 34. None of the traditional students reported using computers more than eight hours per week for homework assignments.

Likewise, students were asked to identify the number of hours per week in which they typically used computers outside the regular school day for "play" purposes (See Table III). No major differences existed between the two groups with regards to this use.

TABLE I

STUDENTS' RESPONSES TO QUESTIONS REGARDING COMPUTER USE

	Percentage			
	yes		no	
	TLC	Trad.	TLC	Trad.
Do you own a computer?	62.0	58.0	38.0	42.0
Have you had formal computer training?	67.0	70.0	33.0	30.0
Do your parents use computers at home or at work?	84.0	86.0	16.0	14.0
Do you desire to use computers more at school?	38.0	30.0	62.0	70.0
Do you desire to use computers more at home?	36.0	35.0	64.0	65.0

TABLE II

COMPUTER USE BY STUDENTS FOR HOMEWORK OUTSIDE THE REGULAR SCHOOL DAY

	Number of Students		Percentage of Students	
No. of Hours	TLC	Trad.	TLC	Trad.
0	21	33	24.0	51.0
1-2	30	21	35.0	33.0
3-4	23	6	26.0	9.0
5-6	6	3	6.0	5.0
7-8	2	1	2.0	2.0
9-10	1	0	1.0	0.0
>10	5	0	6.0	0.0
Totals	88	64	100.0	100.0

TABLE III

COMPUTER USE BY STUDENTS FOR PLAY

No. of Hours	Number of Students TLC	Number of Students Trad.	Percentage of Students TLC	Percentage of Students Trad.
0	61	45	69.0	70.0
1-2	17	15	19.0	25.0
3-4	6	2	6.9	3.0
5-6	2	1	3.0	1.0
>6	2	1	3.0	1.0
Totals	88	64	100.0	100.0

Students were asked to indicate factors that prevented them from using computers in school as they wished. Nine students from the traditional setting reported that they could not operate a computer, compared to only two such responses in the TLC group. The traditional group had 17 responses citing "insufficient access to computers" compared to only 6 in the TLC setting. In the TLC group, 23 said school officials prevented them from using computers to a greater degree while only 6 in the traditional setting indicated school officials hindered their use of computers at school.

Students were also asked to respond to other questions regarding computer use. When students were asked to describe the process utilized in the preparation of a research paper, 67% of the TLC students mentioned computers as an integral part of this process compared to only 41% of the traditional students. In the process of preparing a resume and letter of application, 57% of the TLC students indicated that they would definitely use computers while only 36% of the traditional group indicated that they would use computers.

Students were asked to grade their ability to use a computer. In the TLC group, close to 90% gave themselves an "A" or a "B"; less than half of the traditional group (45%) graded themselves in the "A" or "B" category. No one in the TLC group felt they would receive an "F," yet five percent indicated such failure in the self-graded evaluation in the traditional setting. Ten percent of the TLC members graded themselves as average while 42% of the traditional group said a "C" would be the grade received of computer ability.

Computer Attitudes

In order to measure students' attitudes regarding computers, the "Computer Opinion Survey," also known as the "Computer Anxiety Index" (CAIN) was administered by the students' regular language arts teachers within the normal class periods for both the TLC and the traditional groups. The survey responses were provided on a Likert-type scale (1-6) with a range of possible total scores from 26 to 156. The lower scores indicate less anxiety or more positive attitudes regarding the use of computers; the higher the score, the more negative the person's attitude is regarding the use of computers. Both a t-test and an analysis of variance were conducted on the test data.

A statistically significant difference existed between the TLC and the traditional group indicating a more positive attitude toward computers is held by those students in the TLC. This was true on both the t-test (See Table IV) and on the anova (See Table V) at the 95% confidence level. Furthermore, the two-way anova clearly indicated an interaction effect of gender. Females in the TLC group had a more positive attitude than did all other students in this study, while females in the traditional grouping held the most negative attitude with regard to using computers (See Table VI).

