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Computer attitudes of selected students and educators in relationship to computer access and experience and gender

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The University of Nebraska - Lincoln, 1991

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COMPUTER ATTITUDES OF SELECTED STUDENTS AND EDUCATORS
IN RELATIONSHIP TO
COMPUTER ACCESS AND EXPERIENCE AND GENDER

by

Virginia C. Grogan

A DISSERTATION

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Virginia C. Grogan, Ph.D.

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Adviser: F. William Sesow

The purpose of this study was to examine computer attitudes in relationship to gender, access to a home computer, computer experience, and education role among and between students in grades four, eight, and twelve; teachers; and administrators. Also examined were kinds of home computers, home computer users, and personal use of computers at home or at school.

The Computer Attitude Scale (Loyd and Gressard, 1984) was the selected instrument for the study. Respondents indicated to what extent they felt about statements about computers. Responses were analyzed for the total population and for the subgroups of students and educators. The surveyed population of 865 was selected from students, teachers, and administrators in the Ralston Public Schools, Ralston, Nebraska.

The following conclusions were drawn based on the computer attitudes of students and educators surveyed:

1. Students and educators had a positive attitude toward computers based on questions about computer anxiety, confidence in working with computers, and liking computers. Students had a slightly more positive attitudes toward computers than educators.

2. Although not statistically significant, younger students reflected a more positive attitude toward computers than older students. Twelfth grade students were first introduced to computers in fourth grade while the others started school computer experiences in kindergarten.

3. Among the teachers and administrators, no relationship existed between age and computer attitudes.

4. Students and educators displayed statistically significant relationships between computer attitudes and home computer access. Those with a home computer had more positive computer attitudes.

5. A significant relationship was shown in computer attitudes and the amount of experience with computers. Those with more computer experience had more positive attitudes than those with little computer experience.

6. Gender differences in computer attitudes were not a significant relationship. It appears that the computer literacy program implemented by the Ralston Public School District over the past nine years has not reflected gender bias.

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I give thanks to the Lord for being with me during a very difficult change in my life and as I returned to finish my degree. I also wish to thank my family for their patience and love during the times they did not get to see me.

The memory of my father and of his PhD forty years ago gave his children an example of what was possible; the obstacles he scaled, coming from a very poor and large family background, provided us with a model of what could be accomplished if we stuck to a difficult task.

Finally, I dedicate this degree to my mother for her early interest in her children's education. She knew when to talk and when to listen. Without her guidance none of her children would have succeeded as we have; she was our first teacher, our earliest editor, and our most favorite typist. Education was very important to her as she cheerfully worked with each of us and continues to lovingly work with her grandchildren, Nathan, Steven, Evan, and Byron.

V. C. G.

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CHAPTER ONE

INTRODUCTION

On a spring day a month before the end of the school year in 1982, some 260 educators in eight school buildings read a note from the assistant superintendent of curriculum. Before them on the sheet of paper, was a notice that blared out a mandate, which meant either five days of summer workshops or four Saturdays in the fall. Some fervently signed up for the summer. Others played the "wait and see" game. Would this be another time of rapid inservice with no followup? Or would this be the beginning of a new phase in the district's educational progress? Or was this just a way to force some educators into an unwanted and undesirable program as had been done with other programs of the recent past? Ready or not, computers had arrived in the schools.

Several years earlier this writer had experienced extremely negative responses to the school district's mandated computer literacy course for teachers and secretarial support staff. While perceived to be a negative situation, the writer learned that the computer didn't bite and could actually be a tool to make the educational process more efficient and effective.

Some new approach or idea can cause some to hide and others to eagerly seek acceptance. The challenge of technology is around us as we use our bank cards, have our purchases scanned, or program our VCRs. Local and national newspapers and magazines have for years carried articles about computers. In the field of education, the Educational Leadership of the ASCD (Association for Supervision and Curriculum Development) in recent months has devoted whole issues or part of issues to computer technology (examples are the October 1990, February 1991, April 1991, and May 1991 issues). The Phi Delta Kappan Magazine and News, notes, and quotes from the Phi Delta Kappan Association have related articles and short highlights on school use of computers (examples include issues for December 1985, Spring 1986, February 1987 and March 1991). Some educational groups have included whole issues to computer technology in curriculum areas such as art education (National Art Education Journal, May 1991 and June 1991).

A look through magazines and a glance at television commercials convince the public that computers are here to stay. Yet with all of the computer publicity, there still appears a concern that some groups have better access to computers than others. Some schools have more computers than others and some children get to use the computer more. Some ethnic groups and females are being left out of the computer world and some people get better experiences with computers.

John Naisbitt, author of Megatrends (1982), has advocated some new challenges which include the shift of our society to an information feedback systems and electronic heartland by the year 2000. The ASCD has, as part of its Consortium Schools, included a strong push for technology and computers. In the ASCD's Third Consortium, "Schools for the 21st Century," one school in the Ralston School District, has a major goal of information and technology for its students beginning in the year 1995. This writer is a member of Ralston High School's Futures Planning Team.

McLean (1982) stated that the High Tech-High Touch society of today demands that children grow up with computers, play with computers, and be comfortable with computers in a non-threatening manner. Over seventy-five percent of all jobs will involve computers by the year 2000 A.D. and people need to be prepared to use computers. (McLean, 1982).

THEORETICAL PERSPECTIVE

Anderson, Welch, and Harris (1984) found that classroom instruction about computers was the area where the students could develop either computer anxiety or computer respect. Their research also had shown that the educational system would be the place where most students would be prepared for the information society of the future. After observing student interaction on computers, using computers and reading about computers in the educational system, this writer became more aware of possible differences in how students reacted to computers in the computer lab and in the classroom, especially with an assignment using one of her classroom's two computers. Some of these differences seemed to be related to age and gender. Older and female students appeared to be less comfortable with computers and technology than the younger students (of both genders). Other differences seemed to be tied to previous experiences with computers either at school or home and whether or not the students had access to a computer at home.

Gender differences had been noted in earlier math and science studies, in research by Fennema and Sherman (1976, 1977), Steinkemp and Maehr (1984), Benbow and Stanley (1984), and Eccles-Parson (1984). Computer attitudes and mathematics ties were studied by Collis (1987) and others.

Five major factors of gender differences in computer attitudes had been observed and measured by several researchers. These include

(1) Gender and computer images, computer attitudes, and associations by Cambre and Cook (1984, 1987), P. B. Campbell (1985), N. J. Campbell (1986), and Collis and Williams (1987);

(2) Gender developmental and behavioral characteristics in relationship to computers by Hawkins (1984) and Eastman and Krendl (1987);

(3) Gender differences with computers due to adult and peer influences by Stalker (1983) and Lockheed and Frakt (1984);

(4) Gender and social bias with computer use by Cole and Hannafin (1983), Gilliland (1984), J. S. Sanders (1984), Schubert (1986), and Yeloushan (1989); and

(5) Computers in the schools, arrangement of computers and staffing of computer classes by Saunders (1978), Fisher (1984), J. S. Sanders (1986), Miura and Hess (1983, 1984),and Lapointe and Martinez (1988).

A gender difference in computer experiences, abilities, anxieties, and continued computer use seemed to have evolved just as differences were noted in earlier math and science achievement research. These factors, as studied by the aforementioned researchers, had shown that more males than females enrolled in computer science courses and that more males continued to take advanced computer classes than females. "First come, first serve" directions had shown that males were at the computer first and were more aggressive in the use of the computers. Other evidence by the aforementioned researchers had shown that parents and peers approved of males having their own computers. More males went to computer camps. Advertisements for computer hardware and software were geared toward the male population. Male and female teachers spent more time with males and encouraged males more than females in computer classes.

Decreased gender differences in computer attitudes and computer use and increased availability of computers outside the school for females began to show in research by Loyd and Gressard (1984, 1986) and Kay (1989a, 1989b). Other recent research had noted the increase in computer equity for teachers and administrators as well as students in elementary, middle school, and secondary schools along with a more positive computer attitude for all groups. Work in this area had been done by Marshall and Bannon (1986), S. D. Smith (1986), and Banks and Havice (1989).

Educators need to be aware of the observed differences in gender, age or grade, computer experience, and access to a home computer and should seek methods and means to provide computer equity for students. Students and educators both need to know how a computer can be used and how to overcome their fear of computer technology whether they are using word processing, developing graphic designs, or solving mathematical problems. The schools must keep up with the information society of tomorrow.

STATEMENT OF THE PROBLEM

The purpose of the study was to examine computer attitudes (identified as computer anxiety, computer confidence, and computer liking by Loyd and Gressard, 1984) as they related to gender, access to a home computer, computer experience, and role or grade level among elementary, middle school, and high school students and teacher and administrators. Based upon the assumption that differences in computer attitudes do exist, the following four null hypotheses were tested:

(1) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *education role* (student or educator).

(2) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *computer experience.*

(3) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *access to a home computer.*

(4) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *gender.*

DEFINITIONS

The following definitions were used in the study:

Clone: A computer which is compatible to another computer and made to operate the another computer's software. An example is the Franklin computer which is an Apple computer clone. It runs Apple software but does not cost as much as an Apple computer.

Computer: An electronic device which is capable of storing, manipulating, and retrieving information according to a list of precise instructions called a (software) program.

Computer Access: Availability of computers for personal or school use whether at home or work or school.

Computer Attitudes: Feelings about computers related to anxiety/ fear/ phobia about computers, confidence in using a computer, and liking to use a computer.

(1) Computer Anxiety: Apprehension and fear toward learning about and using computers (phobia). An example is: "The idea of working on a computer scares me."

(2) Computer Confidence: At ease in learning about or using computers.

(3) Computer Liking: Finding that computers are useful and easy to operate..

<u>Computer Literacy/ Computer Education</u>: Computer awareness through classes which teach computer operation, computer applications and uses, the computer in careers, and the future of computers. Gaining skills in computer applications which includes word processing, graphics, data bases, spreadsheets, and information retrieval.

<u>Computer Programming/ Computer Education</u>: Programming languages (Pascal, Basic) and limitations, planning, and designing of these programs. Also called <u>Computer Science</u> classes.

<u>Computer Science Classes</u>: Another name for computer programming classes.

<u>Education Role</u>: Students or educators in the study.

<u>Educators</u>: Teachers and administrators combined as one unit for this study.

(1) <u>Administrators</u>: Building level principals and assistant principals and central office administrators, the superintendent and assistant superintendents.

(2) <u>Teachers</u>: All teachers at elementary, middle, and high schools and three at the central office. Teachers include district-wide *directors* or *coordinators* for health, computer technology, and psychologists with offices located at central office; *athletic-activities directors; teacher specialists* such as art, physical education, special education, and reading teachers; and *classroom teachers.*

<u>Gender</u>: Combined cultural affects of sex, biological, social, and psychological factors that make the differences in females and males.

<u>Students</u>: Ralston students in grades 4, 8, and 12; student subjects in this study.

<u>Software</u>: Programs designed to be used on the computer. These include word processing, graphics, games, and data bases.

ASSUMPTIONS

The following assumptions were made for this study,

(1) The subjects would answer the survey accurately about their attitudes toward computers.

(2) The population surveyed in this study would have an impact on decisions about computers and computer technology in the Ralston School District at both the elementary and secondary levels and at the administrative and teaching levels.

LIMITATIONS OF THE STUDY

(1) The population to be studied was confined to all fourth, eighth, and twelfth grade boys and girls and all administrators and teachers in the School District of Ralston, Nebraska, during the 1990-91 school year.

(2) The study was delimited to attitudes that might influence the students and educators using computers.

(3) The findings of the study may or may not be applicable to all females and males in all elementary, middle school, and high schools.

(4) The design for the study was survey research, using the Computer Attitude Scale (Loyd and Gressard, 1984, 1986) and related demographic information obtained from the subjects and the district administrative offices.

(5) The study was subject to the weaknesses in survey research.

(6) The findings of the study were subject to the weaknesses inherent in studies utilizing volunteers.

SIGNIFICANCE OF THE STUDY

Behavioral and personality characteristics had been studied in the mathematics and science gender enrollment research. The research on male and female computer science enrollment was a relatively new area with most studies reported starting in the early 1980s. The computer studies had begun to show that female and male enrollment in computer science classes were affected by the students' attitudes and by influences from peers, teachers, and parents. More recent research had shown that access to a home computer and computer experience affected computer attitudes more than gender, age, or education role (student or educator).

Educators should be made aware of the factors that cause student anxiety, liking and confidence about computers. With the increased emphasis on computer and electronic-information technology, every effort should be made to provide adequate training and preparation for all computer users, both females and males and students and educators. This study was developed to determine which of the factors affect attitudes toward computers: gender, access to a home computer, computer experience, or education role.

The study formulated concern about computer attitudes of students and educators in one school district. The data from the study provided information concerning possible influences on computer attitudes. The major significance of the study was to determine if an assessment of gender, access to a home computer, computer experience, and educational role or age was related to attitudes of the population.

PROCEDURES

The following procedures in the study on computer attitudes related to gender, access to a home computer, computer experience, educational role and grade or age are described below with further detail in Chapter Two, Review of Literature; Chapter Three, Setting, Research Methods, and Procedures; and Chapter Four, Analysis of Data.

(1) A review of literature had been conducted in the following areas of

(a) introduction of gender studies about differences in development and behavior, science and mathematics attitudes, and computer and mathematics attitudes in relationship to gender;

(b) computers in the schools studies about computer use, enrollment, school arrangements and locations, teachers, and students;

(c) gender and computers studies about gender and computer attitudes, advertising, role models, adult and peer influences, and stereotyped images about computers and computer users;

(d) access to a home computer, computer experience, age, grade, and education role studies in relationship to gender; and

(e) summary of research on gender, computers, and computers in the schools.

(2) Definitions were formulated for gender and for computer attitudes and its three subscales of computer anxiety, computer confidence, computer liking, computer technology, and the different populations in the study.

(3) The Computer Attitude Scale (see Appendix A) developed by B. H. Loyd and C. Gressard (1984) was used as the instrument for this study. The instrument contains two major parts:

(a) The first part contains three ten-item subscales in a 30 item questionnaire: Computer Anxiety, Computer Confidence, and Computer Liking. A four part Likert-type response scale ranging from "1: STRONGLY AGREE" to "4: STRONGLY DISAGREE" is provided for response. In each subscale, five statements are stated positively, and five are stated negatively.

(b) The second part contains demographic and computer background information about the respondent (included gender, grade/teaching level, computer experience, computer use at school and at home, access to a computer at home, family use or nonuse of computers at work and at home, and future role of computers in respondents' lives).

For this study, the second part was expanded beyond the information that Loyd and Gressard had used in their studies; this included adding information about computer users at home (most and least users), specific types of home computers, current and future use of computers by the respondent, and a more detailed description of computer experience. The study specifically looks at gender, access to a home computer, computer experience, and education role (grade level for students, age for educators).

(4) Since this instrument has not been used with students younger than seventh grade, a pilot test was conducted with two classes of fourth grade students at a local parochial school to check for possible misunderstanding of the wording of the instrument. Some adjustments were made in the wording of some statements before the instrument was used in September, 1990; most were additions of another clarifying or easier word.

(5) The survey was distributed to 233 fourth graders, 263 eighth graders, 207 twelfth graders, and 255.95 (FTE) teachers and administrators. Surveys were distributed in faculty meetings, advisement sessions with twelfth graders, Bridge group meetings with eighth graders, and home classes with fourth graders. Responses of the Computer Attitude Scale were made on the individual surveys.

(6) The data was tabulated and analyzed with the hypotheses being tested at the 0.05 level of significance. Tukey-HSD (Honestly Significant

Difference) procedures were conducted to test significance of the hypotheses.

(7) Based on the analysis of data, conclusions were drawn and recommendations were made.

REMAINDER OF THIS STUDY

The first chapter introduced the study through presentation of the problem, definition of terms, assumptions, limitations, significance of the study, and the procedures of the research design.

The second chapter of the study provides a review of the literature including basic gender differences and relationships of science mathematics, and computers; computers in the schools; gender and computers; home computers, computer experience, education role, and age or grade level.

The procedures utilized in the study are presented in Chapter 3 which includes a description of the setting, the research design, instrumentation of the study, sampling, and distribution of the survey. Chapter 4 presents an analysis of the data while Chapter 5 includes a summary of the findings, conclusions, and recommendations. The Bibliography and Appendixes follow the last chapter.

CHAPTER TWO

REVIEW OF THE LITERATURE

INTRODUCTION

Few empirical studies have been designed that look at computer attitudes according to gender, age/ grade level, computer experience, and access to a home computer. Early studies on computer attitudes only concentrated on gender and age/grade level. More recent research has shown that there are significantly fewer gender and age differences in computer attitudes and more differences in computer attitudes due to access to a computer and computer experience.

The computer has been listed as a major force in the restructuring of schools according to Cawelti (1989) of the Association for Supervision and Curriculum Development (ASCD). ASCD has encouraged schools to include technology in the three Futures Planning Consortiums of American schools since the middle 1980s. Changes that occur in education must consider the issue of computers and technology. The purpose of this study was to assess computer attitudes of students and educators in a k-12 public school setting which has had a nine year emphasis on computer literacy. The factors of gender, education role (age or grade level), computer experience, and access to a home computer were considered an intricate part of this study.

COMPUTERS IN THE SCHOOLS

Schools at times were reluctant to place computers in their systems, citing costs, lack of adequate training and poor software programs. Once in the schools, computers were mostly located in the mathematics and science departments. The computers locations and arrangements became part of studies about computers in the schools. Saunders (1978) reported that science teachers at first, and later math teachers, and their departments controlled computers in schools. Gender role models in computer and math classes was considered an issue in computer attitudes by Stalker (1983). Stalker described that nationally, females formed 88% of the elementary and 50% of the secondary schools' teachers. Male teachers concentrated in mathematics and science, where most of the computers were located, while females mostly taught English, languages, and fine arts. Hawkins (1984) noted that the computers were more likely found in rooms for math, science, and business classes than in other areas in the schools.

In the early years of computer technology, the biggest problem was just getting schools to place computers into the schools. One school which had just started using computer systems, according to Saunders (1978), could only use one of their two computer terminals at a time and only with a telephone modem connected to a large GE computer in another city. The ERS: Spectrum (1983, Spring) reported that 43.5% of 1300 districts stated that their number one reason to use computers was for training their staffs; one of the last reasons listed for school computers was computer technology for students. The fear of failing when working with computers was another reason some schools gave for not using computers, asserted Gerschner (1982). Bitter (1983), Linn and Fisher (1984), and Barbour (1984) advocated that some schools did not have adequate computer programs because they failed in their teacher training. They stated that schools needed strong computer literacy and application classes for teachers. Newsnotes by Phi Delta Kappan (1985) submitted that one third of teachers felt uncomfortable with computers but that 82% of the teachers thought computers could improve teaching. The Public Broadcasting Office (Phi Delta Kappan, 1985) reported that only 40% of the surveyed teachers and 54% of their principals had any computer training in 1985. Wagschal (1984) on the other hand proposed that some schools did not have computers due to extreme computer costs, poor planning for computer use, poor software, and poor computer curriculum that did not apply daily use.

Once a school district had computers, differences appeared as to the number of computers and locations of the computers in the schools. Computer allocation in schools was different depending on the region of the United States and size of the school, announced Anderson, Welch, and Harris (1984). The central section of the United States was almost twice as likely to have computers in the classrooms as were the southern states (40% to 25%). Western and northern states students had approximately the same access to computers, 33% of the schools. Hayes (1983) suggested that the schools with computers were mostly large high schools in affluent, large districts. Larger school districts (those with over 25,000 students) used computers more than the smallest districts (less than 300 students).

In the early 1980s the more wealthy schools had more computers; Ashbrook (1984) related the poor and illiterate usually were in schools with few computers and with low school finances. Lipkin (1983, 1984) and "Questions Teachers Still Ask" article (Instructor and Teacher, 1984, October) reported that 90% of all public schools had one computer while less than 65% of the schools with minority and/ or low socio-economic students had one computer. Becker (1982, 1983), Lautenberg (1984), Luehrmann (1984), P. B. Campbell (1985), and the "Sex Bias at the Computer" article (AEDS Monitor, 1986, January-February), all summarized that affluent schools had computers but less than half of the poor schools had computers. By 1989, 48% of the Caucasian students, 35% of the African-American students, and 38% of the Hispanic students had used computers in their schools according to the report, "Computer Use in the United States: 1989" (NAEA News, 1991, June).