TABLE IV

t-TEST ANALYSIS OF COMPUTER ATTITUDES OF TLC AND TRADITIONAL GROUPS

Variable	No. of Cases	Mean	Standard Deviation	Standard Error
TLC	87	59.8276	21.284	2.282
Traditional	64	70.0938	20.767	2.596

F Value	2-tail Prob.	t Val.	Degrees of Freedom	2-tail Prob.	t Val	Degrees of Freedom	2-tail Prob.
1.05	.844	-2.96	149	.004	-2.97	137.74	.004

TABLE V

ANALYSIS OF VARIANCE FOR COMPUTER ATTITUDES
BY SEX AND GROUP

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig. of F
Main Effects	3889.821	2	1944.911	4.465	.013
SEX	3.500	1	3.500	.008	.929
GROUP	3883.673	1	3883.673	8.916	.003
2-Way Interactions	2098.318	1	2098.318	4.817	.030
SEX GROUP	2098.318	1	2098.318	4.817	.030
Explained	5988.140	3	1996.047	4.583	.004
Residual	64028.033	147	435.565		
Total	70016.172	150	466.774		

TABLE VI

COMPUTER ATTITUDES AS DEMONSTRATED BY MEANS BASED ON GENDER

GENDER	TLC	TRADITIONAL
Males	62.91	65.45
Females	56.82	75.45

The lower the mean score the more psitive the student attitude is regarding cmputers while the higher the score the more negative the student attitude. Consequently, Jenks students in the TLC group reflected slightly more positive computer attitudes than the normative group, yet students in the traditional setting scored slightly more negative. Based on normative data the standard deviation for junior high students is 19.05 and college students is 17.76 (Montag, Simonson, & Maurer, 1984). Therefore, the girls in the traditional school setting scored slightly more than the normative standard deviation amounts lower in computer attitudes than the TLC girls with a difference of 19.43.

Computer Literacy

All Jenks High School juniors were given section one of the "Standardized Test of Computer Literacy" (STCL) by their language arts teachers within the regularly scheduled class periods.

The difference between the TLC students' computer literacy mean of 9.97 and the traditional group's mean of 8.00 was statistically significant at the 95% confidence level (See Table VII). An analysis of variance from gender and group on computer literacy shows no significant interaction of variables was evidenced (See Table VIII).

It should be noted, however, that when the Jenks student groups were compared to the normative data for section one of the STCL, both were much lower than the expected mean of 18.62 (Simonson, 1984).

TABLE VII

t-TEST FOR GROUP DIFFERENCE ON LITERACY

Variable	Number of Cases	Mean	Standard Deviation	Standard Error
TLC	87	9.9655	4.637	.497
CONTROL	64	8.0000	3.460	.432

F Val.	2-tail Prob.	t Val.	Degrees of Freedom	2-tail Prob.	t Val.	Degrees of Freedom	2-tail Prob.
1.80	.015	2.86	149	.005	2.98	148.96	.003

TABLE VIII

ANALYSIS OF VARIANCE FOR GENDER DIFFERENCE ON LITERACY BY SEX AND GROUP

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig. of F
Main Effects	167.081	2	83.541	4.803	.010
SEX	24.627	1	24.627	1.416	.236
GROUP	141.287	1	141.287	8.123	.005
2-Way Interactions	21.538	1	21.538	1.238	.268
SEX GROUP	21.538	1	21.538	1.238	.268
Explained	188.619	3	62.873	3.615	.015
Residual	2556.732	147	17.393		
Total	2745.351	150	18.302		

Conclusion

All four of the research questions were positively addressed. Statistical findings indicate a significant difference between the two student groups on both of the standardized instruments used to evaluate the computer attitudes and computer literacy. The data from the computer use questionnaire also revealed a substantially greater desire for computer access in the educational setting by TLC group. Students in the Transformational Learning Center exhibited more positive attitudes toward computers, higher computer literacy scores, and a greater likelihood of using computer applications.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND COMMENTARY

This chapter contains four segments. The first provides a summary of the study, describing the problem and research design, as well as the findings. The conclusions are identified in the second portion of the chapter. Recommendations for further research are listed next. The final segment provides a commentary related to this study.

Summary

The purpose of this study was to identify the impact, if any, of different means by which students interact with computers within the educational setting. Specifically, the study was focused on students' computer literacy, attitudes, and use. Research questions which guided the study were those listed below.

1. Are students in a computer-integrated setting more knowledgeable regarding computers than students who are in a traditional classroom environment?

2. Do students in a computer-integrated setting use computers differently than do other students?

3. Do students in a computer-integrated setting have a more positive attitude toward computers?

4. Does the gender of the computer user affect the degree of computer knowledge, actual use of computers, or attitudes toward computers?

This study involved the administration of two standardized instruments for the quantitative analysis of data regarding computer attitudes and literacy. The specific instruments used were the "Computer Anxiety Index" (CAIN) and the "Standardized Test of Computer Literacy" (STCL), section one. A third, original instrument was designed especially for this study to obtain data on computer use.