Edwards (1984) and the "Sex Bias"article (The AEDS Monitor, 1986, January-February) found that in the northeast, 86% of the affluent suburban communities had computers while only 64% of the rural, low income, mostly minority schools had computers. For example, one school in New York listed two computers per classroom while another school a few miles away stated two computers existed for 350 students. The Corporation for Public Broadcasting (Phi Delta Kappan, 1985, June) reported only 13% of the teachers had a computer in the classroom (usually one, sometimes two computers). The "Sex Bias" article (AEDS Monitor, 1986, January-February) found from one computer for every 62 students in South Dakota to one computer for 1072 students in Hawaii. The majority of the schools had one computer for every 100 to 200 students. At the high school level the national ratio was an average of one computer for every 125 students. Hayes (1983) and Piemonte (1985) were concerned that one computer would not adequately service the computer needs of the many students. Piemonte stated that twelve times the current 400,000 computers (in 1985) would be needed to provide an adequate computer literacy curriculum for all students. Yet by 1986, the National

Center for Educational Statistics Report (1990) survey found 95.6% of all schools used computers. By building level, 94.9% of the elementary schools, 98.5% of the junior highs, and 98.5% of the high schools had at least one computers in 1986.

The kinds of computers and the computer uses were important to some researchers on computers in the schools. Hayes (1983) outlined that most schools had Apple products (51.11%) with Radio Shack and Commodore computers found in 22.9% and 12.1% of the schools. In 1981-82 schools used Apples mostly for gifted elementary students, Commodores for regular elementary students, and Radio Shacks for high school students.

Schools used computers for a range of purposes. Computer-aided instruction and drill and practice were used for low ability and low socio-economic students, and computer programming was used for gifted students, according to Eisele (1979, 1981), Billings (1981), Becker (1982, 1983), Bork (1984), P. B. Campbell (1985), and Leper and Gurtner (1989). Secondary teachers felt that all students must have a minimum understanding of computers and must learn the role of computers but felt that not all students needed programming skills, reported Hansen, Klassen, Anderson, and Johnson (1981). Williams, McDonald, Howard, Reese, and Raine (1984) discovered students in mostly white schools learned programming while students in non-white schools did rote computer exercises. Several researchers recited that schools favored computer literacy, word processing, and computer applications for the students [Johnson, Anderson, Hansen, and Klassen (1980); Shell (1980); Watt (1981, 1982); Arnold, Birke, and Faulkner (1981); Ringle (1981); Hade (1982); Eisele (1983); and Braswell (1984)].

As the decade progressed more word processing and electronic on-line computer searches were found in the schools, stated Marshall and Bannon (1986), Eastman (1986), and Byrd and Koohang (1989). Word processing was the dominate use in 67% of the homes with computers and computer games were next at 44% for the adults and 84% for the children, according to a 1989 U. S. Census Bureau study (Omaha World Herald, 1991, March 31).

GENDER STUDIES

While the previous researchers were concerned with school access to computers, others were looking at computers and students. Based on gender, students' attitudes about different subjects and about learning in general have been studied for several years. Gender differences due to genetic and behavioral development, social learning, gender-related roles and tasks, learning styles, and achievement were evaluated in studies and reports by Stein and Smithells (1969); Wittig and Petersen (1979); Paris, Olson, and Stevenson (1983); and Yeloushan (1989). Burke (1989) found that gender does account for some gender differences in school performance. However, gender difference in performance still cannot be explained by gender role identification according to Burke.

These gender issues were found to be significant in looking at education and computers. Kohlberg (1966) stated that parents' attitudes either stimulate or retard development of basic gender role attitudes. Mischel (1966) noted that young children identify their gender by their social role (male versus female). Nash (1979) reported gender identification occurred by two to four years of age; parents expected girls to do better in elementary school. Mischel (1966), Parsons, Adler, and Kaczala (1982), and Kavrell and Petersen (1984) found that as early as second grade, children tended to view certain educational areas as appropriate only to that gender: athletics, math, and mechanical skills were male areas while reading, writing, and the arts were female areas. Kavrell and Petersen (1984) proposed that puberty changed the gender roles and interests in children. Parsons, et al., (1982) explained that parents of daughters thought math was more difficult for their daughters and told them to work hard to do well, while boys were just expected to do better. The fathers stressed that their daughters take social sciences and humanities but their sons were expected to take advanced math and science.

Good, Sikes, and Brophy (1973) discovered that teachers could also affect student gender stereotyped responses and behaviors. High achieving males received more favorable praise from their teachers while the low achieving males received the lowest teacher-student contact patterns and the lowest achieving females were ignored. Females receive more rewards for being dependable but boys get more responses for any behavior, continued Mischel (1966).

Gender in Math and Science Studies

Skolnick, Langbort, and Day (1982) specifically looked at gender issues with both mathematics and science. They found no proven biological gender differences in learning mathematics and science. When children took equal numbers of courses, gender differences in mathematics diminished and disappeared. In the early studies of math and science classes, data by Skolnick, et al., agreed with Good, et al., (1973) that males got called upon more and asked more direct, open ended, complex and abstract questions than females. Males also received more detailed instructions while females were expected not to deviate from appropriate gender role expectations. Benbow and Stanley (1984), in their research on science and math classes, discovered females took more biology and males took more physics. Males took more semesters of math (66% of the males) than females (40% took extra semesters of math); males took more calculus than females. Kahle (1982, 1983) reported that females were more likely to consider careers in life science and not in the more masculine gender stereotyped areas of calculus, chemistry, and physics. When Kahle studied females in all female schools, females did equally well on math, physical science and natural science when compared to males in other schools.

Gender in relationship to mathematical anxiety and attitudes were specific issues with research studies and investigations by Brush (1978), Eccles-Parson (1984), and Harnisch (1984). Fox, Tobin, and Brody (1979) reported that social factors were more responsible for gender related differences in math achievement just as researchers had noticed in earlier studies of science achievement. When females took the same math classes as males, no gender differences occurred. The differences they noted were that males took more math; males emphasized the male domain of math; and parents and educators supported males more in their math coursework. Fox, et al., and Fennema and Sherman (1976) stated that parents bought more science and math toys for their sons, expected their sons to do better, and gender stereotyped their children into certain math and science classes. When their children made poor grades in math, the males were considered lazy and the females were thought to lack the ability to do better. Fox, et al., stated that females were discouraged from taking math by educators; the educators had negative expectations for females gifted in math. The educators were observed interacting more with males than females during math and science classes. In addition their study showed that females were affected more by their peers influences and were reluctant to take college courses or to take advanced classes in math and science. Frieze (1980) ascertained that females differed in their degree of orientation to tasks. Females reported a lower sense of competency in learning science. Frieze stated that females were less likely to attribute science success to their own high ability and more likely to attribute science failure to their poor ability.

Meece, Parsons, Kaczala, Goff, and Futterman (1982) detected fewer females elected to take advanced level math courses or pursue math oriented careers. While the data determined younger females and males were equally good in algebra and basic math, the high school age females were better at computation skills tests, and males were somewhat better on math reasoning tests. Meece, et al., also learned that males received six more hours per year of math instruction than females, which was significant if multiplied by 12 years, they noted. They noticed that females' math abilities declined earlier and in greater rates than males in junior high school due to differences in self-confidence in math ability rather than actual abilities.

Fennema and Sherman (1977) concluded their research by stating that the differences in math studying and math achievement by the gender is related to socio-economic and gender role expectations. No gender related differences in math achievement were found in their study. Math achievement did not increase with grade level or math class level. The only gender difference was that fewer females were enrolled in math classes. The females were better at verbal skills, but as they took higher level classes, no gender difference occurred. Fennema and Sherman did not notice that females or males were more successful in their own stereotyped domains. Harnisch (1984) disclosed that males by age 17 had superior math scores, but there were only small math score differences by gender in the ages 9 to 13.

Gender and science achievement and development were reported by Lesser (1973); Maehr and Nicholls (1980); Frieze and Hanusa (1984), Kremer (1984); and Steinkemp and Maehr (1984). Gender differences in motivational patterns in science achievement occurred around age 13, according to several researchers such as Haertel and Walberg, Junker, and Pascarella (1981) and Paris, Olson, and Stevenson (1983). They also explained that females begin to shift away from science which could affect the females' possible science careers. Matyas (1984, 1985) detected gender difference existed when mostly males were taking more science classes. Females participated less in science curriculum and co-curricular science activities. Females were less confident in their scientific abilities and in their science problem solving skills, according to Matyas.

The studies about gender attitudinal relationships between computers and mathematics and/or science were based on the fact that computers where originally in science and math departments. Researchers had proposed that the apprehensions and attitudes they found in math and science students would be transferred to computers. Papert (1980) suggested that a young school child's attitudes about mathematics and the learning of mathematics could be transferred to attitudes about computers. Winkle and Mathews

(1982) stated that a positive attitude about math, career and education goals showing the relevancy of math, and positive influences from parents, teachers, and counselors could help change females' negative attitudes about the computer area. In their research on relationships between mathematics and successful computer students, Payton and Loyd (1984) concluded that there was a significant positive correlation between attitudes toward computers and attitudes toward mathematics. In two studies on the relationship between the effects of math anxiety and gender, Gressard and Loyd (1984a, 1987) looked at computer attitudes of secondary and college students. Overall they found a strong relationship existed between math anxiety and computer anxiety. Gressard and Loyd revealed that lower math anxiety levels meant a more positive computer attitude.

Eighth and twelfth grade students' computer attitudes were the focus of Collis's work (1985). While there were significant relationships in attitudes about computers and about subject areas of math, science, and writing, the most significant evidence was in comparing math with computers. Males were more positive in attitudes and liked computers better than those males not yet in the computer class. Collis noted that no significant relationship existed between computer experience and positive attitudes about computers with the females. Linbeck and Dambrot (1986) found that a positive experience with math would lead to a more positive attitude about computers. Bracey (1988) stated that decreased math anxiety resulted in increased computer achievement, and that a highly positive computer attitude helped the student improve in computer achievement. A high computer anxiety rate resulted in lower, less positive computer attitudes; but Bracey reported that math anxiety and computer anxiety were not significant.

Bellando and Winer (1985) reported a moderate relationship between computer anxiety and math anxiety. Sorge and Wark (1984) proposed a strong background in both math and verbal skills was needed for positive computer abilities while Peterson and Fennema (1985) and Guinan and Stephens (1988) stated that only a strong math background was related to positive computer achievement and computer attitudes.

Several researchers found no significant gender differences with the math and computer attitudes. College students' computer anxiety was tied to math anxiety and personality types in Bellando and Winer's (1985) research. They discovered no significant differences for gender and a moderate relationship between computer anxiety and math anxiety. Popovich, Hyde, Zakrajsek, and Blumer (1987) found high internal consistency and significant correlation with gender differences of the students' computer attitudes. Popovich, et al., reported that females were less positive toward computers, based on gender differences in college level course in computers and math; but females were more positive to new technology such as scanning devices and bank machines. There were no gender differences in the self report ratings of anxiety with computers. Gender differences were noted when computers were used as application tools and not as equipment for computer games.

Voogt (1987) recorded no gender difference in comparing computer science, mathematics, and physics classes with computer performance. Even with negative math and science attitudes, both males and females had a positive attitude toward computers. Guinan and Stephens (1988) determined gender was not related to computer aptitude or achievement in a study of high school students in beginning computer science courses. The results predicted that a strong math background was related to computer achievement rather than gender. Gender, math performance, and computer attitudes of high school students were described by Munger and Loyd (1989). Their research revealed that the students had overall positive attitudes toward computers. They did not note a gender difference in computer attitudes or math performance. Munger and Loyd found students had a positive attitude and positive performance with technology (computers and calculators) when comparisons were made about math performance and attitudes. Munger and Loyd discovered a weak association between math performance and computer attitudes when computers were not used primarily in the mathematics area; the students in those cases did not use computers in mathematics but used computers mostly in other areas such as English, foreign languages, graphics, and word processing.

Other researchers, such as Cole and Hannafin (1983), found significant gender differences in math and computer attitudes. They looked at the relationship of attitudes to gender, math, and computer experience. Cole and Hannafin concluded that females with low self-perceptions about their math competency had lower computer self-perceptions. Students with computer experience had a greater sense of perceived ability to be successful with computer science courses. Lockheed, Nielsen, and Stone (1983, 1985) related that females obtained less computer skills than expected while males gained more than expected. Males, younger students, and college prep and advanced math students gained relatively more skills in required computer science courses than females, older students, and students in other remedial to average math classes.

Hawkins (1984) sought information about the negative attitudes and technology such as computers. Females were asked questions about how they identified computers with mathematics and science, about gender-related differences in science and math, and about their own learning patterns. Hawkins noted that females found the type of computer use and the computer lab setting along with a variety of computer applications to be helpful. Also looking at gender differences with computer attitudes, Luckins (1984) claimed females had less than positive computer attitudes based on a study of students computer attitudes in a computer training program.

Dambrot, Watkins-Malek, Sillings, Marshall, and Garver (1985) examined gender differences in computer attitudes and aptitudes with college students. These differences were compared with math aptitude and anxiety and scholastic achievement with computers. The freshmen in an introductory psychology class responded with some small but statistically significant gender differences. Dambrot, et al., stated that females were more negative toward computers, scored lower in computer aptitude, and had fewer prerequisite math ability and math course work than males. The male students had more computer related courses, better computer aptitude, and lower math anxiety related to computer attitude. The study showed a small but statistically significant gender difference in computer aptitude. N. J. Campbell and Perry (1988) detected that females scored lower on standardized math and science achievement tests than males. The females perceived math skills were needed to gain computer skills; their perception about math skills was significantly lower than the males.

The introduction and this section on gender issues has concentrated on math, science, and those subjects' relationships to computers and computer attitudes. Computer literacy was conceived as being taught through the educational system for all students. Researchers brought up issues about gender differences related to how schools locate computers, what is taught in the schools about computers, and how attitudes of other students and adults might affect the users attitudes toward computers. The review of literature for the remainder of the chapter will concentrate on gender and computers in the schools. Related gender issues will be compared with access to a home computer, computer experience, education roles (student or teacher), and age and grade levels. A summary of the review of literature on the research on gender and computers in the schools will be in the last section of this chapter.

COMPUTERS

In studying the amount of computer time and computer use, Hawkins (1984) observed two gender trends. Males were more likely to use the computers and to use the computers after school more than females. Males were overall more enthusiastic about computers and weekly used the computers more: 34 computer hours for males, 22 hours for females. Hawkins perceived that in the classroom, males controlled the computer more than females; males used the computers 47.2% of the time versus females' use of computers 25.1% of the time.

Gender differences in computer science majors at the college level was a trend noted in the educational system in the 1980s. The National Center for Educational Statistics (1990) reported an increase in computer science degrees in 1986-86 with 39,664 degrees. Male students increased from 10,202 in 1980-81 to 25,929 and females from 4,919 to 13,735. Masters degree programs in computer science increased 49.6% from 1981 to 1986 with a 54.16% increase in males and 38.8% increase in females degrees. Smaller increases occurred in the doctoral computer science programs with 252 degrees in 1980-81 to 374 in 1986-87. Gender differences were noted with only 52 females receiving doctorates compared to 322 males in 1986-87; in 1980-81, 25 females received the advanced degree while 227 males obtained the doctorate in computer science.

On the k-12 grade level, Bakon, Nielsen, and McKenzie (1983) reported that in ten New Jersey high schools in 1982, males composed 60% of the computer classes while in California in 1983, there were five males to three females in the classes. Females outnumbered males in eighth grade math classes but by the twelfth grade, males outnumbered the females by two to one in the math and computer classes. The University of California-Berkeley outlined computer science classes as being 73% male, stated Bakon, et al. Lacina (1983) also found more males than females taking computer science. Females were considered to be computer deprived and anxious about computers and related technology experiences. Anderson, Welch, and Harris (1984) revealed that 8% of the females in a school were likely to take computer classes compared to 14% of the males. Gilliland (1984) discovered in California in 1982 that females made up 35% of the students in computer classes but by the next year computers classes were 46% females, a 42% increase in one year. In looking at the four consecutive computers science courses, Sorge and Wark (1984) reported two males for every female were enrolled throughout the program.

Hawkins (1984) noted gender and age differences in the programming skills with the older children being more skilled and the males more skillful than the females. Younger males were correct 36% of the time with their programming while the younger females were correct only 6% of the time. As the computer programming students became older, males were correct 70% while females were correct only 26% of the time. In correcting computer errors, younger males (31.1% versus 19.9% of females) and older males were more successful (48.9% versus 17.4%) than females, reported Hawkins. Sanders (1984) maintained that both genders did equally well on computers but males played computer games more after school, signed up for more computer electives in high school, and majored more in computer science at college than females.

Twice as many males as females were in academic computer classes while three times as many females as males were in computer applications classes ("Sex Bias" article, the AEDS Monitor, 1986, January-February). No differences existed between females' and males' performances in computer programming; the only differences were in enrollment figures where 4% of the females took computer programming versus 14% of the males.

Students who voluntarily strived for computer knowledge and experiences participated in computer camps and summer classes. Hess and

Miura (1983) and Miura and Hess (1983, 1984) were the first researchers who noted gender and socio-economic differences in computer camp enrollment, especially as the students became older. Overall males outnumbered females three to one, with some computer camp sites having between 5% to 43% females. More females took computer camp classes at early grade levels but females participated less as they became older. As the computer curriculum changed into more programming, fewer females took the camps. Hess and Miura reported that higher percentages of males attended the expensive residential camps. Females in high proportions attended camps and classes sponsored by public schools but only a few attended private sponsored camps. More males and children from middle and upper classes attended the special camps. Parents were more willing for their sons to go to summer computer camps than for their daughters. Males were brought to camps, females "begged to go", according to one camp director, stated Hess and Muira (1983). Fisher (1984) also reported that by sixth grade the gender difference in computer camp enrollment was apparent with males making up 74% of the camps while only 27% were the females.

Jones and Wall's (1985) data analysis of instructional technology (computer technology) and education majors showed that education majors had greater reductions in computer anxiety and higher than predicted scores in computer science courses than the technology majors. Baylor (1985) recounted that educators' computer attitudes could be transferred to their students. An educator's gender or age did not predict computer attitudes. Female educators had a more favorable attitude toward computer assisted instruction, flow charts, computers, and calculators while male educators had a more positive attitude toward computer programming and to Basic, a programming language. Baylor continued, teachers over age 41 were more positive toward computers, calculators, and computer aided instruction while teachers less than 40 years old were more positive about flow charting, programming and the Basic language.

Marshall and Bannon (1986), reported that older respondents had more positive computer attitudes, and that educators were more positive toward computers than students. Older respondents had significantly higher positive knowledge about computers than younger respondents. Males had more significant computer knowledge than females. Teachers had more computer knowledge than students but there was no difference between the three adult education groups (teachers, media specialists, or administrators). Mruk (1987) obtained background information about adults' gender and finances. Traditional students and non-traditional (those returning to school after several years, seeking specialized training) were examined. Mruk collected data about the adult learner as a non-traditional learner by looking at age, gender, and motivation to learn basic computer skills. In the traditional college computer classes, 65% were males and 35% were females while 46% males and 54% females were in non-traditional computer classes. Both genders in the non-traditional classes had more positive attitudes than those in the traditional classes. Lewis (1988) found that older females who have been away from school for many years were less positive and more apprehensive in their computer attitudes. Upon returning to school to complete their education, older adults did better on computers in computer literacy classes, enjoyed computers more, and obtained better experiences with computers than younger adults in the computer classes. As they gained experience, older adults became more bold in learning about computers, stated Lewis.

The schools have been established as centers for computer education, as shown in the aforementioned review of literature. However, the issue of gender still appeared in additional studies. Lockeed and Frakt (1984) were concerned about increasing females' use of computers. They discovered in California, 75% of the twelfth grade females and 66% of the sixth grade females agreed that computers would help them get better jobs. Lockeed and Frakt (1984) found, through a second study of high school students in mandatory computer classes, that 80% of the females and 82% of the males agreed that computers were important. In a third study, they reported no gender differences in sixth graders' confidence on computers or computer attitudes.

Yet some researchers were concerned that gender computer differences could be related to developmental differences. By third grade, Benbow and

Stanley (1980) stated that gender differences in anxiety occur with both genders considering math as a male domain. Preschool males created computer clubs in several school and kept females away, reported P. B. Campbell (1983). Only one in three females was "into" computers, noted Campbell. Lacina (1983) also learned that in higher grade levels, males were more aggressive about working on computers, not allowing females access and computer science was considered an advanced math class. These observed images created a strong, male stereotype to computer technology. Males more than females took computer science which, Lacina felt, caused females to have a culturally deprived anxiety about computers and related technology experiences. According to Voogt (1987), females performed lower and engaged less in computer literacy classes than males. But both genders reported a positive attitude toward computers.

J. S. Sanders (1984) believed that gender developmental and behavioral factors could affect students' attitudes toward computers. Sanders concluded females saw that computers isolated them from people and that by middle school age, they preferred people to things (computers). Females preferred human rewards for right answers (not machine rewards) and had other interests besides computers. Females, in Sanders studies, felt they would be "unfeminine and unattractive" to males if they worked on computers. Males were reported to be more aggressive on computer time. Adolescent females were found to accept the idea of being helpless, about puberty time and were more likely to give up computers to the males, stated Sanders.

Social and developmental issues, Lockheed and Frakt (1984) suggested, could be related to females using the computer less than males. They proposed that gender segregated lives started in grades k-8 where computers often were considered male turf. When only one computer existed in a classroom, unequal use of the computer occurred as males worked more hours on the machines than females. Lockheed and Frakt stated that parental issues could affect female use of computers; they found parents purchased computers more for their sons than their daughters, just as earlier research found parents purchasing more math and science items for sons than daughters.

Stereotype images of computers could also be a factor in student use or non-use of computers in the schools. Winkle and Mathews (1982) felt that females were handicapped by their anxiety about computers and its related technology images. By third grade gender differences in anxiety occurred, with both genders considering math as a male domain. Turkington (1982) suggested that males gravitated to computers and teachers promoted their own expectations that males would enjoy and be good at computers. Rosser (1982) told of one school where teenage males harassed females by telling the females that they were stupid on computers until the teachers intervened and kept the males out of the after school computer classes to give the females more computer experience. Even preschool children, Beeson and Williams (1983) observed, responded in gender stereotyped manners. However, with computer use, those over five years old showed no gender stereotyping while those under five did show gender stereotyping. Beeson and Williams felt this was a reverse of general gender studies which found gender differences and gender stereotyping by children; earlier studies had thought the males were to be the computer users. Fisher (1984), from research studies, listed some sources of possible negative computer attitudes. Gender bias in software; social bias, stereotypes, peer pressure, and male behavior toward females in computer classes; and the content and structure of computer programming could all affect female computer attitudes. Teenage males were more likely to play video arcade games than teenage females. The computer games were related to land battles, monsters, sports, and space wars, reported Kiesler, Sproull, and Eccles (1983) and J. S. Sanders (1984). Games were played on computers by 67% of children over twelve and by 88% of children under twelve years of age. In addition, Kiesler, et al., noted that male computer "hackers" had created a male role model that taught children to break the rules and to be destructive; an example was males who purposely overload the memory capacity of the computers to create crashes of the computer system to show their computer dominance. Most software was biased in male language and roles, and few arts and writing programs existed which appeal more to females, proposed Sanders (1984).

In addition to gender stereotyped studies, some researchers found related areas of gender images. J. S. Sanders (1984) continued, that because of the male machine image of computers, females were afraid of breaking the machines or making mistakes. To work on a computer was considered unfeminine by the females. Computers were usually located in math departments and created an image that computers were for the male activity; computer hackers were always male. In addition, Sanders contended that there were few females in print and on TV who used a computer. Lockheed and Frakt (1984), from their study, looked at computers ads, magazines pictures, etc., and found females were portrayed as the observers while males worked on the computer. The computer image as a "male turf" existed when computer materials were directed toward one gender, stated Lockheed and Frakt. They also noticed that beginning computer classes emphasized programming as the major use for computers. Alvarado (1984) realized that while males were more aggressive with computers, most students had positive computer role models.

Levin and Gordon (1989) reported males were stereotyped by their peers as being more capable of using computers than females. N. J. Campbell (1990) discovered female college students considered the computer less of a male domain than male students. Access to a home computer and positive computer attitudes about computer usefulness were found to be more important to all students.

Schubert and Bakke (1984), in their studies concerning computer use and gender, discovered fewer females took time to learn about and work with computers, and females took fewer computer programming classes. Females received less time training for computers; and they also deferred their computer time to males to avoid hostility and sought to create friendships more than the males did. Schubert and Bakke observed that females lacked aggressive behavior to sign up on posted computer time lists. Females sought permission to use the computer before signing up, while males did not. One female stated that she was not allowed to read a computer magazine although her brother could.

P. B. Campbell (1985) and Moore (1986), based upon their research, expressed several factors that had created barriers to female computer use. These barriers included the math machine image of computers and stereotyped ideas about math, computer use, and gender roles. In addition the idea of math anxiety and of computer introduction and use of computers in the classroom could cause computer anxiety in females and ethnic minorities. Campbell and Moore both proposed that the "made for males" media image of computers, where 70% of the ads showed males while only 3% showed females, could affect computer attitudes. They concluded software ads for male sports and wars and destruction software programs could contribute to the gender barriers. Teachers limited computers to those with computer experience which were usually male students, stated both Campbell and Moore.

Computer attitudes of teachers and students in relationship to gender and grade level were evaluated by S. D. Smith (1986). Significant gender differences were found with females being more confident than males in belief of their computer ability and competence in use of computers. There was no significant grade level or role (teacher or student) differences in gender stereotyping of computer attitudes. Wilder, Mackie, and Cooper (1985) discovered gender differences at all ages with males having more positive computer attitudes than females. Eastman and Krendl (1987), in a study of eighth graders, found significant differences in attitudes about computers and in gender roles. Males were more stereotyped on the computer class pretest; females were less likely to expect their computer ability would differ from males. Females were less likely to think math skills were needed on computers; males thought math skills were necessary.

S. D. Smith's second study (1987) of a rural school system in the early stages of computer implementation, showed a significant difference between genders in gender stereotyping. Both genders had positive computer attitudes but the females were more positive about themselves in computer roles while the males were more biased toward males. High school teachers were less gender stereotyped in viewing their students' computer education, believing both genders could work on computers. The elementary teachers were more gender stereotyped; they considered males better at computers. Voogt (1987) advanced the idea that females performed lower and engaged less in computer literacy than males. In Voogt's study, males were encouraged more by their peers in computer science classes while both genders perceived the same encouragement from parents and teachers.

On the college level, 928 students in Scotland each randomly selected two paragraphs about a computer scientist named either "Karen" or "Kevin" (the paragraphs were identical except for the names) in a study by Siann, Darndell, Macleod, and Glissov (1988). After being questioned about their own experience of, knowledge about, and attitudes toward computers and technology in general, the students rated the person according to 16 attributes related to computer scientists and computers. Based on the higher and stronger ratings in almost all of the 16 areas, Karen was rated as a more attractive computer science person than Kevin. No gender differences were noted whether the rater was a female or a male and there was no gender difference in electronic or computing experience or computer attitudes of the rater.

Some researchers sought more information about how role models could affect gender stereotyping and the male-machine computer images. Lane (1982) found that math and science teachers were more accepting of computers than art teachers. Stalker (1982, 1983) related that most computers were located in the mathematics and science departments where mostly males taught while the female teachers taught in the English, foreign languages, and fine arts where few computers were located. Rosser (1982) recited the National Assessment for Educational Progress study which found that counselors and teachers had discouraged females from taking computer classes. If females wanted computer science, the educators did encourage them to take the computer prerequisites of math, according to Rosser.

Schools had a tendency to arrange computers in rows to discourage communication, reported Sanders (1984). Computers were found more in math rooms which gave a "male association" image. More math teachers and more male teachers taught computers classes. Few female teachers and counselors were enthusiastic and knowledgeable about computers. The teachers did not allow females to work two per computer; females were expected to be like the males, who preferred to work alone. Sanders' study found where there were too few computers in the schools; with a "first come, first served" statement by the teacher, the aggressive computer users, usually males, were allowed to take over the computers. Teacher did not organize voluntary computer use time and group computer activities which the females stated they liked.

Parental role models were also considered by researchers. Edwards (1984) and Sanders (1984, 1986) found that more parents expected technical careers for their sons and paid for the sons' hardware, software, and computer camps which was similar to earlier math and science studies about parental influences. More fathers used computers, setting a male role model image for their children. N. J. Campbell and Perry (1988), on the other hand, reported that parental attitudes toward computers, as perceived by the students, did not affect the students participation in the computer science classes.

In the area of ethnic images Anderson, Welch, and Harris (1984) revealed no significant differences in a student's ethnic background with those taking computer classes. In a cross-cultural comparisons of gender differences in adolescents' attitudes toward computers and selected school subjects, Collis and Williams (1987) looked at two samples of 2105 eighth and twelfth grade students in British Columbia and China. In both countries, twelfth grade females were more negative about math, science, and computer studies than females in eighth grade. Males overall were more positive toward computers and their impact on society, and their own self confidence with computers.

Ages of the computer users were reviewed by some researchers. Jones and Wall (1985) found no significant differences in gender and computer anxiety existed with older students with less computer experience. Education majors had a greater reduction in computer anxiety than noneducation majors. There was no significant relationship to computer attitudes based on age or year in college in Miura's (1987) study. Mruk (1987) studied older learners; 69% of the older learners stated that they had an increased self esteem at the end of the computer class compared to only 25% of the traditional, younger students response. Age and education did have a direct effect on computer attitudes while gender and income did not, assertained Morris (1988-1989). The amount of education was the best indicator of positive computer attitudes.

Two studies by Kay (1989a, 1989b) looked at computer attitudes. Kay (1989a) revealed that both genders' scores were low on programming skills. In addition, no significant gender differences appeared with their scores on computer knowledge and attitudes toward computers, both genders scored high. However, males were more positive in all areas of computer literacy, experience, skills, application ability, awareness, and programs for computers than females. Males were more committed to computers and were significantly more positive on computer locus of control, and in listing specific uses of computers. In the second study, Kay (1989b) surveyed college students and reported no gender differences in computer literacy and computer experience. There was a significant correlation among the positive cognitive, affective, and behavior attitudes. A positive computer attitude correlated to strong computer skills and feelings of control over the computers.

Computer use has been important in the gender and computer issue. By the late 1980s computers were being used by more Americans both at home and at school or work, according to the 1989 Census Bureau study (The Omaha World Herald, 1991, March 31). About 32 percent of the surveyed people, three years and older, were using computers compared to 21% in an earlier 1984 study by the Census Bureau. Forty-six percent of the children reported access to school computers, up from 28% in 1984.

Yet several researchers were still concerned about gender differences in computer use. While Maccoby (1966) stated that males were significantly better at visual-spatial awareness, Springle and Schaefer (1984) inferred that the gender differences might also occur at an older age. Gender did not significantly affect the computer task at the preschool level, claimed Springle and Schaefer. The four year olds improved over time but there was no effect on the computer programming ability based on the gender of a child. In Cambre and Cook's reports (1984, 1985, 1987), the data analysis of age and gender showed a significant gender relationship in four of the five areas: fear of mistake, confidence to learn, fear of use, and potential comfortable with computers. There were two statistically significant relationships with age only: fear of mistake and computer smarter than respondent). Overall, Cambre and Cook recounted a reduction of anxiety after the first week and the greatest reduction was with females and in the adult age groups.

Hawkins (1984) related there were no gender differences in word processing skills. After three studies, Hawkins summarized that computers could be used as tools for achieving a variety of goals. Students should be matched with their goals and interests about computers and schools should support the learning about technology for all students. Lockheed and Frakt

(1984) proposed software computer uses in the gender issue. They stated females wanted practical uses of computers, programs for language arts, music, and the visual arts, where females excel more. Alvarado's (1984) study found that the schools' computer software had both overt and subtle gender sexism in the programs. Alvarado was concerned that a decreased emphasis on computers in mathematics classes might hinder gender use of computers due to software programs selected.

According to Chen (1985), there were no gender differences in similar computer experiences. But males more than females had more positive total experience with computers based on higher level computer programming classes and voluntary experiences such as home computer use. Males had overall more positive computer attitudes, confidence, and liking of computers in general. Chen found in classes that used nonprogramming computer processes, few gender differences were noticed. Swadener and Jarrett (1986) also found some gender differences in computer use and preference of computer software; a small percentage of the males used the computer more than most other males and all of the females in the study. Females saw more non-standard ideas for computer use in the future while the males wanted more of the same types of computer programs as they used now. Moore (1986) noted that the nature of computer courses, different gender behavior patterns, adult attitudes and role models, and software advertisements and accessibility could create gender differences with computers. Becker (1983) positioned that male students are affected more by computer use than females since the males received more reinforcement for positive behavior and had better computer attitudes and interest.

Eastman and Krendl (1987) reported that three groups of eighth graders were divided into groups which either used electronic computer encyclopedias, used regular printed materials only, or did not do a research project. There was no gender difference in achievement on computers; females did as well as males. The females did not out perform the males as hypothesized; however, the females were reported to be significantly higher in organization, presentation, and referencing ability skills. Collis (1985) reported females had a less positive computer attitude. Females said females were just as capable in learning about computers as males, according to Collis' study. Males were uncertain that the females could learn about computers. The females' self-confidence about their own computers skills were lower than males. Overall in looking at students' computer attitudes, females endorsed a negative attitude toward computers but had a more positive attitude about writing and word processing on computers.

ACCESS TO A HOME COMPUTER

The research has shown that arrangements of computer and the computer literacy programs in the schools are important; yet some gender differences still exist. The most recent data has begun to report that access to a home computer and computer experience are more important than gender in studying computer attitudes and successful experiences with computers. Computer attitude differences occurred in studies about those with a home computer and in gender studies about home computers. Some studies were concerned with who owned home computers while other studies were concerned with who used the home computer and for what purpose.

Marshall and Bannon's (1986) study concentrated on what kinds of computers were used at home and at school. When students and educators were asked, 46% had home computers with the Atari as the overall home computer choice at 27%. Apple computers were owned by 7% of the respondents, 8% had Commadores, 6% had Radio Shacks, 3% IBM, and 18% were using other kinds of computers (several had more than one computer). When the students and educators were asked about computers at school, Apples computers were the most used computers at 43% followed by Commadores at 28%, IBM at 22%, and Radio Shack at 2%. The goal of 67% of the surveyed people was to purchase a home computer, with 38% planning on buying Apple computers. Bracey (1985) reported similar results; Texas

Instrument was the main home computer in 29% of the homes in Minnesota, followed by Apples at 23% and Commodores at 19%. If new computers were to be purchased, 28% of families would buy Apples and 27% would select IBM. Families with more education were more likely to have home computers. Young and more affluent families with children were more willing to spend the time and money for computers. In looking at family income, Bracey noted that 23% of families with incomes over $40,000 had computers. Families with incomes in the $25,000 range were buying most of the computers for home while those with $15,000 family incomes purchased the least number of computers.

The 1989 U. S. Census Bureau study reported that nationally home computers were found in 15% of the homes, up from the 1984 figure of 8% of the homes with computers (Omaha World Herald, 1991, March 31). Access to a home computer was tied to family income in the 1990 National Center for Educational Statistics report (U. S. Department of Education, Center for Education Statistics, 1990). Twenty-six percent of the adults with family incomes of more than $40,000 reported access to home computers while only 3% of the adults with less than $10,000 family income reported computers.

In surveying students with home computers, 7% of teenage females and 40% of teenage males used computers outside of class, according to Beyers (1984). Beyers discovered that 25% more males than females had access to computers at home. There was little gender difference in computer achievement in teenagers who took required computer courses. Yet in another study, Lockheed and Frakt (1984), wrote that of the 400 students in a required computer science class, 50% of the males and NONE of the females used computers outside the classroom. Fisher (1984) reported 21% of the males had access to home computers and only 15% of the females did in a 1982 California study of all sixth graders. At school, 20% of the males had access to computers while 17% of the females could get to the computers. Sanders' (1984, 1986a) data showed 64% of the males had home computers and 51% of the females did, but both genders stated that the home computers were mostly used by the males in the family or their fathers. Swadener and Jarrett (1986) noted that almost 66% of the females in their study had computers at home. Only 19.4% of the students in Cambre and Cook's reports (1984, 1985,1987) had a computer at home. Miura and Hess's (1983) detected that twice as many males students as females had home computers and that the computer owner was a highly academic achiever who enjoyed programming and playing games. The sons were the heaviest computer user (2-3 hours per day), with the father using a computer for business and work and the mother not using the computer at all.

When considering users of the home computer, Swadener and Jarrett (1986) observed that computer use did not differ between the genders, but a greater percentage of the males had computers at home and saw the male as the most common computer user. Females without home computers saw males as the most common user but females who had home computers, 66% of the females, saw females as the most common user. In the Computer Equity Training program, Sanders (1986b) found 64% of males had the home computers and 51% of females did. Three times the number of females to males did not use the computer at all. Only 26% of the females used the computer at the start of the program while at the end, 48% were able to use computers effectively, an increase of 144%. When the students were asked about parental influences, parents were said to buy computers for their sons but not their daughters and to discuss computer classes and computer careers with their sons but not with their daughters.

Lapointe and Martinez (1988) found the greatest difference in students' computer attitudes was if a family owned computer. Looking at grade level, they reported 31.4% of the third graders, 37.3% of the seventh grader and 35.2% of the eleventh grader had home computers. In comparing ethnic heritage, African-Americans, Hispanics, and Native Americans had the lowest average of computer ownership while Asian-Americans had the highest average of home computers, stated Lapointe and Martinez. N. J. Campbell and Dobson (1987) revealed sixteen percent of the students had home computers and 33% used the computers at school. Their study showed that home ownership and school use of computers was significant for both genders. They noted that grade level of the students was not significant for either gender in computer attitudes or computer use. Johanson (1985) discovered both females and males who had a home computer had improved computer confidence over those without a home computer. In Johanson's study, the differences in computer attitudes between having and not having a home computer was reduced as the computer course continued and all students gained computer experience.

N. J. Campbell's (1986) research also supported the computer attitudes issue that home computer use was a significant relationship which resulted in lower computer anxiety scores. Levin and Gordon (1989) showed that owning computers made students more motivated and confident about computers, and more positive about the need for computers. The National Assessment of Educational Progress (Lapointe and Martinez, 1988) reported that students who had computers at home and at school had better computer skills than those with only school access; the highest skills were shown by those having computers at home. They reported no gender differences in computer skills. Hayek and Stephens (1988) studied high school students in computer programming courses. Those students with home computers had lower anxiety as did those students with prior computer experience. In completing the computer course, there was no significant effect about computer attitudes based on the job use of computers by the students or their parents, the education of the parents, or gender of the students.

Vrendenburg, Fleet, Krames, and Pliner (1984) perceived males owned more computers and were six times more likely to enroll in a computer science class than females. Males also liked computers more and could list more brand name computers than could the females. More females than the males did state that they were afraid of computers. There were no gender differences found in computer access at school, their general knowledge about computer locations in the school, or the number of places that used computers. Also Vrendenburg, et al., disclosed that there were no gender differences in the students' responses about their need for computers, their parents liking computers, or computer capabilities for their own education. In a non-gender related question when the student were asked what they wanted to do with free time, most of the students preferred to read a book (20.3%), watch TV (6.4%), or see friends (67.8%, males more than females); only 4.1% of the students wanted to work on the computer.

In a study by Chen (1985), almost 23.7% of the males and 18.1% of the females had home computers. Males used the home computers 6.1 hours per week and females used them 3.6 hours per week. In Collis's (1985) study, there was gender difference in use of the computers outside of school with both 8th and 12th graders being active home users. The eighth grade students' mothers were listed most as not using a computer by 80% of males and 82% of females while in the twelfth grade 60% of the males and 76% of the females listed their mother as a non-computer user. Collis found 92% of the males selected males as most likely to use a computer. Females also listed a male as the likely user, though at a lower percentage, 61% average. Bright males who liked science and math, but who were not considered socially mature, were listed as the friend who used computers most, at home or at school. Luehrmann (1985) reported males were likely to have a computer at home and make better grades in academic subjects than females, according to freshmen at the University of California-Berkeley. Twice as many males as females had a computer at home or had written a computer program. Luehrmann found few minorities had access to a home computer and 80% of subscribers to computer magazines were male.