The sample consisted of two matched student groups at Jenks High School, one group in a computer-integrated setting known as the TLC and the other in a traditional high school setting.

After obtaining administrative approval from the Jenks school district, data were collected by administering the three separate instruments within one normally scheduled language arts class period during the week of December 16-20, 1991, by the students' regular language arts instructors. Although the entire junior class was tested, in part to comply with the confidentiality requirements of the district, only data gathered directly from the two student groupings were analyzed in an effort to determine whether or not computer-integration influenced students' computer use, computer attitudes, and computer literacy.

All three focal points of analysis revealed substantial differences and/or statistically significant scores in favor of the TLC environment. While demographic composites revealed matched groups with regard to computer use, TLC students consistently responded that they not only used computers more often in an average week, but they desired even further access to computers at school and could more effectively incorporate computers into tasks that may be required of them. Thus, students exposed to computers as educational tools in the TLC program at Jenks were substantially more likely to utilize that computer technology in their daily activities as illustrated by student initiated responses to the questionnaire designed to gather information on students' patterns of computer usage.

With regard to computer attitudes, this study's t-test results indicated a statistical significance for students in the TLC program as compared to students in the traditional school environment. A more positive attitude toward computers existed in the TLC students.

According to the t-test conducted between the two groups, a statistical significance verified that students currently in the TLC program exhibited greater computer knowledge than those students enrolled in the traditional environment.

Finally, gender did not seem to play a key role in use or literacy. However, females varied greatly in computer attitudes depending on whether or not they were actually exposed to computers in the classroom as demonstrated in the two-way analysis of variance.

Conclusions

1. Attitudes toward computer technology depended on the amount of actual, and practical, computer exposure received. Within the TLC computer-integrated environment, students demonstrated a significant

gain in more positive attitudes with regard to computers than did those students in the traditional school setting. Neither formal computer training nor computer ownership appeared to reflect distinct differences in the results.

2. A computer-integrated learning environment resulted in increased computer literacy skills. TLC students exhibited significantly higher computer literacy scores irregardless of the amount of formal training in the computer literacy area.

3. In a traditional school setting, girls may not find adequate support to encourage their use of computer technology. However, when females received equal access, explanation, and encouragement with regard to computer technology, their attitudes demonstrated significant positive improvement.

Recommendations

1. Secondary education should be provided in a computer-integrated environment. Isolated and specialized computer elective courses such as literacy should be eliminated. In accordance with Brownwell's (1987) analogy that computers, like household appliances, may be used quite effectively without the benefit of an understanding of all aspects of the technology and operation. Bork (1981) pleaded over a decade ago "if I could leave you with one message . . . stop teaching BASIC" (p. 12). Some educators completely reject computer literacy as obsolete and assert that "such instruction is not only unnecessary, but in many cases, undesirable in that it may produce an aversion to computers with some students" (Geisert & Futrell, 1990, p. 8).

2. The TLC project should be continued and re-evaluated at Jenks High School. Based on the successful results of the TLC students involved in this study and the importance of technology as mentioned in the review of the literature, the program should be continued after the National Foundation Grant officially expires when these students graduate in 1993.

3. A program should be implemented to allow greater student accessibility to computer hardware and software beyond the normal school day. According to an article cited earlier in the review of the literature,

> in some schools, access for pupils to computing facilities is provided before and after school and at other times outside the normal school day; in such cases [there are] many reports of pupils arriving at school very early or staying very late to make use of the equipment. Most surprisingly, perhaps, the motivating effect . . . of pupils who have previously responded negatively to the educational provisions which schools make (Lancaster, 1985, p. 27).

4. A study should explore the gender attitudes issue revealed in this study. Similarly, according to one study

> educationally disadvantaged students . . . passive students who saw school as a series of events outside their control, became more active, and began to feel they had some control over events. The individual nature of computer use, researchers, concluded, seems to encourage independence (Fisher, 1983, p. 84).

Perhaps gender qualifies one as educationally disadvantaged since much of the literature points to the existence of gender bias throughout educational practices and levels, especially in the areas of math, science, and computers which have been traditionally male-dominated subjects.