Enochs (1985) studied general attitudes of 512 middle school students toward computers. Looking at gender and grade level, and access to a home computer, the overall computer attitude was moderately high with no significance in grade level or gender. However, there was a significantly higher and more positive attitude toward computers by those with a home computer. Half of the group in Marshall and Bannon's (1986) study had home computers and the majority of the respondents had access to a computer. The students recorded a significantly higher positive attitude toward computers than those without a home computer. There was no gender difference in computer attitudes in home computer access. Students under age 19 years who had a home computer had more positive attitudes toward computers than those without computers, according to Marshall and Bannon. In computer knowledge, there was no difference between those with and those without home computers.

N. J. Campbell (1986), in studies about computer anxiety, found gender was significant for home computer ownership and school computer use. However, gender was not significant for grade level based on the 49% male and 51% female students' responses. Nickell, Schmidt, and Pinto (1987) established that both genders had positive computer attitudes with the regular use of computers and home computer access. N. J. Campbell (1989), in another report, detected that gender and school level differences were found in comparing those with and those students without a home computer. There were no gender or grade difference in computer attitudes and anxiety for school use of computers when computers were available and school use was controlled, continued Campbell. More males had home computers than females. In the grade levels, more 7th to 9th graders had home computers than the 5th and 6th or 10th to 12th graders.

While most research supports access to a home computer in relationship to positive computer attitudes, Miura's (1987) study did not. Computer attitudes and access to a computer outside of school were not statistically significant with the study of college students, even though 34% of the males and 28% of the females had computer access outside of school.

While more males than females had access to home computers, overall the review of literature on access to a home computer has shown that more positive attitudes exist for computer users that have a home computer, regardless of gender.

COMPUTER EXPERIENCE

Along with access to a home computer, research is just starting to show that computer experience affects computer attitudes and abilities. Early exposure to computers resulted in high computer success and computer experiences, reported N. J. Campbell and Perry (1988). Their study with high school students supported the idea that students would be more likely to pursue computer studies if they developed positive computer attitudes. Those students with computer experience had a greater sense of perceived ability to be successful with computer science courses; experience in the lower grades attributed to better computer skills and knowledge, according to Campbell and Perry. Computer experience did not result in a difference in the students' perceptions of career usefulness of computers.

Rosser (1982) found females and ethnic minorities were not likely to sign up for classes even though they perceived computers as "great." Females generally did less well on programming tests than males but females with more computer experience did as well or better than males. Beyers (1984) stated that there was little difference in computer achievement among teenage females and males who took required computer courses. Fann, Lynch, and Murranka (1988) expressed that the more experience a student had on the computer, the more positive the student's attitude toward computers. Also a more positive attitude results in more completed assignments and in increased desire by the student to use the computer in the future. A less experienced student would use one-on-one training and used friends for help in the computer literacy sections rather than seeking teacher help. Fann, et al., did conclude that students with different levels of experience would seek different amounts and types of training in the future. No gender differences were found.

In one case study of computer use by Vernon-Gerstenfeld (1989), females encourage each other more and received more help than males. The older female students had less computer experience than male students. Yet Krendle, Broihier, and Fleetwood (1989) reported both genders helped each other equally when working with computers. Females were found to use the computer more, 27 hours, while males were found to have less total classroom computer time, 12 hours.

There was a significant reduction in computer anxiety and improved computer attitudes following computer use, according to Lambert, Lewis, and Lenthall's (1989) study. The computer attitudes of 44 college students with high levels of computer anxiety were reduced more significantly by computer experience. Mahomood and Medewitz (1989) assessed the effects of progressive phases of computer literacy on the individuals' attitudes, values, and opinions toward information technology. Mahomood and Medewitz ascertained that as the students became more computer literate, they became more positive about information applications (computerized, electronic data) but they did not significantly change in attitudes and values information technology due to their computer literacy experiences.

A study by Dalton, Hannafin, and Hooper (1989) with high achievers and low achievers was designed to compare the effects of individual versus cooperative computer assisted instruction (CAI) on student performance and attitudes. Pretests and post-tests of the students' computer attitudes showed that the cooperative assisted instruction method to learn computers was rated more favorably by low ability females than by low ability males. Individualized instruction was rated least favorable by the low ability females. The low ability males preferred individual instruction since it was evidently less embarrassing than cross-gender cooperative instruction.

Lockheed, Nielsen, and Stone (1983, 1985), in a study about computer experience, reported that females gained fewer computer skills than expected while males gained more than expected. The gender differences came from differences in computer access and experience which was more important for male achievement. Males who asked the teacher for help showed a positive and significant computer achievement level. Lockheed, et al., stated that gender differences in access to computers and increased teacher and student interactions were statistically significant and positive for females. Rampy (1984) noted that only 37% of the females were enrolled in a computer literacy programs; however, with good computer exposure females did as well or better than males. When asked about their future use of computers, females saw themselves using computers for labor saving household chores while males would use computers for financial planning, games, or for career help.

Levin and Gordon (1989) discovered prior computer experience had a greater effect on computer attitudes toward computers than gender. Gender differences occurred with males having a significantly more positive affective attitude toward computers than females, they reported. Koohang (1986) used Loyd and Gressard's 1984 Computer Attitude Scale and the subscale on computer anxiety. Using a one way ANOVA with computer experience, grade, and gender, Koohang reported that gender and computer experience, but not grade level, were significant. Males with more computer experience scored higher and showed less anxiety than females, but students with more computer experience had higher mean scores than those with less computer experience.

Computer attitudes of teachers and students in relationship to gender and grade level were evaluated in two studies by S. D. Smith (1986, 1987). In both studies there were significant differences of computers attitude by grade levels. The first years of experience were important for students to gain computer experience and confidence. Students in schools with strong computer programs increased their confidence as they gained experience, while the teachers' confidence decreased as they gained computer experience. Based upon computer experience, elementary students were significantly more confident about computers than junior and senior high students. In both studies, students overall were more confident than teachers; the teachers' sense of computer confidence scores were significantly lower than the students scores. An earlier study by Jones and Wall (1985) looked at age, gender, and computer experience. Thirteen percent of the students had one or more semesters of computer science and 55% had no computer experience. The study reported that older students with less experience showed no significant differences between gender and computer anxiety. There was a significant relationship between prior computer experience and reduced computer anxiety scores by the end of the course.

Addressing the effects of gender, age, and computer experience on computer attitudes with 354 high school and college students, Loyd and Gressard (1984b) found there was no significant gender difference in computer attitudes in relationship to computer experience. Some significant effects were found concerning age and computer experience but no clear trend was noted. Computer experience was significant to positive attitudes on all three subscales of the Computer Attitude Scale (computer anxiety, computer confidence, and computer liking). Females with more computer experience had more positive computer attitudes than males, reported Gressard and Loyd (1984a, 1987). In their two studies with 217 female and 139 male secondary and college students, gender was not a major factor in math anxiety or computer attitudes while computer experience had a small but significant effect. Koohang (1987) studied the attitudes of 60 general education class students toward computers. There was no overall significant difference with gender and the computer attitudes. Those with more computer experience had a greater positive computer attitude; males had a slightly higher but not statistically significant rating. Experience in computer programming and computer application instruction resulted in more positive computer attitudes for both genders.

Using college students, Nickell, Schmidt, and Pinto (1987) looked at gender and gender role differences in computer attitudes and experiences. The 166 subjects' scores showed that the males had a more positive attitude toward computers than females but the gender difference was not significant. A computer used regularly and access to a home computers were related to positive computer attitudes for both genders. Woodrow (1990) found more evidence that supported the suggestion that computer attitudes are affected more by computer experience than gender. No statistically significant relationship existed between computer attitudes and gender, age, or home computer in Woodrow's study. Females with prior computer experience had more positive computer attitudes, reported Arch and Cummins (1989) in their study of college students. Males were found to use computers more and males reported being more comfortable with computers than females. Males in college in Miura's (1987) study rated themselves higher on the perceived ability to work with a computer than females did.

Banks and Havice (1989) and Baumgarte (1984) found the best computer teachers matched computer use expectations to the students, were competently trained computer instructors, and gave on-line instructions and provided good access to computers. Banks and Havice, along with Loyd and Gressard (1984b), concluded that the teacher who provided more classroom computer experiences had a more positive influence on what the students' computer attitudes would be. Gender and the amount of computer experience by teachers in staff development programs were studied by Loyd and Gressard (1986) to determine the effects of teacher computer attitudes and perceptions of the computers' usefulness on students' attitudes. Loyd and Gressard's 1984 Computer Attitude Scale combined the teachers' experience on computers and showed that significant differences occurred with computer experience in the areas of computer anxiety and computer liking. Significant differences in gender occurred in the areas of computer anxiety and computer confidence. Those with more than one year computer experience were less anxious, and male teachers were significantly less anxious. The males were significantly more confident in learning about and using computers. There were no significant differences in computer liking and those with more computer experience found computers to be more useful. Overall attitudes showed fewer differences between genders for teachers with more than one year of computer experience.

Bitter and Davis (1985) contended that for teachers, a positive correlation existed between the average educators' attitudes toward computers and average levels of computer knowledge. Teachers also had a positive attitude about computers in the educational domain; they wanted to expand their computer knowledge. Bitter and Davis noted that computer anxiety and computer helplessness decreased for the educators with over three years of computer experience. The study did not report on differences in education role, age, or gender. A pilot study by Small and Haley (1986) investigated alternative computer inservice programs for elementary school teachers. After ten one-hour inservice sessions at each school, the authors stated that teachers were generally receptive to computers and computer uses. But the teachers stated they were afraid of exposing their ignorance when using computers, and of being unprepared and slow with computers.

Honeyman and White (1987) reported, on their research on computer anxiety, that attitudes changed over time with 38 teachers and administrators in a semester long introductory computer applications course. Anxiety did decrease after time for the beginning computer adult students'; though for some it took as long as 30 hours for the decrease in computer anxiety to occur. Honeyman and White suggested that for adults, short term inservices of one to two days are not the best way to lower computer anxiety and increase attitudes toward computers. Eighty seven graduate students (97% teachers) were questioned about their attitudes toward computers by Manarino-Lettett and Cotton (1987). The teachers felt computers were valuable additions to teaching (90%) that would enhance the teaching and learning process (86%). Teachers did not find computers to be a threat (93%) and did not find computers to be complicated (85%). However, 64% of the teachers found the computer course to be frustrating. The majority of the teachers used the computer once a week or less (73 of the 87 graduate students). Over 50% (55%) of the teachers had access to computers at school and 13% had computers in their classrooms. Almost 20% had their own computer while another 8% used computers outside of school and home situations. Lewis (1985) released information that with adults, the older females who had been away from school for many years were less positive and more apprehensive about computer. According to Lewis, when older adults returned to school to complete their education, they did better on computers in computer literacy classes, enjoyed the computer more, and obtained better experiences with computers than younger students.

In evaluating a new experience using the Stages of Concern Questionnaire, 1976 (Rutherford, Hall, and George, 1982), Wedman and Heller's (1984) study found the more anxious teachers only reached step two, "little experience with innovations and new ideas," of the questionnaire. Of the eighty-seven teachers taking an off-campus microcomputer education course, those who were more anxious about computers had less positive experiences about computers. Those teachers who received reinforcement, did collaborative learning, and had management skills instruction had more positive computer experiences.

In this section of the review of literature has found five areas that could affect gender computer enrollment and computer attitudes. These are (1) students' and educators' attitudes and associations with computers, (2) developmental and behavioral characteristics of the students, (3) parental and peer influences and pressures, (4) software and computer use images, and (5) school arrangements of computers and schedules of the computer classes. Winkle and Mathews (1982) felt females' self concept concerning computer technology must be enhanced with acceptance and encouragement for them to participate in computer work. Enhanced computer equity for females would show expanded career goals, positive computer role models, and future job options in technology for females.

SUMMARY AND CONCLUSIONS

The literature and research review has shown that researchers once assumed that a tie existed between gender differences in computer attitudes and stereotyped social behavior and educational abilities and skills. Actual studies, however, revealed that the major factors which affected computer attitudes were access to a home computer, access to school computers, and computer experience. Some gender differences had been discovered in the review of the literature about computers in the schools. The real issue currently is how schools use computers and who gets to use them, regardless of the gender or age of the computer user. Those students and educators with more computer experience were generally more positive attitudes toward computers. Those with access to a home computer will generally have a more positive attitude. Those with positive computer attitudes are going to gain more computer skills and abilities, regardless of the computer user's gender or age. The next chapter will develop the setting, the research methods, and the procedures of this study on gender and computer attitudes and Chapter Four will provide the data analysis of this study.

CHAPTER THREE

SETTING, RESEARCH METHODS, AND PROCEDURES

Students and educators using computers in today's schools are involved with a rapidly expanding technology field. In Chapter Two, Review of Literature, the major factors of gender, age, computer experience and access to a home computer were examined. This study using elementary and secondary students and educators was developed to determine if there is a relationship between attitudes toward computers and gender, computer experience, access to a home computer, and education role (grade for students, age for educators).

STATEMENT OF THE PROBLEM

The purpose of the study was to examine computer attitudes (identified as computer anxiety, computer confidence, and computer liking by Loyd and Gressard, 1984) as they related to gender, access to a home computer, computer experience, and role or grade level among elementary, middle school, and high school students and teacher and administrators. Based upon the assumption that differences in computer attitudes do exist, the following four null hypotheses were tested:

(1) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *education role* (student or educator).

(2) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *computer experience.*

(3) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *access to a home computer.*

(4) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *gender.*

SETTING FOR THE STUDY

The School District of Ralston

The setting of the study was the School District of Ralston, Nebraska. The district was selected based upon its eight year emphasis on computer literacy and the large number of computers in the district (540 total, for a computer and student ratio of 1: 5.8) and number of computers available in classrooms (479 just for student use, for a ratio of 1 computer to 6.6 students). At the time of this study each elementary classroom had one to two computers with a minimum of 18 in each building's computer lab. The district and information related to computer use was accessible to the writer for the initial data collection and follow up.

The School District of Ralston, located in the Omaha metropolitan area, includes residents in Ralston (6,243, 1990 census population) and in Omaha city limits for an estimated district patron population of 22,000; an estimated 20-25% had children in school. The district is the smallest of the six metropolitan area school districts (14th largest in the state, Statistics about Nebraska Elementary and Secondary Education, 1989-90) with 3,144 students in May, 1991. The district is considered lower-middle to middle class with a business section bordering the northern edge of the district. Due to statute changes in the area of state financial support of schools, the district was considered property rich but income poor and resulting in lower funding from the state. The Ralston's patrons at the time of this writing were concerned about the per pupil costs of education in comparison to larger neighboring school districts and about still keeping high standards for their children's educational opportunities. The changes in the school board as a result of the 1990 election reflected this change in attitude toward keeping costs down while other neighboring districts were increasing budgets. The per pupil costs was one of the highest in the state due to Ralston's continued goal of being on the cutting edge of educational programs and due to the large number of experienced teachers. Over 50% of the teachers had 10 and more years experience and over 50% had advanced degrees.

Ralston's Computer Literacy Curriculum

Since 1982 the Ralston School District had stressed a school wide emphasis on computers. The twelfth graders were the first group to receive computer instruction when they were in the fourth grade. The eighth and fourth graders in this study had received computer instruction and hands on computer activities since kindergarten. The educational staff (teachers, administrators, secretaries and aids) had taken a mandated computer literacy class or a computer science programming class (for graduate credit) beginning in 1983, with the district picking up the cost of the training. As the computer technology had changed, additional after school inservice programs and graduate credit classes had been offered to allow teachers, administrators, and support staff additional computer knowledge. The district continued to allow staff and educators opportunities to purchase computers.

The Ralston District's commitment to computer technology continued in the schools with the Computer Curriculum (Ralston, 1989), approved by the school board in December, 1989. This program emphasized an "on-going, flexible program developing first an awareness of the computer and then the utilization of this technology within the standard K-12 school curriculum," according to the philosophy statement (1990). The mastery of the computer literacy aspect of the curriculum would be accomplished by the end of the sixth grade. The K-8 scope and sequence included computer awareness and computer utilization. Keyboarding was to be introduced in the third grade and continued with formal and informal instruction through the eighth grade. Introduction to computer programming continued to be offered at the seventh and eighth grade as well as computer development in gifted programs, extended day programs, and enrichment classes.

Introduction and advanced computer science programming classes were also available at the high school. Computer applications were found in all curricular areas; some examples included graphics with color Apple IIe and Macintosh computers and interactive video with laser disc player and Macintosh Hypercard systems in the art department; interactive video with Macintosh in the science department as well as Apple GS science programs;

computer aided programs (Apple IIe and GS and IBM) in the foreign language, music, drafting/architectural drawing, and mathematics departments; IBM computerized bookkeeping and accounting; and word processing in journalism and English composition courses as well as traditional business applications using the computer. The media center/ library had on-line computer searches and CD rom encyclopedia systems using IBM and IBM compatible computers.

Computers in Ralston Schools

Ralston Schools had a large number of computers available for student and teacher use. The spring of 1991 district inventory displayed a total of 540 computers, mostly some form of Apple; these included 20 Apple IIc, 327 Apple IIe, 108 Apple GS, 56 Macintosh (including 2 color Mac LCs), and 28 IBM. 20 were added in 1990-1991 through a computer purchase campaign with an area grocery chain. The Table 3-1 displays the computer inventory according to building.

Computers in the elementary schools were usually distributed with a minimum of one computer per classroom (most had two) with 18 to 24 in the each buildings' computer labs. At least one IIe and one Macintosh were in each elementary school principal's office (except for one who only had a IIe) along with a minimum of one computer in the library-media center or teacher workroom. All SPED (special education) classrooms had at least one computer and special programs such as speech and reading and multi-district shared cooperative classes for the hearing impared and for the English-as-a-second language (ESL) program had a computer.

TABLE 3-1

Ralston's Computer Distribution by Building

Building	IIc	IIe	GS	Mac	IBM	Bldg.	Student Pop.
Central Office	x	x	x	8	4	12	x
Blumfield Elem	x	24	21	1	x	46	363
Karen Western El	x	12	21	1	x	34	234
Meadows Elem	x	29	10	3	x	43	312
Mockingbird Elem	x	31	8	x	x	39	266
Seymour Elem	x	14	18	2	x	34	295
Wildewood Elem	x	25	10	x	x	35	277
Middle School	x	76	15	10	x	101	505
High School	20	116	5	31	24	196	892
Totals	20	327	108	56	28	540	3144

At the Middle School 62 computers were networked in the computer lab and some were used for students publications; other computers were in classrooms. At the high school most Apple IIe computers were in the computer lab and keyboarding rooms and the IBMs were in the business department; these were networked. The remainder of the computers were in classrooms (such as the Apple IIc in English for students to checkout for composition classes, the Apple IIes and Apple II GSs and the Macintoshes in the art, the science, and the technology departments classrooms) and in the offices of teachers, administrators, student services department (counselors, nurse, dean), and the main office for the support staff. Most of the Macintoshes were in the main office area and student services department in a network system. The library also had a computerized inventory and check out system along with electronic information retrieval computers.

Based on Ralston High School's membership in the 14 school ASCD Consortium, the Apple Computer Corporation had made a proposal to the school board which would place 120 networked color Macintoshes (Mac LC) in each teachers' classroom in the high school. The two computer labs would have 30 Mac LCs in each lab along with smaller labs of 8-10 in selected areas such as the library-media center and composition classes. Three data bank servers would be available along with additional hardware and software packages for teacher and student use. Forty-five days of free inservice would be part of the program with teachers nationwide providing the practical inservice with at least one software company providing an additional 18 days of free inservice with the software programs. Ralston High School would be the Apple Corporation's Showcase Mac School. The school board had voted on July 8, 1991, to purchase a total of 150 Mac LC systems.

Since 1982, the Ralston schools has had a computer committee and each building had a designated computer coordinator. A district wide computer director maintained the computers, developed computer literacy classes, provided up-to-date computer information, and continued contacts with major software and hardware companies.