Commentary

It is interesting to note how thoroughly matched the two groups of students in the Jenks project appeared to be. Although the students were members of matched pairs on 19 academic variables as identified earlier, the additional demographic similarities revealed in this study reflect a homogeneous community. For example, the groups were nearly identical even in the proportion of families that owned computers and in the proportion of parents who used computers. Parental levels of education and occupations were almost identical as well. Obviously, these criteria were not primary variables in the selection of student participants for the TLC project and for the control group. It may be that the population of the Jenks school district is somewhat homogeneous in these factors. However, regardless of the reason, the student responses in this study reflect a relatively high socioeconomic level in relation to both parental education and occupations. Not one student responded that a parent was unemployed. Furthermore, few responses indicated single-parent homes, a fact which seems difficult to believe by today's standards.

Results appear to indicate that females may be stereotyped within the traditional school environment and that their attitudes tend to mirror those traditional expectations. If, however, female students are provided with adequate exposure, encouragement, and attention in regard to computers, their attitudes regarding computers tend to change dramatically. This finding may be consistent with the fact that, surprisingly, the five most frequently mentioned occupations for mothers of students of the two groups were not only identical, but appeared to reinforce gender stereotyping of female roles in society: housewife, secretary, teacher, nurse, and self-employed. The fact that the occupations of mothers, but not those of fathers, were so similar may also be linked to the observation that those occupations do not seem to reflect the varied levels of education attained by female parents as they do for male parents. Could it be that society continues to perpetuate sex stereotyping so dramatically? It may be speculated that these data from Jenks simply demonstrate what women have experience for years--a woman's education and occupation tend not to be considered as important as those of males in this society.

Although many of the mothers received a high level of education, their occupations did not reflect that fact as did the occupations of their male counterparts. Should schools combat these gender stereotypes? If so, how? Perhaps the even larger and more important question is: does the school as an institution make a distinct difference or does it merely recycle society's prevailing value systems? Do instruction and knowledge change anything? In a 1992 report by the American Association of University Women, public schools were accused of perpetuating gender biases in textbooks, tests, and teachers from preschool through high school. The report claims that such gender bias undermines girls' self-esteem and discourages girls from courses of study, such as math and science, needed in the workforce today. It's clear that our public schools are short changing America's girls (Sadler, 1992). Perhaps if schools had done a better job of eliminating early gender bias in the educational experience of the mothers in this study, the occupations should have been more diverse? Schools should adopt a proactive rather than reactive role in these areas, whether it is in aggressively attacking gender discrepancies and traditional expectations of females or in integrating technology. Schools must adapt and change.

Results of this study seem clearly to support the supposition that increased exposure to computers will impact, and consequently increase, students' positive attitude, degree of literacy, and amount and type of use regarding computers. This appears to be related to the use of computers as educational tools rather than as the primary curricular emphasis of a course. Therefore, teachers and administrators should plan for computer applications to be fully integrated within the curriculum rather than being segregated in an elective "computer" course. Computers, too often, are purchased and automatically installed in a lab situation without even considering alternatives. Educators must admit that computers are tools too helpful in today's society to omit from every potential learning experience and environment.

It was very interesting to note that, while they may have received a greater percentage of formal computer training as a group, students in the traditional school setting scored significantly lower than the students in the computer integrated environment on all three measures of computer literacy, attitudes about computers, and use. No longer should students have to choose an elective in high school in order to get any exposure to computers. Computer training in isolation is insufficient and inadequate in today's school and will be intolerable in the schools of tomorrow. "Schools with computers either taught classes in computer literacy or computer programming. Such uses did not tap the power of computers . . . that need remains" (Young, 1991, p. 144). The literature emphasized repeatedly that "attaining more fully integrated use of technology across the curriculum is a desirable goal" (Geisert & Futrell, 1990, p. 248).

According to the literature, schools are on the brink of a technological revolution which will undoubtedly affect both the content and the process of classroom procedures and educational practices. The ability to access changing knowledge is becoming more important than the acquisition of specific knowledge, at least in some fields. As Wilburg (1991) declared,

> We no longer live in an age where it is possible to know all the facts, even just the important ones . . . our future students, face an information explosion that is so extensive that the most valuable skill in the future will involve managing not memorizing information (p. 116).

Educators must initiate changes and network skills.

> One of the principal difficulties in talking about the electronic learning environment of the future is that it will not be a single environment . . . will consist of many flexible combinations of electronic devices and services (Gibbon, 1983, p. 3).

Educators must realize that gaining access to the latest factual information, particularly in fields where the knowledge is currently changing so rapidly, is much more significant than merely memorizing facts which may soon be deemed obsolete. In fact "a classroom revolution might take place if and when teachers . . . teach students how to create, organize, store, and manipulate data" (Geisert & Futrell, 1990, p. 108). Consequently, the research opportunities are limited only by imagination. Although this study was limited to

Jenks High School's population and the subject of computer impact on learning, there are seemingly unlimited research possibilities involving the utilization of technology and its effect on schools and students.