RESEARCH DESIGN

The survey research approach in this study was employed to determine students and educators attitudes toward computers. In survey research, samples are used with large and small populations to discover distribution, interrelations of psychological and sociological variables, and relative incidence according to Kerlinger (1979). In the case of this study, all students in grade four, eight, and twelve and all teachers and administrators were surveyed. Survey research as a data collection procedure provided the advantage of low cost, ease of accessible data collection, and the ability of the researcher to obtain information within the Ralston Public Schools District.

THE INSTRUMENT

After reviewing computer attitude research instruments, a decision was made to use the Computer Attitudes Scale (CAS) survey (see Appendix A) by B. H. Loyd and C. Gressard (1984) with their permission (obtained in the fall of 1985; see Appendix B). Loyd and Gressard studied three groups using the CAS; two 1984 studies included 142 high school students, 107 community college students, and 105 liberal arts college students (N=354) in one group and 155 students in grades 8 through 12 in another study while the third study, conducted in 1986, surveyed 112 elementary, junior high, and senior high teachers. Loyd and Loyd (1985) completed a reliability and validity of the CAS (see Table 3-2) that included a fourth subscale called Computer Usefulness with 114 K-12 teachers in computer staff development courses.

In 1986 Gressard and Loyd also performed two validity tests using their Computer Attitudes Scale, one with 192 elementary, junior high, and senior high teachers and another with 70 of the original 192 teachers in the second test. Munger and Loyd (1989) using the CAS and math performance, surveyed only high school students as did Koohang (1986) in studying computerphobia, using only the Computer Anxiety subsection of the CAS. Previously Payton and Loyd (1984) studied math and computer attitudes with 105 college students using the Computer Attitudes Scale. Koohang (1986), Abler and Sedlacek (1987), and Woodrow (1990) also used the CAS in their research.

Computer studies have ranged from computer anxiety to computer literacy research. Gressard and Loyd (1984, 1987), Koohang (1987), Loyd and Gressard (1986), Loyd and Loyd (1985), and Payton and Loyd (1984), looked at total computer attitudes and also the subscales of the CAS. However, the majority of their reports concentrated on the total computer attitudes as did many other researchers including Abler and Sedlaek (1987), Bannon, Marshall and Fluegal (1985), Baylor (1985), N. J. Campbell (1990), Chen (1985), Eastman and Krendl (1987), Jackson and Yamanaka (1985), Kay (1989), Levin and Gordon (1989), Small and Haley (1986), and Woodrow (1990). Based upon aforementioned information, this writer decided to concentrate on the total computer attitudes of the population in this study.

The CAS survey had been used with students in grades 7-12, college students, teachers and administrators but had not been used with fourth graders before this study. The decision to include the 4th graders in this study was based on research by Hess and Miura (1983), Schubert (1984), Hawkins (1984), Campbell (1986), Swadener and Jarrett (1986) and Campbell and Dobson (1987) who included fourth graders in their studies and by Cambre and Cook (1987) and Lapointe and Martinez (1988) who assessed students computer attitudes starting with third graders. Sixth graders and older students' were examined according to computer attitudes by Lockheed and Frakt (1984), Wong, Uhrmacher, and Siegfried (1984), Johanson (1985), and J. Sanders (1986).

Secondary students in grades eight and twelve were included in computer attitude research by Collis (1985), Eastman (1986), Eastman and Krendl 1987), Collis (1987), and Collis and Williams (1987) while Springle and Schaefer (1984) and Beeson and Williams (1983) looked at preschool children in their computer research. Several computer attitude studies had used only high school students such as Cole and Hannafin (1983), Kulik, Bangert, and Williams (1983), Lockeed, Nielsen, and Stone (1983 and 1985), Guinan and Stephens (1988), Hayek and Stephens (1989) [using 52 students at this writer's high school], and Banks and Havice (1989).

Computer attitudes and computer knowledge of teachers, administrators, and library media personnel and students grades 7 through college had been examined by Vrendenburg and others (1984), Lindbeck and Dambrot (1986), and Marshall and Bannon (1986). Only college students were tested by Payton and Loyd (1984), Dambrot, Watkins-Malek, Sillings, Marshall, and Garver (1985), Popovich, Hyde, and Zakrajsek (1987), Mahomood and Medewitz (1989) and Kay (1989) while Smith (1986) included computer attitudes of students in grades 1-12 and their teachers. Some computer studies had concentrated only on teachers and administrators such as those conducted by Hansen, Klassen, Anderson, and Johnson (1981), Wedman and Heller (1984), Madsen and Sebastiani (1987), Honeyman and White (1987), and Manarino-Lettett and Cotton (1987).

This writer's conclusion was to include the fourth graders in the Ralston District survey even though the Computer Attitude Scale instrument had not been used before at the fourth grade level. Concern about the fourth graders ability to understand all of the questions lead to a pilot study with St. Gerald's fourth graders, who also live in the Ralston district. After the pilot study, some modifications of the wording were made to meet the fourth grade reading level. A reliability test (see Table 3-2) was run based on the data collected for the fourth grade. The overall reliability using Cronbach's alpha reliability coefficients test was .888 with .744, .705, and .768 in each of the three subscales.

TABLE 3-2

Reliability Tests on Computer Attitude Scale

	LOYD AND GRESSARD			GROGAN	
	Grade 8-12	Adults	Educators	Grade 4	Total
	1984	1986a	1986b	1990	1990
Total Computer Attitudes	0.95	N.A.	0.95	.888	.953
Computer Anxiety	0.86	0.90	0.89	.744	.881
Comp. Confidence	0.91	0.89	0.89	.705	.880
Computer Liking	0.91	0.89	0.89	.768	.878
Populations	N = 155	N = 192	N = 70	N = 162	N = 777

Computer Attitude Scale Survey Format

Demographic data questions were expanded beyond the original format and placed at the end of the survey rather than Loyd and Gressard's placement of demographic data at the beginning. This allowed the subjects to immediately focus on the computer attitude questions and complete the demographics section as a final task. As presented in the Appendix A, the survey format was a single sheet of 8 1/2 x 14 paper folded to create four pages. One version was used for the students and another for the adults. Words such as father and mother versus husband and wife and different ages, grade and building levels were found in the appropriate student and adult versions.

The Computer Attitude Scale (CAS), a 30 item questionnaire was divided into three ten-item subscales, Computer Anxiety, Computer Confidence, and Computer Liking. The Likert-like response scale contained four parts with responses coded from "1", "strongly agree" to "4", "strongly disagree." The responses for the positively worded items (as shown in the Table 3-3) were then recoded in a reverse rating of 1=4, 2=3, 3=2, and 4=1. This scoring strategy resulted in high scores on the Computer Anxiety subscale corresponding to lower anxiety and in high scores on the Computer Confidence and Computer Liking subscales corresponding to higher confidence and liking of computers. In general, with the scores of the subscales three combined, a higher score corresponded to a more positive attitude toward computers, according to Loyd and Gressard.

The second section of the CAS sought demographic background information about the respondent's grade, gender, computer use at school, access to a computer at home, users of the home computer, and current and future computer use. Teachers and administrators were asked the same information but asked about building level responsibility rather than grade.

TABLE 3-3

Computer Attitudes Survey Statements

Subscales	Positive Statements	Negative Statements
Computer Anxiety	1, 7, 13, 19, 25	4, 10, 16, 22, 28
Computer Confidence	5, 11, 17, 23, 29	2, 8, 14, 20, 26
Computer Liking	3, 9, 15, 21, 27	6, 12, 18, 24, 30

Population of the Study

The population of the study were all students in fourth, eighth, and twelfth grades and all teachers and administrators of the Ralston Schools. The 3144 students were located in six elementary schools, one middle school, and one high school. At the beginning of the 1990-91 school year 233 fourth graders were located in eleven classes, 263 students were in the eighth grade at the middle school, and 207 students were in twelfth grade at the high school.

There were 254.8 (FTE) educators at the eight schools and one administrative building. The 240.3 teachers (Full Time Equivalence [FTE] included 4 PhD and 135.10 Masters degrees with three PhDs in progress. The 14.5 administrators had 3 PhD, 11.5 Masters and/or Specialist degrees. Fourth graders in St. Gerald's Elementary School, located in Ralston, were used in the pilot.

SURVEY PROCEDURES AND TIME TABLES

At the weekly meeting of administrators of the Ralston Public Schools at Central Office during the second week in September, 1990, the study and the survey procedures were introduced and those present completed the survey. Each survey was numbered according to grade level and school for the students (i.e.: ME-1A was one student in one fourth grade class at Meadows while ME-1B would be the other classroom; high school and middle school students where just identified by building), and by a three digits identification number for the educators (using the teacher directory and consecutive numbers starting with the first school, Blumefield).

On September 20, 1990, the student surveys and cover letters in eleven envelopes were distributed to the Ralston fourth grade teachers; two extra copies in each packet were included in case new students had arrived that week. Middle school eighth grade surveys and letters were placed in the Bridge-advisement teachers' mailboxes. The twelfth grade surveys were placed in the high school advisors mailboxes also on September 21, 1990. The teachers surveys were sent to the eight principals for distribution.

Students were surveyed in their home class in each of the six elementary schools' fourth grades (eleven classes), in Bridge meeting times (advisement groups) at the Middle School, and during advisement at the High School. Faculty members (teachers and administrators) were surveyed during required teachers and administrators meetings in September, 1990; the High School educators' survey was completed October 5, 1990, during the monthly faculty meeting. Each questionnaire took about 10 minutes to complete, as stated by Loyd and Gressard.

By checking the code numbers, missing surveys of educators included a personal note and another copy of the survey (with a new number). Follow up on the missing surveys started October 15, 1990. As shown in Table 3-4 almost 100% of elementary and secondary student forms were returned by October 30, 1990 (100% for fourth grade, 97.98% for eighth grade, and 100% of twelfth grade students). All educator forms were received by November 15 after a third contact (92.8% final response with 232 surveys). Of the 902 returned, 865 were usable.

TABLE 3-4

Survey Distribution and Return Percentages

	Number Distributed	Number Returned	Percentage Return
Educators			
Elementary	122	107	88%
Middle School	46	43	90%
High School	63	63	100%
Coordinators, Directors, and Administrators,	19	19	100%
Educators Total	250	232	92.8%
Students			
Fourth Grade	225	225	100%
Eighth Grade	248	243	98%
Twelfth Grade	202	202	100%
Students Total	675	670	99.3%
POPULATION TOTALS	925	902	97.5%

DATA PROCESSING AND ANALYSIS

Each returned Computer Attitude Scale survey was tabulated and tallied on a long single form sheet by three Ralston High School National Honor Society members as part of their service projects. Each returned student survey received a three digit code number. Using the forms, a freshman advisee of the writer helped with the computer data entry. The Nebraska Evaluation And Research (NEAR) Center at the University of Nebraska-Lincoln provided the statistical information and treatment of the computer data with the SPSS-X, Statistical Package for the Social Sciences-Form 10.

Four scores were computed for each student and educator, one score for each of the three subscales and one for the total Computer Attitude mean score. According to Loyd and Gressard in their studies, high scores on the Computer Anxiety subscale were to correspond to lower anxiety, while higher scores on the Computer Confidence and Computer Liking subscales were to correspond to a greater degree of confidence and liking, respectively. For this study rather than creating a sum total score, mean scores were calculated for the total Computer Attitude to correspond to actual responses of Strongly Agree = 1.00 to Strongly Disagree = 4.00.

To examine the nature of these computer attitudes, means and standard deviations were computed for the total computer attitude score using the Cronbach test. Means and standard deviations were calculated for each of the independent variables of gender, home computer, computer experience, education role, grade (students) and age (adults). To assess the impact of these variables on computer attitudes, two-way analysis of variance (ANOVA) procedures were used as well as one way ANOVA procedures. Tukey test procedures (Tukey-HSD) were calculated on those areas with statistical significance.

Two-way factor analysis of variance procedures was used with the first factor of gender (female or male) and the second factor, access to a computer at home (yes or no). The third factor, computer experience, was divided into a three levels: less than one week to one year (none to little experience with computers); one to three years (some computer experience) and three to more than five years (a lot of computer experience). With the fourth factor, the subjects were asked to identify education role (student or educator). The fifth factor for students only, grade level, was divided into three levels: fourth grade, eighth grade, and twelfth grade. Educators were asked note their age in one of the four adult age levels of 21-30, 31-40, 41-50, and 51+ years for the sixth factor. Students were also asked their age from the years of 8 to 19, but this was only used to determine the average age for each grade level for demographic data. The remainder of the demographic information included information about the kinds of home computers, who used the computer most at home and for what reasons, who used the computer the least, self use of computers, and expected future self use of computers.

Each of the four hypothesis was tested at the .050 level of significance. Testing was conducted on the relationship of gender, access to a home computer, computer experience, education role, and grade (students) and age (adults) to the computer attitudes scores. The two-way analysis were checked for the effects of education role and gender, computer experience and gender, and home computer and gender. In addition, two-way interactions were checked with access to a home computer and computer experience, home computer and education role, and computer experience and education role. Relationships of the population subgroups of students and educators were examined according to grade for students and age for educators.

SUMMARY

After a review of the literature on computer attitudes, a survey instrument was selected with permission of Loyd and Gressard, the Computer Attitudes Scale (1984). A pilot test was conducted, modifications were made, and the survey was administered in the Ralston School District to all students in grades four, eight, and twelve through classroom and advisement sessions and to all educators via faculty meetings and direct mailings. Reliability tests were produced to check for internal consistency of the survey.

The data was tabulated and transferred to computer disks. The Statistical Package for the Social Sciences-Version 10 (SPSS-X) was applied. Cronbach's alpha test was applied to check reliability as presented in Table 3-2. Factor analysis of variance were utilized in each of the factors of gender, education role (age or grade level for the subgroups), computer experience, and access to a home computer. Sum of squares, degree of frequency, mean squares, f-ratios and degree of significance were tabulated along with cross tabulations of the factors.

Additional demographic data was collected such as types of home computer most frequent user and type of use of the home computer, least user, and personal computer use and estimated future use. The data collected provided information on computer attitudes in the district according to age (adults) or grade level (students), gender, computer experience, and access to a home computer and also provided the district with a means to evaluate the effectiveness of its' computer emphasis in a district-wide study. In addition the survey may have caused the participants to evaluate their own knowledge and feelings about computers.

The next chapter, Chapter Four, provides a list of the hypothesis through analysis of data collected for the study.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

Over 75 percent of the jobs in the United States do or will require computer knowledge by the end of the 1990s, according to Turkington (1982). In developing schools for the future, selecting, planning, and implementing technology in the schools is one of four goals of the ASCD consortiums (Cawelti, 1989). To provide students with a universal experience with computers, the schools have become the primary source for computer education and computer experiences. The review of literature, presented in Chapter Two, has shown most students do not have access to computers at home. Those who do have access to a home computer gain more experience with and gain a more positive attitude toward computers and their own computer skills than those that do not. In addition gender and socio-economic differences may hamper students ability to an equal opportunity for computer education. The Computer Attitude Scale survey was used with one school district to determine computer attitudes of students and educators. This study was designed to determine if computer attitudes are related to gender, access to a home computer, computer experience, and education role.

STATEMENT OF THE PROBLEM

The purpose of the study was to examine computer attitudes (identified as computer anxiety, computer confidence, and computer liking by Loyd and Gressard, 1984) as these related to gender, access to a home computer, computer experience, and education role among and between elementary, middle school, and high school students and teacher and administrators. Using the Computer Attitudes Scale (CAS) (see Appendix A) and based upon the assumption that differences in computer attitudes do exist, the following four null hypotheses were tested:

(1) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *education role* (student or educator).

(2) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *computer experience.*

(3) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *access to a home computer.*

(4) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on *gender*.

A demographics section of the CAS included questions about gender, age, grade, access to a home computer, and amount of computer experience. In addition all respondents were asked how they used the computer now and predictions of their future computer use. Those with home computers were asked about the kind of home computer and the most frequent and least frequent computer user at home.

The data gathered and reported in this chapter was collected through the use of the Computer Attitudes Scale survey, an instrument developed by Loyd and Gressard in 1984 (See Appendix A: student and educator versions). The instrument contained two major parts. The first part was designed with a 30 item questionnaire with ten items in each of the subscales of computer anxiety, computer confidence, and computer liking. A four part Likert-type response scale was used to record the results with codes ranging from "1: STRONGLY AGREE" to "4: STRONGLY DISAGREE." In each subscale, five statements were stated positively and five were stated negatively. The second section contained demographic and computer background questions which included gender, age, grade (students) or education role (students and educators), computer experience, computer use at school and at home, access to a home computer, users of the home computers, and future role of computers in the respondent's life.

The instrument had been tested for internal consistency in three early studies (Loyd and Gressard, 1984, 1986a, 1986b). Cronbach's alpha reliability coefficients test was done for each of the four areas of computer attitudes and the three subscales of computer anxiety, computer confidence, and computer liking. For the purpose of this study, a reliability coefficient test was conducted for the fourth grade and for the total population.

POPULATION OF THE STUDY

Demographic data from the study is presented and discussed in this section of the chapter. Of the 925 surveys distributed, 902 were returned for a 97.5% return rate. Educators in the Ralston K-12 district had a response rate of 92.8% and students had a rate of 99.3%. For the total population, 25.7% were educators (n = 232) and 74.3% were students (n = 670). The review of literature demonstrated that the majority of research on computers and computer attitudes was related to gender. In this study gender also was a major consideration in the data collection and analysis. Of those who returned the survey, females made up 51.5% of the total population (students and educators) while males were 48.5% of the total population. Within the grouping of students and educators, almost 49.0% of the students were female while the 61.0% of the educators were female.

TABLE 4-1

Comparisons of Students by

Gender and Grade

	Gender						
Grade	Female	%	Male	%	Total	%	Age Mean
4th Grade	108	48.2%	116	51.8%	224	33.9%	9.16 yrs
8th Grade	115	48.7%	121	51.3%	236	35.8%	13.23 yrs
12th Grade	99	49.5%	101	50.5%	200	30.3%	17.20 yrs
Student Total	322	48.8%	338	51.2%	660	100.0%	

For student subgroup of the population, females composed 48.8% (n = 322) of the students while there were 51.2% males (n = 338) (see Table 4-1). This gender ratio stayed consistent in each of the three grades (48.2%, 48.7%, 49.5% for females in grades 4, 8, and 12). The age mean for each grade were 9.16 years for the fourth graders, 12.23 years for the eighth graders, and 17.20 years for the twelfth graders. The fourth graders were 33.9% of the total student population, the eight graders were 35.8% and the twelfth graders were 30.3% of the student population.

TABLE 4- 2

Comparisons of Educators by

Age and Role

	Educators Role Classifications					
	Teachers		Administrators		Total Educators	
Age Ranges	Number	%	Number	%	Number	%
21-30 Yrs	21	9.6%	0	0.0%	21	9.1%
31-40 Yrs	70	32.1%	1	7.1%	71	30.6%
41-50 Yrs	82	37.6%	10	71.4%	92	39.6%
50 Plus Yrs	36	16.5%	3	21.5%	39	16.8%
Age N. A.	9	4.2%	0	0.0%	9	3.9%
Totals	218	100.0%	14	100.0%	N = 232	100.0%

Teachers Average Age: 42.4 years

Administrators Average Age: 47.4 years

The educators responded to the Computer Attitude Scale survey which had questions similar to the student version; the differences were in the area of family members who used computers where children and spouse were used versus sibblings and parents. The educators group included two groups, teachers and administrators. Teachers accounted for the 237 (94%) of the educators. There were fourteen administrators (5.6% of the educators population). The educators listed their building level (elementary, middle school, high school, central administration building). At the district administrative offices, 2.6% of the educators worked in the building while the six elementary schools had 47.8% of the educators, the 7-8 middle school had 19.0%, and the 9-12 high school had 32.8% of the educators. The average age of the educators was 42.4 years (n = 219) and 47.4 years for the administrators (n = 14). Educators' ages ranged from 9.1% in the 21 to 30 years age, 30.6% in the 31 to 40 year bracket, 39.6% in the 41 to 50 year group, and 16.8% in the over 50 years old educators group. Nine teachers (3.9%) did not report their age (see Table 4-2). By gender, 58.2% of the 232 educators were female (n = 135) and 41.8% of the educators were male (n = 97).