Schools today must accept the technological challenge of tomorrow and confront obstacles such as cost, software selection, and staff development involved in integrating computers in the educational process. Educators must constantly be willing to include the computer in the regular classroom as a teaching tool for all (regardless of the specific discipline), rather than reserving computers as a separate skill only for specific types of elective course offerings, or administrative record keeping. "It is ineffective to separate content and process . . . the use of technology must be a part of content courses" (Young, 1991, p. 144). The role of education is shifting and so is the focus of education in tomorrow's world.

> The essence of the coming integrated, universal multimedia, digital network is discovery--the empowerment of human minds to learn spontaneously, without coercion, both independently and cooperatively (Perelman, 1990, p. 18).

If educators truly have a mission to prepare students for the future, and since computers are going to be part of that future as the literature verifies, then administrators and boards of education must strive to increase both computer accessibility and computer training for both teachers and students. Staff development programs should be planned and implemented to encourage and accommodate experimentation by teachers seeking to enhance instruction via computer technology. In a survey of precollegiate teachers, 59%

agreed that teachers who are using computers for instruction are inadequately prepared and 52% thought their students were more computer literate than themselves (Buerry, Haslan, & Legters, 1990). As Johnson and Maddus (1991) reminded educators, "until preservice and inservice efforts improve, it is unrealistic to expect the average teacher to make profitable use of instructional computing" (p. 11).

Computer skill development should be incorporated in elementary schools rather than secondary since students can benefit from using computers in earlier grades in developing basic skills. "An overwhelming 91% of all teachers polled said that computers were effective tools to help students develop basic reading and writing skills" (Buerry, Haslan, & Legters, 1990, p. 54). Otherwise, only a small fraction will achieve the confidence and skill needed for success outside the school's arena. School personnel must recognize the importance of preparing students for learning and accessing relevant knowledge instead of merely echoing academic rhetoric of yesterday. Johnson and Maddus (1991) emphatically asserted that

> computers are guaranteed a place in tomorrow's schools. They have permeated every aspect of modern life to the point that we no longer have a choice about whether or not they will permeate education. There are currently more computers in the world than there are people. Computers are here. They will not go away. We will make a place for them (p. 13).

> The new generation must be prepared to take its place in a very different world, one whose shape we can only guess. The substance of these guesses will influence the shaping on the future; the accuracy . . . will help determine the effectiveness of our efforts to prepare the next generation . . . likened efforts to determined needed educational changes to an attempt to hit a moving target--it is necessary to aim where it will be, not where it is, judging the speed of the target in relation to the speed

> of the projectile . . . we can think of no faster moving target for the lumbering cannon of education to take aim at than computers and their impact on education (Tolman & Alfred, 1984, p. 21).

The future awaits all of us, and mastery of computers is only the beginning.

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APPENDIXES

APPENDIX A

TRANSFORMED LEARNING CENTER (TLC) DESCRIPTION

FROM JENKS SCHOOL DISTRICT

A TRANSFORMED LEARNING CENTER: USING TECHNOLOGY TO RESTRUCTURE SCHOOLS

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To address the fact that today's students are living in a rapidly changing information age, Jenks Public Schools has implemented a program which utilizes emerging technologies to transmit knowledge in a flexible, student-centered, self-paced environment that encourages mastery learning. This four year high school program has transformed the traditional teacher role and empowered the student to become responsible for his own learning. Redesigned to provide a multidisciplinary team approach among the core areas of mathematics, science, language arts, and social sciences, the TLC program provides an alternative to the traditional instructional delivery system. Students learn heuristic methods that allow them to access information, analyze and solve problems rather than simply recall facts. The goal of this project is to create a system for transforming traditional teaching and learning processes to make them more compatible with our emerging socio-technical culture while nurturing productive human relationships.

Four major premises guide this alternative learning design: 1) In order for technology to function according to its full capability as a tool for teaching and learning, it must be used outside the time-in-grade, time-in-class concept by which schools are structured and organized. 2) The teacher's role will be altered to one of diagnostician, manager, subject-matter expert, small group facilitator, and technology specialist. 3) Productivity will be maximized when students work in an environment which gives them responsibility for their own learning with technology and which integrates self-paced, individualized mastery learning and personalized guidance by professional educators. 4) The school-within-a-school provides the opportunity to transform a social institution through the appropriate utilization of technology in an integrated system.