TESTING OF HYPOTHESIS

Using the Statistical Package for the Social Sciences-Version 10, (SPSS-X), an analysis of variance (ANOVA) with repeated measures was used to determine the relationship between variables and to determine whether significant differences were present. Significant differences were determined by the analysis of variance procedure between the sub-groups as well as differences within the groups according to gender, access to a home computer, computer experience, and education role (student or educator). When students were analyzed alone, the grade level was studied (grades 4, 8, and 12). The educators were analyzed by ages, 21-30, 31-40, 41-50 ,and 50 plus years. Tukey-HSD (Honestly Significant Differences) procedures were conducted in the areas where significant differences were indicated at the .050 level of statistical significance.

Table 4-3 provides a mean score for each question as answered by the total population and summarizes the percentage of responses to each Likert-like scale categories. Table 4-4 provides the computer attitude mean scores for each of the independent variables of education role, computer experience, access to a home computer, and gender for the total population and for the two subgroups of students (by grade) and educators (by age); computer attitude mean scores in two-way interactions for the groups are also included. Scores ranged from very positive computer attitude scores of 1.00 = strongly agree to 4.00 = strongly disagree (very negative attitude toward computers).

Four hypotheses related to computer attitudes were formulated and tested. The results of testing the hypotheses are presented in the remainder of this chapter.

TABLE 4-3

Computer Attitude Scale Survey Questions by

Mean Scores and Percentages of Responses

Question	Mean	S. Agree	Agree	Disagree	S. Disagree
1	1.545	62.7%	24.6%	8.1%	4.5%
2	1.911	43.3%	30.7%	17.7%	8.4%
3	1.713	53.2%	29.8%	9.6%	7.5%
4	1.684	57.7%	21.7%	15.2%	5.5%
5	1.679	52.6%	33.4%	7.5%	6.5%
6	2.202	31.4%	31.4%	23.1%	14.2%
7	1.703	56.0%	25.1%	11.6%	7.3%
8	2.536	23.7%	22.5%	30.4%	23.4%
9	1.792	48.6%	30.0%	14.9%	6.5%
10	1.611	61.4%	22.1%	10.5%	6.0%
11	1.544	61.1%	27.5%	7.4%	4.1%
12	2.399	47.6%	27.2%	13.7%	19.6%
13	1.891	47.6%	27.2%	13.7%	11.6%
14	1.951	41.3%	31.7%	17.1%	9.4%
15	2.147	32.0%	38.0%	21.7%	12.5%
16	1.793	51.2%	24.8%	17.5%	6.5%
17	1.853	42.0%	37.8%	13.3%	7.0%
18	2.076	41.0%	23.3%	22.7%	12.9%
19	1.883	42.4%	33.8%	16.9%	6.9%
20	1.738	48.9%	29.2%	16.1%	5.8%
21	2.302	28.9%	27.0%	29.1%	15.0%
22	1.697	54.7%	27.0%	12.3%	6.0%
23	1.683	50.6%	35.0%	9.8%	4.6%
24	1.826	50.0%	27.0%	13.3%	9.7%
25	1.694	52.1%	30.9%	12.5%	1.5%
26	1.699	55.0%	27.1%	10.8%	7.1%
27	2.143	32.6%	32.5%	23.0%	11.9%
28	1.820	49.8%	25.9%	16.8%	7.5%
29	2.006	36.3%	35.5%	19.6%	8.7%
30	2.131	36.7%	27.8%	21.2%	14.3%

TABLE 4-4

Computer Attitude Scores for Total Population

and Student and Educator Subgroups

	Population Groups			Students X Grades			Educators X Ages			
	Total	Stu	Edu'r	4th	8th	12th	21-30	31-40	41-50	51+
Role	1.87	1.87	1.95	1.61	1.87	2.05	1.86	1.83	1.93	2.17
Gender	1.49	1.91	1.86							
Female	1.91	1.89	1.93	1.56	1.98	2.10	1.88	1.80	1.89	2.31
Male	1.86	1.83	1.91	1.65	1.77	2.07	1.77	1.83	1.98	2.00
Computer	1.54	1.87	1.95							
Yes	1.76	1.78	1.77	1.59	1.77	1.96	1.90	1.62	1.73	1.97
No	1.98	1.93	2.12	1.62	1.97	2.19	1.84	2.02	2.16	2.30
Experience	1.86	1.85	1.94	1.61	1.87	2.05	1.83	1.89	1.93	2.14
< 1 yr	2.31	2.19	2.63	1.76	2.21	2.39	0.00	2.51	2.70	2.75
1-3 yrs	1.93	1.84	2.09	1.63	1.94	2.10	1.86	1.88	2.00	2.65
> 3 yrs	1.74	1.73	1.75	1.56	1.72	1.90	1.81	1.65	1.75	1.83
N =	865	660	232	224	236	200	21	71	92	39**

**9 educators gave no age

Hypothesis One: Education Role

At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on education role (student, educator).

TABLE 4-5

T-Test for Total Population

Comparing Computer Attitudes in

Relationship with Education Role

Total Population N = 861

				Pooled Variance Estimate		
		Mean	SD	T-value	Df	2-Tail Prob
Student Subgroup	n = 629	1.867	.574	-1.86	859	.063
Educator Subgroup	n = 232	1.954	.697			

As shown in Table 4-5, the data obtained by testing hypothesis one provided information regarding the relationship of computer attitudes and education role. The testing of this hypothesis was done to determine if significant differences existed overall with computer attitudes and education role in relationship to the whole population of the study and the two subgroups (students and educators). An analysis of variance with repeated measures was conducted for computer attitudes; education role was a single factor. Concurrently two-way factor analyses were conducted to check the relationship between education role and grade (students), education role and age (educators), and education role and gender.

Education Role

The education role for the population included two groups, the students in grades 4, 8, and 12 and the educators with ages of 21-30, 31-40, 41-50, and 51 or more years. The educator subgroup was a combination of teachers and administrators; there were too few administrator (N = 14) to have a separate education role for them. Using a T-Test between the two education role subgroups of students and educators, no statistically significant relationship was found (T-value = -1.86, p. = .063).

The student subgroup was analysed for significance in education role and grade (see Table 4-6). For the students grade was significant in relationship of education role and computer attitudes. Using the Tukey procedure, significant differences were found at the .050 level of statistical significance for fourth grade with both eighth and twelfth grades; also significant differences were found between eighth grade and twelfth grade. The mean scores showed that fourth graders had more positive mean scores than students in the other two grades and eighth graders were more positive than twelfth graders. The scores were 1.607 (4th grade), 1.874 (8th grade), and 2.088 (12th grade). For the educators, no significance was found in the one-way analysis of computer attitudes and age as shown in Table 4-6.

TABLE 4-6

Summary of One-Way Analysis of Variance

Comparing Computer Attitudes in

Relationship with Subgroups

Students n = 621				
Grade	DF	Mean Square	F	Sig Of F
Between Groups	2	11.106	37.795	.000*
Within Group	619	.294		

Educators n = 225				
Age	DF	Mean Square	F	Sig Of F
Between Groups	3	.975	2.069	.105
Within Group	222	.471		

*p. < .050

Education Role Summary

The testing of hypothesis one has shown that statistically significant differences did not existed between education role and computer attitudes for the population as a whole and for the educators, F (2.069) = .105. For the students, grade level and education role were statistically significant at the .050 level, F (37.795) = .000.

Education Role and Gender

Gender and education role in relationship to computer attitudes were next tested at the .050 level of significance. Table 4-7 displays the two-way interaction analysis. Gender was not a significant factor in education role and computer attitudes. No statistically significant difference was noted in the main effect of education role, F (3.430) = .062 or in the main effect of gender, F (1.343) = .247.

TABLE 4-7

Summary of Analysis of Variance

Comparing Computer Attitudes in

Relationship with Education Role and Gender

Total Population N = 854

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Role	1	1.291	3.430	.062
Gender	1	493	1.343	.247
2-Way Interaction				
Role X Gender	1	.051	.138	.710
Residual Effects	350	.371		

Education Role: Hypothesis One Summary

Hypothesis One stated that "at the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on education role." The research and data analysis supports the null hypothesis one that no statistically significant relationship existed with education role and computer attitudes; the only statistical significance found was in the relationship of the student subgroup by grade level where fourth graders had more positive computer attitudes than the other two grades and eighth graders were more positive in their attitudes toward computers than the twelfth graders. Between the subgroups and for the whole population, no significance were found in computer attitudes and education role; gender and education role are discussed in Hypothesis Four. Therefore, the null hypothesis on education role is accepted.

Hypothesis Two: Computer Experience

At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on computer experience.

Computer experience, as found in the review of literature in Chapter Two, has seemed to affect attitudes toward computers. The amount of computer experience and the types of computer utilization experiences enter into the relationship of computer attitudes. In this study the respondents were asked about the amount of computer experience they had, from less than one week to more than five years; 824 responded to the question. The survey occurred early in the school year, in the first month, so some respondents could have had little computer experience prior to association with the Ralston Schools. Those who responded to less than one week up to one year were considered beginners with little computer experience. The experience responses of one to three years would reflect some computer experience while those responses from three years or more years would reflect considerable computer experience. Table 4-8 reports the computer experience responses by education role (student or educator).

TABLE 4-8

Comparisons of Computer Experience for Students and Educators

Experience	Students	%	Educators	%	Total	%
1 year or less	93	15.6%	32	14.1%	125	15.2%
1 to 3 years	190	31.8%	41	18.1%	231	28.0%
3 or more years	314	52.6%	154	67.8%	468	56.8%
Population Totals	597	100.0%	227	100.0%	824	100.0%

Almost 57% classified their experiences at three or more years (468 of the 824 responding to the question) and 28.0% had one to three years of computer experience. A high percentage of the district's educators (67.8%) and 52.6% of the students had computer experience of three or more years. Those with one year or less of computer experience accounted for 15.2% of the total respondents (n = 125).

Types of Computer Experience

Each respondent was asked about the kinds of experiences they have had with computers at home or at school. This allowed those without a home computer to note those areas in which they had experience with or about computers. In a similar manner those with access to a home computer could list experiences related to both home, school, and other locations. Multiple answers were allowed and 834 responded to the list. Word processing and writing were the most frequent types of use of computers at 76.9%, followed closely by computer games at 76.0%. Job related activities were the third area of computer use (65%); respondents could refer to jobs after school (students) or at school jobs (educators) [writer's note: the high percentage of job use of computers could be significant on computer attitudes of both students and educators]. Graphics and programming uses for the future reported at 42.7% and 32.4% respectfully.

In looking at the respondents' expected future use of computers, similar patterns to current use appeared with word processing and writing as the major use of the computer (71.8%) with job related uses next (70.0%). Business use of the computers (56.6%) was listed along with computer games (53.6%) for use in the future. The use of graphics was expected to be a part of the user's future (44.9%) as well as programming (39.4%).

The data obtained by testing hypothesis two provided information about the relationship between computer experience and computer attitudes. Testing was conducted to determine if significant computer attitude differences existed with computer experience in relationship to other factors for the whole population and the two subgroups. Computer experience was used as an independent variable with computer attitudes (see Table 4-9).

TABLE 4-9

Summary of One-Way Analysis

Comparing Computer Attitudes in Relationship with

Computer Experience

Total Population N = 824	DF	Mean Square	F	Sig Of F
Within Groups	2	16.273	50.819	.000*
Between Groups	821	.320		

*p. < .050

Two-way factor analysis were conducted to check the relationship between both computer experience with education role and computer experience with grade for students and age for educators. The level of statistical significance was set at .050 for all tests. When significance was found, other Post Hoc tests were run, either a T-test or a Tukey test.

Computer Experience

Table 4-9 provides a more detailed description of the one-way data analysis for the total population and the two subgroups for computer attitudes and computer experience. The analysis of variance by the Tukey-HSD procedure shows significant differences between the three experience groups at the .050 level. As shown in Table 4-4, the population had an overall positive attitude toward computers. Those with less than one year experience had significantly less positive computer attitudes (M = 2.31) than the other two experience groups (1.93, moderate experience) and 1.74). The group with three or more years experience with computers had the most positive attitudes toward computers.

After statistically significant differences were found for the total population, tests were performed on the subgroups of student and educator. Significant levels of differences in computer attitudes at the .050 level were found for both subgroups as reported in Table 4-10. For the students and educators, differences were found using the Tukey-HSD procedure in the amount of computer experience. The two subgroups had positive computer attitudes. In looking at the mean scores for both subgroups in Table 4-4, those with three or more years computer experience had more positive computer attitudes than the others; students with three years or more experience had mean score of 1.731 and educators had a mean score of 1.752. The middle experience groups had more positive computer attitude mean scores (students = 1.839, educators = 2.093) than those with little computer experience (students = 2.193, educators = 2.631). Those students and educators with less than one year computer experience had significantly less positive computer attitudes than the other two groups. The educators with little experience on computers almost had a negative computer attitude.

TABLE 4-10

Summary of One-Way Analysis of

Computer Experience and Student and Educator Subgroups

Students	DF	Mean Squares	F	Sig of F
Between Groups	2	7.850	27.373	.000*
Within Groups	594	.287		

Educators	DF	Mean Squares	F	Sig of F
Between Groups	2	10.845	28.076	.000*
Within Groups	224	.386		

* p. < .050

Summary of Computer Experience

Based on the preliminary look at computer experience, there was a significant difference with computer attitudes and computer experience. Therefore, the data on computer experience tentatively fails to support the null hypothesis that no differences in computer experience would exist for the total population and for the subgroups.

Computer Experience and Education Role

Based upon education role, for the total population, the results showed that the main effect of computer experience was significant at F (53.716) = .000 and role was significant at F (7.506) = .006, both at p. < .050. The two-way interaction analysis showed definite statistically significant differences at F (5.816) = .003, p. < .050 (see Table 4-11).

In an examination of the two education subgroups, students and educators, the main effects of experience and role were significant but not in a two-way analysis of experience and role. As described in Table 4-12, computer experience was statistically significant for the student subgroup at F (25.562) = .000, p. < .050, as well as grade for students, F (30.416) = .000, p. < .050. A further two-way interaction of grade and computer experience was not significant, F (1.183) = .317. For the educators, the main effect of computer experience was statistically significant at F (28.252) = .000, p. < .050. The main effect for educators by age was not statistically significant at F (2.291) = .079 as reported in Table 4-12. The two-way interaction between educators' computer experience and age was not significant.

TABLE 4-11

Summary of Analysis of Variance

Comparing Computer Attitudes in Relationship with

Computer Experience and Education Role

Total Population	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Experience	2	16.869	53.706	.000*
Role	1	2.357	7.506	.006*
2-Way Interactions				
Role X Experience	2	1.827	5.816	.003*
Residual Effects	818	.314		

* p. < .050

A Tukey-HSD procedure was done with the educator subgroup for the variable age. As shown in Table 4-13, in a one-way analysis, no statistically significant difference was found for educators based on age, unlike the students based on grade which were significant, F (37.795) = .000 as presented in Table 4-6).

TABLE 4-12

Summary of Analysis of Variance

Comparing Computer Attitudes in Relationship with

Computer Experience and Education Role Subgroups

Student Subgroup N = 592

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Experience	2	6.617	25.562	.000*
Grade	2	.306	1.188	.000*
2-Way Interactions				
Experience X Grade	4	.306	1.133	.317
Residual Effects	583	.259		

Educator Subgroup N = 219

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Experience	2	10.677	28.252	.000*
Age	3	.366	2.291	.079
2-Way Interaction				
Experience X Age	5	.340	.901	.432
Residual Effects	203	.373		

* p. < .050

TABLE 4-13

One-Way Analysis of

Computer Experience and Age for the Educator Subgroup

Educators	DF	Mean Squares	F	Sig of F
Between Groups	3	.975	2.069	.105
Within Groups	219	.471		

Computer Experience and Education Role Summary

Computer experience again was significant for the population in education role two-way interaction analysis with education role as well as the main effects of both experience and role. With the two subgroups, the main effects of computer experience was significant but not in a two-way interaction with grade for the students or age for the educators. The main effect of grade was significant for the students where students in the lower grades had more positive attitudes than the upper grades. Age was not statistically significant for the educators. The data does not support the null hypothesis that no differences would exist for computer experience.

Computer Experience and Gender

The next area of computer attitudes and computer experience to be examined was its relationship to gender. All tests were run at the .050 level of statistical significance. An analysis of variance was conducted for computer experience and gender and is displayed in Table 4-14 for the population. There was not a significant relationship between gender and computer experiences in a two-way interaction. Only the main effect of computer experience was significant for the total population, F (16.048) = .000, p. < .050.

TABLE 4-14

Summary of Analysis of Variance Comparing Computer Attitudes in Relationship with Computer Experience and Gender

Total Population N = 818	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Experience	2	16.048	50.442	.000*
Gender	1	.249	.784	.376
2-Way Interactions				
Experience X Gender	2	.746	2.346	.096
Residual Effects	812	.318		

* p. < .050

An analysis of computer attitudes in relationship to computer experience and gender and was conducted with the subgroups of students with grade level and educators with age levels (see Table 4-15). For the student subgroup, only the main effect of computer experience was significant at the .050 alpha level, F (26.694) = .000 but not for gender or the two-way interaction of experience and gender.

For the educator subgroup, the main effect of computer experience alone was statistically significant at F (27.941) = .000, p. < .050, but not for the main effects of gender or for the two-way interaction of gender and computer experience (see Table 4-15).

Computer Experience and Gender Summary

No significant difference were found for computer attitudes in relationship to gender and computer experience for the population as a whole. The subgroups did not show differences for gender or gender and experience but data did show significant differences for the main effects of computer experience with computer attitudes at F = .000 for all studied groups.

TABLE 4-15

Summary of Analysis of Variance Comparing

Computer Attitudes in Relationship with

Computer Experience and Gender for the Subgroups

Student Subgroup N = 591

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Experience	2	7.581	26.694	.000*
Gender	1	.137	.481	.433
2-Way Interactions				
Experience X Gender	2	.535	1.332	.153
Residual Effects	585	.234		

Educator Subgroup N = 227

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Experience	2	10.906	27.941	.000*
Gender	1	.123	.315	.575
2-Way Interactions				
Experience X Gender	.139	.069	.173	.837
Residual Effects	221	.390		

*p. < .050

Computer Experience: Hypothesis Two Summary

Hypothesis Two stated that "at the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on computer experience." The research and data analysis on computer experience does not support the null hypothesis two that no statistically significant relationship will exist with computer experience and computer attitudes and Hypothesis Two is rejected.

Hypothesis Three: Home Computer

At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on access to a home computer.

The review of literature in Chapter Two described recent studies which were beginning to show significant differences in computer attitudes based upon access to a home computer. The difference between the "haves and have nots" showed that those with a home computer had more positive attitudes toward computers and computer utilization skills. Those without a home computer usually displayed a more negative attitude toward computers. This hypothesis looked for statistically significant differences in relationships of access to a home computer, home computer with education role, grade and age for the subgroups, computer experience, and gender. Students and educators were asked if they had access to a home computer and to name the computer or computers at home. If they had a computer that was not listed on the survey instrument, they could write the name in a provided space. A total of 407 respondents or 44.8% of the population had access to a home computer. By education role, 45.2% of the students and 43.5% of the educators had a home computer.

TABLE 4-16

Comparisons of Students With Home Computer Access

By Gender and Grade Level

		Having Home Computer			
Grade	Enrollment	Female	Percent.	Male	Percent.
Fourth Grade	225	43	19.1%	53	23.6%
Eighth Grade	236	47	19.9%	68	28.8%
Twelfth Grade	200	39	19.5%	50	25.0%
Student Total	661	129	19.5%	171	25.9%

Table 4-16 displays student access to home computers and computer ownership by grade and gender. The percentage with access to home computers was 42.7% of the fourth graders, 48.7% of the eighth graders and

44.5% of the twelfth graders. By gender 19.5% of the females and 25.9% of the males had home computers. Gender differences by those with and those without home computers is about the same for each grade level in comparison to the total population.

At the elementary level, some differences were noted with some schools' students having more home computers than students in other schools. The fourth graders with computers ranged from 62.1% at one school located in the southwestern part of the school district to 19.5% at a low socio-economic school in the northeastern part. Table 4-17 reports total percentages of students with home computers by grade level (grades 4, 8, and 12). Forty-six percent of the educators (n = 107) had access to a home computer; 25.4% were females and 20.7% were males (see Table 4-18).

TABLE 4-17

Comparison of Students by Grade Level for
Those With Access to a Home Computer

Students	Home Computer
Grade Four	42.7%
Grade Eight	48.7%
Grade Twelve	44.5%
Students Total	45.4%

TABLE 4-18

Comparisons of Educators by Gender for

Those With Access to a Home Computer

Educators	Number	Female	Percent.	Male	Percent.
Teachers	218	58	26.6%	42	19.3%
Administrators	14	1	7.1%	6	42.9%
Educator Totals	232	59	25.4%	48	20.7%

Kinds of Home Computers

The population was asked to identify the names of their home computers. Several who reported multiple home computers had both an Apple (or Apple compatible/clone) and an IBM (or IBM clone). Thirty-one reported two home computers, ten had three home computers, and four had four home computers. Seventeen females and twenty-seven males had more than one home computer. Nintendo-type game computers were not considered as a computer.

Table 4-19 shows the responses to the survey question concerning the kinds of home computers. Apple computers were in 43.9% of the homes with home computers included Apple plus, Apple IIe, Apple GS, and the Macintosh. IBM and IBM compatible (clones) computers were in 24.0% of the homes. Other home computers listed were 36 Commodores (in 8.2% of the homes), 12 Radio Shacks (2.7%), 11 Texas Instruments (2.5%), and 82 other computers (18.7%) which included AT & T, Delta Gold, Epison, Franklin, Hyaundi, Kay Pro, Leading Edge, Tandy, Vendex, and Zenith computers.

TABLE 4-19

Comparisons of Kinds of Home Computers

Computers Owned	Students	Educators	Total	% Owning
Apples	109	83	192	43.9%
Commodore	32	4	36	8.2%
IBM/ IBM Clones	88	17	105	24.0%
Radio Shack	8	4	12	2.7%
Texas Instrument	11	0	11	2.5%
Other Computers	71	11	82	18.7%
Total Home Computers	319	119	438	100.0%

The respondent was the major user of the home computer at 40.1% with the father of a student or the husband of an educator next most likely to use the computer (26.7%), followed by the mother of the student or wife of the educator (17.4%). Males were the dominant home computer user in

63.2% of the houses and females the main computer user in 36.8% of the homes, not including the respondent. The mother of the student or wife of the educator was the least likely user of the home computer at 28.8%; the father or the husband was the second person reported to be the least likely computer user at 22.3%.

Multiple answers were allowed in responding to the types of uses of the home computer. Word processing was the most common use (23.2%) followed by job related computer use (21.0%). Other responses included playing computer games at 17.5% and doing business applications at 17.3%. Computer programming and graphics were the least frequently reported computer activities (10.3% and 9.4% respectively).

TABLE 4-20

T-Test for

Total Population and Access to a Home Computer

				Pooled Variance Estimate		
		Mean	SD	T-value	DF	2-Tail Prob
Yes, Home Computer	n = 392	1.775	.567	-5.05	854	.000*
No, Home Computer	n = 464	1.933	.625			

*p. < .050

This hypothesis was concerned with computer attitudes in relationship to home computer access. T-tests were conducted with the alpha test level set at the .050 level of statistical significance for computer attitudes and access to a home computer; the total population and each subgroup were analyzed. For the total population, statistical significance was found (see Table 4-20). The mean scores were 1.775 for those with access to home computers and 1.933 for those without home computers.

TABLE 4-21

T-Test for Subgroups and

Access to a Home Computer

Student Subgroup N = 624			Pooled Variance Estimate		
	Mean	SD	T-value	DF	2-Tail Prob
Yes, Home Computer n = 286	1.782	.535	-3.03	622	.001*
No, Home Computer n = 333	1.932	.590			

Educator Subgroup N = 232			Pooled Variance Estimate		
	Mean	SD	T-value	DF	2-Tail Prob
Yes, Home Computer n = 106	1.767	.649	-4.03	280	.000*
No, Home Computer n = 126	2.120	.696			

*p. < .050

Based on the significance of home computer to computer attitudes, T-Tests were run for the student and educator subgroups. A two-tail probability was significant for both groups with .001 for the students and .000 level of significance for the educators (see Table 4-21). For those with home computers similar positive mean scores were found for both subgroups, 1.782 for students and 1.767 for educators. However, for those without access to a home computer a greater difference was found in mean scores with students at 1.932 and educators at 2.120.

TABLE 4-22

One-Way Analysis of

Students and Access to a Home Computer

Yes, Home Computer	DF	Mean Squares	F	Sig of F
Between Groups	2	2.939	10.906	.000*
Within Groups	281			

No, Home Computer	DF	Mean Squares	F	Sig of F
Between Groups	2	8.783	29.467	.000*
Within Groups	332	.298		

* p. < .050

Further examination of access to a computer at home was conducted; Table 4-22 offers the data analysis. For students, significant differences were found to exist for those with home computers at F (10.906) = .000, p. < .050 and for those without home computers F (29.467) = .000, p. < .050. The Tukey-HSD procedure using mean scores was conducted for the student subgroup by grade level. For both those with a home computer and those without one, the fourth grade students had a more positive computer attitudes than both the eighth graders and twelfth graders. Eighth graders had a more positive attitudes toward computers than the twelfth graders. (See Table 4-4)

Home Computer Summary

The initial data analysis using T-tests and one-way Analysis of Variance procedures do not support the null hypothesis three that no differences will exist in computer attitudes and access to a home computer. Tenatively, the hypothesis is rejected. But further examinations of the relationship between computer attitudes and access to a home computer considered education roles, computer experience and gender issues.

Home Computer and Education Role

Analysis of variance (ANOVA) were conducted for home computer and education role with the alpha level set at .050 level statistical significance. Table 4-23 provides the data summary. Main effects were significant for both home computer and education role. A two-way interaction was found for home computer and education role at F (5.340) = .021, p. < .050 level of significance.

TABLE 4-23

Summary of Analysis of Variance

Comparing Computer Attitudes in Relationship with

Access to a Home Computer and Education Role

Total Population N = 856

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Home Computer	1	9.157	25.637	.000*
Education Role	1	1.402	3.932	.049*
Two-Way Interactions				
Computer X Role	1	1.903	5.340	.021*
Residual Effects	852	.356		

* p. < .050

With a significant differences existing in the relationship between home computer and education role, analyses were conducted for both subgroups, grade for students and age for educators. Table 4-24 shows no significance was found for home computer and students grade but significant main effects were found for home computer at F (8.542) = .004 and grade at F (30.272) = .000, p. < .050 level. Tukey-HSD procedures found that significant differences existed between students in grade 12 and grade 4, grade 12 and grade 8, and grade 8 and grade 4. For the fourth graders, there was very little difference in scores between those with and those without computers (YES 1.59; NO 1.62). Differences existed between the grade 12 students with home computers with both grade 8 and grade 4 students. In grades 8 and 12, those students with home computers had more positive scores than those without home computers (8th grade, YES 1.77, NO 1.97; 12th grade, YES 1.96, NO 2.19). (See Table 4-4 for mean scores).

The analysis of variance for the educator subgroup showed a statistical significance for the main effect of a home computer at F (5.797) = .000, p. < .050. No statistically significant relationship was found with age; no significant relationship was found in a two-way interaction of computers and educators (see Table 4-24).

<u>Home Computer and Education Role Summary</u>

The main effects of home computer were found to be significant for the whole population and the two subgroups of the study. For the total population and the student subgroup significance was found for the main effect of education role (grade for students); no significant differences was found in the main effect of educators (age). In a two-way interaction analysis of computer attitudes, access to a home computer and education role were statistically significant for the total population. However, no significance was found in the two-way interaction when an analysis was made of the two subgroups separately.

TABLE 4-24

Summary of Analysis of Variance

Comparing Computer Attitudes in Relationship with

Access to a Home Computer and Education Role Subgroups

Student Subgroup N = 586

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Home Computer	1	2.158	8.542	.004*
Grade	2	7.649	30.272	.000*
Two-Way Interactions				
Computer X Grade	2	.474	1.876	.154
Residual Effects	541	.253		

Educator Subgroup N = 223

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Computer	4	2.559	5.797	.000*
Age	3	.935	2.120	.099
2-Way Interactions				
Computer X Age	3	.316	.715	.544
Residual Effects	215	.441		

* p. < .050

TABLE 4-25

Summary of Analysis of Variance

Comparing Computer Attitudes in Relationship with

Computer at Home and Computer Experience

Total Population	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Computer	1	4.263	13.680	.000*
Experience	2	13.469	43.226	.000*
2-Way Interactions				
Computer X Experience	2	.553	1.776	.170
Residual Effects	815	.312		

* p. < .050

Home Computer and Computer Experience

The next issue of computer attitudes examined access to a home computer and computer experience to determine if a relationship existed between computer experience and home computer in attitudes toward computers. An analysis of variance was conducted for access to a home computer and computer experience. The alpha level of significance was set at .050 for all tests. The analysis of variance revealed there was a significant difference for the main effects of both home computer, F (13.680) = .000, p. < .050 and computer experience, F (43.226) = .000, p. < .050 for the total population. A two-way interaction analysis on computer attitudes did not reveal significant effects (see Table 4-25) for home computer and computer experience for the total group.

TABLE 4-26

One-Way Analysis

Comparing Population Computer Attitudes by

Access to a Home Computer with Computer Experience

Yes, Home Computer	DF	Mean Square	F	Sig Of F
Between Groups	2	6.259	17.649	.000*
Within Groups	441	.355		

No Home Computer	DF	Mean Square	F	Sig Of F
Between Groups	2	7.763	29.764	.000*
Within Groups	374	.261		

* p. < .050

Table 4-26 reports the results of the one-way analysis; Tukey-HSD procedures were conducted on computer experience and those with home computers and those without home computers for the total population.

Significant differences were found with both those with home computers and those without computers in the amount of computer experience. For the "Yes, Home Computers" groups, a significant difference existed at the .050 level between the group with one year and less experience with both the 1-3 year experience and the 3-5+ years experience groups and between the 1-3 year and 3-5+ year groups. For the "No, Home Computers" groups, a significant difference existed at the .050 level for the experience groups with similar results with the Tukey-HSD procedures as with those with home computers.

Since computer experience and home computer did show some effects for the total population, the subgroups of students and educators were checked for possible differences in computer attitudes. Table 4-27 reports significant differences for the main effects of both home computer and computer experience for students. Analysis of variance scores of the main effects were F (6.196) = .013 for home computer and F (23.869) = .000 for computer experience, when the alpha level was set at .050 significance. A two-way interaction between home computer and computer experience existed for students at F (2.479) = .035, p. < .050

The main effects of home computer and computer experience were also significant statistically for the educators computer attitudes. Home computer effects were F (6.848) = .009 and computer experience effects were F (22.772) = .000, with both set at p. < .050 (see Table 4-27). For educators, a two-way interaction with home computer and computer experience did not exist.

TABLE 4-27

Summary of Analysis of Variance

Comparing Computer Attitudes in Relationship with

Computer at Home and Computer Experience for the Subgroups

Student Subgroup N = 594

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Computer	1	1.722	6.196	.013*
Experience	2	6.632	23.869	.000*
2-Way Interactions				
Computer X Experience	2	.689	2.479	.035*
Residual Effects	533	.273		

Educator Subgroup N = 227

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Computer	1	2.571	6.848	.009*
Experience	2	8.550	22.772	.000*
2-Way Interactions				
Computer X Experience	2	.439	1.303	.274
Residual Effects	221	.375		

*p. < .050

Home Computer and Computer Experience Summary

Levels of significance were found for the main effects of access to a home computer and computer experience for the whole population and the subgroups of students and educators. Except for the students with grade, no two-way interactions of home computer and computer experience existed for any of the populations in this part of hypothesis two concerning home computers and computer attitudes.

Home Computer And Gender

As shown in Table 4-28, access to a home computer by gender was the next section of the home computer hypothesis tested; the total population and the two subgroups of students and educators were examined. An analysis of variance was conducted with the alpha level for all tests of significance was set at .050. For the total population, the analysis of variance revealed there was a significant effect only for the main effect of access to a home computer, F (25.429) = .000, p. < .050. No significance was found in two-way interaction analysis between gender and access to a home computer.

For the student subgroup, as displayed in Table 4-29, there was a level of significance for the main effect of computer at home at the .050 level, F (2.158) = .004, p. < .050 but not for gender at the .050 level F (.606) =.437. No statistical significance was found in two-way interaction analysis between gender and home computer access for the student population, F (1.428) = .233.

TABLE 4-28

Summary of Analysis of Variance Comparing

Computer Attitudes in Relationship with

Home Computer and Gender

Total Population N = 852

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Computer	1	9.136	25.429	.000*
Gender	1	.268	.745	.333
2-Way Interactions				
Computer X Gender	1	.428	1.191	.276
Residual Effects	848	.359		

* p. < .050

For the educator subgroup, the only statistical significance was the main effect of access to a home computer, F (16.458) = .000, p. < .050. No significant effect was noted in a two-way analysis for gender and access to a home computer, F (.194) = .660 (see Table 4-29).

T-Tests were conducted on gender and computer access at home (with computer and without computer). No significant differences were found for the two subgroups' computer attitudes. Both genders who reported a home computer had a more positive computer attitude than those without home computers (see Table 4-30).

TABLE 4-29

Summary of Analysis of Variance Comparing

Computer Attitudes in Relationship with

Home Computer and Gender for the Subgroups

Student Subgroup N = 586

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Computer	1	2.158	8.542	.004*
Gender	1	.153	.606	.437
2-Way Interactions				
Computer X Gender	1	.361	1.428	.233
Residual Effects	541	.253		

Educator Subgroup N = 232

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Computer	1	7.555	16.458	.000*
Gender	1	.001	.002	.961
2-Way Interactions				
Computer X Gender	1	.089	.194	.660
Residual Effects	228	.459		

*p. < .050

TABLE 4-30

T-Tests for

Gender and Access to a Home Computer

Gender and YES Home Computer

				Pooled Variance Estimate		
		Mean	SD	T-value	Df	2-Tail Prob
Females, Total Pop.	n = 178	1.8160	.556	1.47	387	.142
Males, Total Pop.	n = 211	1.7373	.573			

Gender and NO Home Computer

				Pooled Variance Estimate		
		Mean	SD	T-value	Df	2-Tail Prob
Females Total Pop.	n = 261	1.9804	.625	-.10	461	.921
Males, Total Pop.	n = 202	1.9862	.629			

Home Computer and Gender Summary

Gender with a home computer was not significant in two-way interactions. However, home computer alone was significant. Post hoc tests with the Tukey-HSD procedure, were conducted between gender and those with a home computer and between gender and those without access to a computer at home in relationship to attitudes toward computers. In both cases, gender was not an issue since no significant difference was found for gender whether the respondent did or did not have a home computer.

Home Computer: Hypothesis Three Summary

The analysis of data of computer attitudes and access to a home computer has shown that access to a home computer is statistically significant at the .050 level for all tests. For the main effects of home computer with computer experience, role, grade, and age (and also in hypothesis one with gender), the main effect of home computer had levels of significance ranged from F = .000 to .013. The only two-interaction for the total population was found with the factors of education role and computer at home for the total population; within each education role subgroup there were significant differences between those with and those without access to home computers. The students differences were found for home computer and grade. For educators, no differences were found for home computer and age. Overall, in the main effects of computer attitudes were significant differences found in the data analysis for home computer access.

Hypothesis three stated that "at the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on access to a home computer." The research and data analysis does not support the null hypothesis three that no statistically significant relationship will exist with home computer and computer attitudes. Therefore, the null hypothesis on computer attitudes and home computer is rejected.

Hypothesis Four: Gender

"At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on gender."

The data obtained by testing Hypothesis One provided information about the relationship of gender and computer attitudes. The testing of this hypothesis, Hypothesis Four, was made to determine if a significant relationship existed with computer attitudes and gender in relationship to the whole population and to the two subgroups, students and educators. An analysis of variance with repeated measures was conducted for computer attitudes; gender was first used as a single factor (see Table 4-31). Concurrently two-way factor analyses were conducted to check the relationship between gender and access to a home computer, gender and computer experience, gender and education role, and gender and grade for students and age for educators.

Gender

The data provided by testing hypothesis one with two subgroups of students educators was selected to determine if differences existed between females' and males' computer attitudes. With the population of N = 854, a T-test was conducted for the computer attitudes by gender. The alpha level for all tests of significance was set at .050. There was not a significant effect of gender by population for computer attitudes (see Table 4-31).

TABLE 4-31

T-Test

Comparing Computer Attitudes in

Relationship with Gender

Total Population N = 854

				Pooled Variance Estimate		
		Mean	SD	T-value	Df	2-Tail Prob
Females	n = 439	1.914	.603	1.31	852	.192
Males	n = 415	1.859	.617			

The subgroup of students' gender and computer attitudes were tested for the hypothesis on gender in relationship to the students' grades (4, 8, or 12). Based on T-test conducted for gender and computer attitudes, no significant effect was noted for the student subgroup (see Table 4-32).

For the educator subgroup based on the educators ages (21-30, 31-40, 41-50, and 50 plus years), no significant gender effect on computer attitudes was noted. As shown in Table 4-32, a T-test found the effect was .807, which was not significant for the statistical level of .050. Gender mean scores were also very similar for the two subgroups as shown in Table 4-32.

TABLE 4-32

T-Test

Comparing Computer Attitudes in

Relationship with Gender for the Subgroups

Students and Gender	n = 622			Pooled Variance Estimate		
		Mean	SD	T-value	Df	2-Tail Prob
Female Students	n = 305	1.892	.561	1.26	620	.203
Male Students	n = 317	1.834	.532			

Educators and Gender	n = 232			Pooled Variance Estimate		
		Mean	SD	T-value	Df	2-Tail Prob
Female Educators	n = 134	1.9637	.687	.24	230	.807
Male Educators	n = 98	1.9410	.714			

Gender Summary

The analysis of variance of gender by total population and student and educators subgroups indicated there probably was not a significant relationship between computer attitudes and gender with the total population and the subgroups at the .050 level.

To completely check the hypothesis of gender and computer attitudes, the other variables of home computer, computer experience, education role, and grade (students) or age (adults) levels were checked. The following section is a summary of the previous tests with gender.

Gender and Education Role

With the hypothesis of gender and computer attitudes, the variable of educational role and gender was next selected for testing. While gender with the total population was not significant, F (1.343) = .247 as shown previously in Table 4-6, the issue of gender by students' grade level and educator's ages still had to be addressed before a final decision could be made about the hypothesis on gender and computer attitudes.

Table 4-33 provides the data analysis for the two subgroups. The student subgroup had a level of significance with the main effect of grade, F (37.439) = .000, p. < .050. No significance was found for the main effect of gender but there was a significant difference with the two-way interaction of gender and grade, F (3.916) = .020. Computer attitude mean scores were similar by grade and by gender. The students of both genders had a positive attitude toward computers. Younger students of both genders were more positive than older students, with the fourth graders the most positive and the seniors the least positive toward computers. Educators did not show significant differences between genders and age (21-30, 31-40, 41-50, 50 plus years) when an analysis of variance was conducted for the main effects of gender and age and the two-way interactions of gender and age. The alpha level for significance was set at .050 for all tests (see Table 4-33).

Gender and Education Role Summary

The analysis of variance for gender by educational role for the total population and for the educators did not show significant effects of gender by role. For only the students was there was statistically significant difference for the two-way interaction of gender and grade. This section of the gender issue (gender and education role, grade, and age) was also temporarily accepted because no overall statistically significant differences were found.

TABLE 4-33

Summary of Analysis of Variance

Comparing Computer Attitudes in Relationship with

Gender and Education Role Subgroups

Student Subgroup N = 617

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Grade	2	10.910	37.439	.000*
Gender	1	.567	1.943	.163
2-Way Interactions				
Grade X Gender	2	1.140	3.916	.020*
Residual Effects	611	.291		

Educator Subgroup N = 223

	DF	Mean Square	F	Sig Of F
MAIN EFFECTS				
Gender	1	.000	.001	.981
Age	3	.972	2.051	.108
2-Way Interactions				
Gender X Age	3	.430	.907	.439
Residual Effects	215	.474		

*p. < .050

Gender and Computer Experience

Gender and computer experience were tested previously and the results are reported in Table 4-14. Gender was not significant for any group. Only computer experience was significant for the total population and the subgroups of students and educators (see Table 4-15). In two-way interactions, gender and computer experience was not statistically significant for the total population at F (2.346) = .096 as shown previously in Table 4-14.