Sixty male and sixty female TLC volunteers representing all ability levels, races, and socio-economic conditions are matched to an equal number of students in the traditional school environment from one of Oklahoma's most outstanding high schools. The four year project and eight year longitudinal follow-up study will provide date to compare the impact of the new educational design with the traditional pattern in the areas of academic achievement, higher order thinking skills, school and job satisfaction, self-concept, and preparation for lifelong learning. Because TLC allows students to move at their own pace replacing the time-in-class, time-in-grade structure, the length of time required to master course objectives via technology-delivered instruction is being measured. Analysis of covariance will be used to determine if the TLC experimental and traditional control groups differ significantly on college entrance examinations, achievement, attitudes, time required for subject completion, and indicators of long-term success.

Project participants expect to demonstrate that the infusion of computers and other interactive technologies used in a fundamentally different way make a significant difference in student and teacher performance. Through transforming the traditional classroom environment and providing alternative methods of instruction which cater to the various learning styles of students, this project will add needed scientific evidence about the use of computers and technologies in the classroom. This study will provide prescriptive data concerning whether and how to use integrated technologies as instructional tools.

The TLC project is a planned research study with the flexibility to continually create ways to facilitate educational renewal. The blend of humane principles and technological enhancements should enable every student to reach his or her full potential. Teachers are empowered to develop a technology-based learning environment that provides both excellence and equity in a financially responsible, timely fashion. The impetus and creativity to redesign will come from teachers who best know student and curriculum needs. This is the vision that will guide school reform in the 1990's, and this research-based project may set a model for restructuring schools that can be replicated across the nation. Out goal is to create an environment that takes advantage of today's tools and produces young people ready to adapt to tomorrow's world.

This is a non-commercial product or venture. The material is based upon work supported by the National Science Foundation Grant No. TPE-8953385. The government has certain rights in this material. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the view of the National Science Foundation.

APPENDIX B

SURVEY QUESTIONNAIRE

Name(last)______________________(first)_________________

1. Sex: _____Male _____Female

2. Approximately how many hours per week do you use a computer **NOT during regular** school hours? Enter a 0 if you do not use a computer at all.

   I use a computer_______hours for school work.

   I use a computer_______hours to play video games.

3. Have you had any formal computer training?

   ______Yes ______No

   If you said "yes," please describe the length and

   type of training.________________________________

4. Do you have a computer at home?

   _____Yes ______No

5. How do you use computers outside school?

6. Are there other ways you would like to use computers outside of school?

7. What prevents you from using computers outside of school as you wish?

8. How do you use computers for school purposes?

9. Are there other ways you would like to use computers in school?

10. What prevents you from using computers in school as you wish?

11. Do your parent(s) or guardian(s) use a computer (Please check only one) at:

    _____Work or at Home

    _____Neither Work or Home

    _____I don't know

12. Occupation of your parent(s):

    father's__________________mother's________________

13. Highest level of education completed by each of your parent(s):

    father's__________________mother's________________

SIMULATIONS:

14. If your teacher assigned a research paper and class presentation, how would you prepare these materials?

15. If you applied for a job and the employer asked you to prepare a one page resume accompanied by a letter of application, how would you prepare these materials?

16. How would you grade your ability to use a computer? (Please check only one)

______A+	______A	______A-
______B+	______B	______B-
______C+	______C	______C-
______D+	______D	______D-

______Below D-

VITA

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Education: Graduated from Miami High School, Miami, Oklahoma, in May, 1972; received Bachelor of Science degree in English Education from the University of Tulsa, Tulsa, Oklahoma, in May, 1977; received Master of Education in Educational Administration at the University of Central Oklahoma, Edmond, Oklahoma, in May, 1980; completed requirements for the Doctor of Education degree at Oklahoma State University in May, 1992.

Professional Experience: English Instructor/Speech and Debating Coach, Welch High School, Welch, Oklahoma, 1977-1978; English Instructor, Moore High School, Moore, Oklahoma, 1978-1980; English Instructor/Department Chair/Gifted Coordinator/Academic Coach, North and South Intermediate High School, Broken Arrow, Oklahoma, 1980-1985; English Instructor, Jenks East Middle School, Jenks, Oklahoma, 1985-1986; High School Principal, Liberty Mounds, Mounds, Oklahoma, 1986-1988; English/Team Leader/Instructional Council, Jenks East Middle School, Jenks, Oklahoma, 1988 to present.