Gender and Access to a Home Computer

Table 4-28 provided data analysis for gender and home computer access. No significance was found for the main effect of gender nor in the two-way interaction analysis for the total population. Similarly for the two subgroups, as shown in Table 4-29, no significant differences existed for either the main effect of gender or in a two-way interaction analysis. In the total population and the two subgroups, significance differences were found only for the main effect of access to a home computer.

Gender: Hypothesis Four Summary

No statistically significant relationships at the .050 level were found for computer attitudes and gender alone or for computer attitudes and gender in relationship to home computer, education role, or the educator's age. No statistically significant differences in computer attitudes were noted with gender and computer experience for the total population. Grade in school and gender in a two way-interaction had a significant difference (F = .020) for the student subgroup. Computer attitudes for the students were positive but the older students by gender had less positive computer attitudes than the younger students. The fourth grade students by gender had similar computer attitude scores as did the twelfth graders but in eighth grade, female had less positive computer attitudes than the males. No statistical significance was discovered for age and gender in a two-way interaction of the educator subgroup. No statistical difference was found for the total population or the subgroups in two-way interactions of gender with access to a home computer or computer experience.

Hypothesis Four stated that "at the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on gender." The analysis of the data supports the null Hypothesis Four that no statistically significant relationship will exist with gender and computer attitudes. Therefore, the hypothesis is accepted.

SUMMARY OF FINDINGS

Computer attitudes of elementary, middle school, and high school students and educators (teachers and administrators) were examined in relationship to the education role (student or educator), grade level for student and age for educators, computer experience, access to a home computer, and gender. The responses were examined to determine if significant differences existed between and among the perceptions of the studied population in computer attitudes.

No significant relationships were found for computer attitudes gender or education role but statistically significant differences were found for access to a home computer and computer experience. Based upon statistically significant relationships at the .050 level, two of the null hypotheses were accepted and two were rejected.

No statistically significant relationship existed between *education role* and computer attitudes with the total population and between the two subgroups. The majority of the research supported the null hypothesis and Hypothesis One on education role was accepted.

Differences existed in the relationship of *computer experience* and computer attitudes with the total population and between students and educators; these were found to be statistically significant with each group of the study. The research did not support the null hypothesis and Hypothesis Two, computer experience, was rejected.

Statistically significant relationship existed and differences were found with the total population and between the subgroups, students and educators based on *access to a home computer* and computer attitudes. The research did not support the null hypothesis and Hypothesis Three on access to a home computer was rejected.

With respect to *gender*, no statistically significant relationship was found to support differences in computer attitudes with the total population and between the subgroups of students and educators. The research did support the hypothesis on gender and Hypothesis Four was accepted.

In this study, the usual correlations on computer attitudes were related to gender and education role levels of grade or age. When gender was combined in two-way interactions with the other independent variables of education role, home computer and computer experience, no significant differences were found as reported in Chapter Two on literature review. This study, however, found significant correlations with access to a home computer and computer experience, which as been reported in recent research literature in recent years.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study was designed to examine computer attitudes in relationship to gender, access to a home computer, computer experience, and education role among elementary, middle school, and high school students, teachers, and administrators. This chapter includes a summary of the study, conclusions, and recommendations.

As society moves into the information age (Toffler, 1980), the computer has become the technical tool which provides students and educators with a means to gain access to new skills and abilities. The educational system is the place where computer skills can most efficiently be taught and learned (Cawelti, 1989). Education in computer use will give citizens the needed step to be computer literate in a world that will have over 75% of the jobs needing and using computers by the 21st Century (Turkington, 1982).

Based on a review of literature in the area of computer attitudes, it was determined that the traditional gender issue with computer attitudes do not exist as much now as ten years ago. Furthermore, no computer attitude differences in relationship to education role (student or educator) existed. In the education system, access to a home computer and computer experience are the greatest influence for creating positive computer attitudes. Thus this study was developed to assess the possible differences of computer attitudes based on gender, education role, computer experience, and access to a home computer for a specific population.

STATEMENT OF THE PROBLEM

The purpose of the study was to examine computer attitudes (identified as computer anxiety, computer confidence, and computer liking by Loyd and Gressard, 1984) as these related to gender, access to a home computer, computer experience, and education role (students and educators). In this study, to arrive at an indication of the impact of the emphasis on computer literacy in the Ralston School District, all educators, teachers and administrators, and all students in grades four, eight, and twelve were surveyed to determine their computer attitudes.

Four null hypothesis were tested for the purpose of this study. The hypothesis are:

(1) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on education role (student or educator).

(2) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on computer experience.

(3) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on access to a home computer.

(4) At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on gender.

PROCEDURES

To complete the study on computer attitudes with one school district's students and educators, the following steps were used.

1. A review of literature was conducted to determine if computer attitudes might be different based on education role, computer experience, access to a home computer, or gender. Gender differences based on developmental and societal behaviors were also reviewed in relationship to computers in the education system.

2. Hypothesis statements were formulated for each of the computer attitudes relationships with education role, computer experience, access to a home computer, and gender, based upon the review of literature on these issues.

3. The Computer Attitude Scale Survey (see Appendix A), developed by B. H. Loyd and C. Gressard (1984) was selected and used as the instrument to collect data. The purpose of the instrument was to determine computer attitudes of all educators and all students in grades four, eight, and twelve in the Ralston School District.

A total of thirty items concerning computer attitudes, with ten items in each of the three subscales of Computer Anxiety, Computer Confidence, and Computer Liking, were presented in the first part of the survey. Each respondent was requested to indicate responses on statements about computers. A four part Likert-type response scale was used to record the results. In each subscale, five statements were stated positively, and five were stated negatively. The second part contained demographic questions and questions about the respondent's computer background.

4. A pilot test was conducted with fourth grade students at St. Gerald's Elementary School in Ralston to check the wording of the instrument for the fourth graders. Adjustments were made to clarify some of the sentences.

5. The reliability coefficient for the fourth grade was computed since this instrument had not been used with students younger than seventh grade.

6. The total population of students in grades four, eight, and twelve and all educators (teachers and administrators) were selected for the study.

7. A total of 925 surveys were distributed. Of the total distributed, 901 (97%) surveys were returned for tabulation. The totals also represented 100% returned surveys from fourth graders, 98% returned from eight graders, 100% returned from twelfth graders, and 92% return from educators. Of the 901 returned surveys, 865 were usable for this study.

8. The data from the survey was tabulated and analyzed. Mean scores were calculated for each of the thirty survey questions on computer attitudes. The demographic part of the survey also was analyzed. T-Tests and analysis of variance (ANOVA) with repeated measures were used to determine the statistically significant relationship between each of the issues related to computer attitudes. The ANOVA procedure was used to identify significant differences. Post hoc tests, using the Tukey-HSD (Honestly Significant Difference) procedure, were conducted on areas were significant differences were indicated.

FINDINGS

The findings of this study are based on the data presented in Chapter 4. Mean scores were calculated for each of the thirty items in the Computer Attitudes Scale which then were formulated into a total computer attitudes mean score for each respondent. The computer attitudes scores were analyzed with the independent variables of education role, computer experience, access to a home computer, and gender. The possible range of the mean scores was 1.000 to 4.000. Statistical levels of significance were set at the .050 level for each hypothesis. Overall the computer attitudes were positive for the studied population. For the total population, the mean score for computer attitudes was 1.89 (1.85 for students, and 1.94 for teachers and administrators). For students by grade, the mean scores were 1.61 for grade four, 1.89 for grade eight, and 2.05 for grade twelve. For the educators, the mean scores ranged from 1.86 for those 21-30 years of age to 2.17 for those over 50. By gender, the mean scores were 1.91 for the females and 1.86 for the males. By access to a home computer, those with a computer had a mean score of 1.77 and those without a computer had a score of 1.98. In comparing the amount of computer experience, those with one year or less had a mean score of 2.30, those with one to three years a score of 1.93, and those with over three years a score of 1.73. Students experience ranged from 2.19 for those with one year or less to 1.65 for those with over three years computer experience. A more dramatic difference occurred in the educators with scores ranging from 2.63 for those with little experience to 1.75 for those with over three years experience.

Hypothesis One

At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on education role (student or educator).

1. Using a t-test for computer attitudes for the total population based upon education role, no statistically significant difference was found at F = .063. Using a one-way analysis with the two population subgroups, students' computer attitudes were found to be significant at F (37.795) = .000 based upon grade level in their education role; students in the lower grades were more positive in their computer attitude scores than the upper grades. For educators based upon age levels in their education role, no significant difference was found in computer attitudes at F (2.069) = .105.

2. In a two-way interaction analysis of role and gender, no significant relationships existed for the total population. For the educators, in a two-way interaction of role with age, no statistically significant difference was found in computer attitudes.

3. Significant differences in computer attitudes based upon education role was found only for the students based upon their grade level using a two -way interaction. In other one-way and two-way interactions of education role, no statistically significant differences were found to support the hypothesis. Hypothesis One on education role was accepted.

Hypothesis Two

At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on computer experience.

1. One-way analysis of computer attitudes in relationship to computer experience was conducted for the total population. For computer experience and computer attitudes, a significant difference was found at F (50.819) = .000, p. < .050. For the subgroups, significant differences in computer attitudes based upon computer experience were found for both groups; for the students at F (27.373) = .000 and for the educators at F (28.076) = .000. Further analysis using Tukey-HSD procedures found more positive attitudes for those with more computer experience.

2. Two-way interactions of computer experience with the other independent variables discovered significance with mostly the main effects. For the total population, computer experience and education role were significant at F (5.816) = .003. For students, experience was significant at F (25.562) = .000 and grade at F (1.188) = .000 but not in a two-way interaction. For the educator subgroup, computer experience was significant at F (28.252) = .000 while age was not statistically significant at F (2.291) = .079; no two-way interaction existed at the .050 level. No further evidence was found in a one-way analysis of the educators' age based upon education role, F (2.069) = .105.

3. Computer experience with gender were next examined in this study. No statistically significant relationship existed in a two-way interaction of computer experience and gender at F (2.346) = .096. For the subgroups, no two-way interaction was found for computer attitudes with gender and computer experience. However, for all three groups, the main effect of computer experience was significant with the total population at F (50.442) = .000, the student subgroup at F (26.694) = .000, and the educator subgroup at F (27.941) = .000.

4. Based upon the data analysis of computer experience, statistically significant differences were found for main effects of computer experience and in a two-way interaction of education role and experience. Those with more computer experience had more positive computer attitudes than those with less experience for all groups. The evidence fails to support the hypothesis that no differences will exist and the computer experience hypothesis is rejected.

Hypothesis Three

At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on access to a home computer.

1. Using a t-test procedure with the statistical level of significance set at .050 and based on access to a home computer, statistically significant

differences in computer attitudes were found to exist with the total population (F =.000), the student subgroup (F = .001), and the educator subgroup (F = .000). Further analysis was conducted on home computer access with other independent variables using a two-way interaction procedure. For the total population home computer and role were significant at F (5.340) = .021 but not for the two subgroups.

2. For the subgroups the main effects of home computer were significant, students at F (8.542) = .004 and educators at F (5.797) = .000. Those with access to a home computer had more positive attitudes about computers than those without a home computer. Computer attitude mean scores were similar for the two subgroups, students at 1.782 and educators at 1.767; a more dramatic difference in computer attitude mean scores was found for those without computer access with students at 1.932 while educators were at 2.120. The main effects of grade for students was significant at F (30.272) = .000 but not for educators' ages at F (2.120) = .099.

3. With computer experience and home computer, only the main effects of the two independent variables were significant, home computer at F (13.680) = .000 and computer experience at F (43.226) = .000. One-way analysis procedures on those with home computers and those without home computers found both had statistical significance based upon computer experience, with home computer at F (17.649) = .000 and without home

computer at F (29.764) = .000. Those with more computer experience were more positive, whether or not they had a home computer

4. In two-way ANOVA procedures with the two subgroups, only the student subgroup was significant at the .050 level, F (2.479) = .035 for home computer and computer experience. For the educator subgroup only the main effects were significant, home computer at F (6.848) = .009 and computer experience at F (22.772) = .000.

5. Home computer access and gender were examined for significant differences in relationship to computer attitudes. Only computer experience was significant at F (25.429) = .000 for the total population, at F (8.542) = .004 for the student subgroup, and at F (16.458) = .000 for the educator subgroup. Gender was not significant in any groups and there were no significant two -way interactions of gender with home computer access. A further check using a t-test of gender of those with a home computer and those without a home computer found no significance for gender.

6. The analysis of data did not support the hypothesis that no differences would exist in computer attitudes in relationship to access to a home computer. The null hypothesis on home computer was rejected.

Hypothesis Four

At the .050 level with respect to computer attitudes, no statistically significant relationship will exist based on gender.

1. Gender was studied in various interactions. In a t-test of the total population, no significant relationship was found to exist for gender and computer attitudes. Similarly for the two subgroups, gender was not significant in a t-test procedure.

2. Gender and education role were not statistically significant in a two-way analysis; no main effects were found for gender for the total population. With the subgroups, students grade and gender were significant at F (3.916) = .020 but educators age and gender were not. No main effects for gender were found for either subgroup.

3. As previously mentioned in the hypothesis on computer experience, in a two-way interaction analysis, gender and computer experience were not statistically significant at F (2.346) = .096. Gender was not significant in the main effects for the total population nor for the two subgroups; no two-way interactions in computer attitudes were found with gender and computer experience.

4. No significant effects were displayed for computer attitudes in relationship to gender and access to a home computer; in two-way analysis only the main effect of access to a home computer was statistically significant

for the total population and the subgroups. Gender was not significant in any of the ANOVAS and was not significant in t-tests for those with home computers or for those without home computers.

5. Overall, no statistically significant differences were found in the gender analysis of computer attitudes; student computer attitudes were positive. Students of both genders in the fourth and eighth grades of were more positive than the students in twelfth grade. Females had slightly less positive computer attitudes than males in the eighth grade but this was not statistically significant. The research does support the hypothesis that no differences would be found for gender and computer attitudes. The gender hypothesis is accepted.

CONCLUSIONS

Based on the findings of this study, the following conclusions are presented.

1. Students and educators in the Ralston School District had a positive attitude toward computers based on the questions about computer anxiety, confidence in working with computers, and liking computers. Students had a slightly overall more positive attitudes toward computers than educators based on the Computer Attitude Scale survey which examined computer

attitudes as found through questions about computer anxiety, confidence about working with computers, and liking computers.

2. Although no major significant differences were discovered in the relationship of computer attitudes and student grade level, younger student reflected a more positive attitude toward computers. Twelfth grade students were first introduced to computers in grade four while the students in grades eight and lower have had school computer experience since kindergarten. Among the teachers and administrators, no relationship existed between age and computer attitudes.

3. Students, teachers, and administrators displayed significant relationships in their computer attitudes and access to a home computer. Those with a home computer had more positive computer attitudes in both subgroups. Also a significant relationship was displayed in computer attitudes and the amount of experience with computers among the students, teachers, and administrators. Those with more computer experience had more positive attitudes than those with less computer experience. Educators without home computers had more negative computer attitudes than students without home computer access.

4. Early studies examined the relationship of gender developmental and the subject areas of math and science which seemed to reveal that females held a less positive attitude toward those subjects than males. More recent research about gender and computers found similar gender differences in the

negative attitudes toward computers by females. More recent studies, including this study, seemed to reveal that there is no significant relationship between computer attitudes and gender. It appears that the computer literacy program implemented by the Ralston Public School District over the past nine years has not reflected gender bias.

RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations are set forth.

1. Apparently the traditional gender stereotype attitudes about computers do not exist in the Ralston Public Schools. Those responsible for the computer curriculum and access to computers should continue to strive to eliminate any possible gender bias and to remedy potential gender differences through role models on technology and computers. A balance between male and female teachers in various subject areas will provide all students with positive role models. The criteria for hiring new educators to the district should include computer background as computers are an intricate part of the school system.

The district's placement of computers in computer labs and in classrooms rather than in the math and science departments could also help to explain the apparent lack of expected gender inequity. Females who use and advocate computers are serving as role models for students of both genders, sending a message that computers are for everyone and not the traditional male domain as found in early studies.

2. It was interesting to find no significant differences in attitudes toward computers among and between students, teachers, and administrators based on education role. As this study was not a longitudinal study, it could not be concluded that students' attitudes would be changed in the future. The twelfth grade students had not received computer training in kindergarten as the other two groups of students; the older students computer attitudes, while still positive, were less positive than the younger students. It is not known if the differences in students' computer attitudes are related to computer experience or to social development and gender behavior. Replication of this study should be done in the Ralston schools to determine if computer attitudes do in fact change as students become older.

Also in a replication study, the population of this study could be compared with a future population to determine if computer education efforts do cause a more positive attitude to develop over time (more computer experience) or if the differences are due to social factors as the students grow older.

3. Access to a home computer is still a problem for the Ralston schools and possibly for other school districts. Over 55% of all students and educators do not have home computers in the Ralston School District. As the review of literature reported, those with access to a home computer have a more positive attitude toward computers and also gain more computer experience. The Ralston schools have tried to decrease the differences between the "haves and have nots" by providing many computer experiences in the schools. The networked labs and the computer literacy program for students allow for additional computer training for all students in grades K-8. Access to a home computer had been used earlier for the high school students with Apple IIc computers which could be checked out nightly for the composition classes only (20 computers). However, with the constant use, the computers were in constant need of repair with about ten available at one time.

A recommendation is the district make purchasing of laptop computers possible for students and families to help decrease the differences in computer access at home. For those students with limited income based on free or reduced lunches, funds should be sought for the purchase of laptop computers for students to checkout for the year, just as students checkout textbooks for the year.

Since a relationship existed between computer experience and access to a home computer and computer attitudes, a followup study should be done to notice a difference in computer attitudes based on computer home ownership. This could be shared with parents, school board, and local businesses who could work in partnership with the schools to making purchase of home computers more affordable.

4. While not a specific part of this study, the Ralston Public Schools of Ralston, Nebraska, need to provide continual feedback concerning the computer literacy and computer attitudes of the students and educators. While students in grades K-8 received reports of progress based upon completion of computer literacy assignments, no study had been made on differences with computer attitudes of the students and educators until this study, nine years after the implementation of computer programs in the Ralston schools.

The Ralston School District should strive to continue their defined K-8 computer literacy program which has been in place since 1982. A need exists to refine and define the computer curriculum at the high school. This could include a technology team made up of a member from each department to review and evaluate computer programs, to help teachers with computer problems, and to oversee the use of computers in an effective manner.

5. Although not specifically examined in this study, job related use of computers by high school students should be explored. Older students' computer attitudes could be affected by the use of computers in after school and summer jobs.

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APPENDIX A

COMPUTER ATTITUDE SCALE: STUDENT AND EDUCATOR VERSIONS

SURVEY OF ATTITUDES TOWARD LEARNING ABOUT AND WORKING WITH COMPUTERS:

Ralston STUDENTS (Grades 4, 8, and 12)

Here in Ralston we have had computers in our schools for many years. This survey is find out what students' attitudes and feelings are about computers and about working with computers.

Think about the computers you have used at school or at home (such as the Apple IIe, Apple GS, Apple IIc, Macintosh, or IBM [at the HS]. Do not consider the Nintendo type computers.

It should take you about ten minutes to complete this survey. **All of your answers are confidential.**

Please return the survey to your teacher when you are finished.

SECTION I: COMPUTER ATTITUDE SCALE

On the next few pages are a series of statements. There are no correct answers for these statements about computers.

You are to mark how much **you** agree or disagree with the ideas expressed about computers. Mark an **X** in the box under the label which is closest to how you feel about each sentence about computers.

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
1. Computers do not scare me at all.	[ ]	[ ]	[ ]	[ ]
2. I'm no good with computers.	[ ]	[ ]	[ ]	[ ]
3. I would like to work with computers.	[ ]	[ ]	[ ]	[ ]
4. Working with a computer would make me very nervous.	[ ]	[ ]	[ ]	[ ]
5. Generally I would feel OK about trying a new program on the computer.	[ ]	[ ]	[ ]	[ ]
6. The challenge of solving problems with a computer does not appeal to me.	[ ]	[ ]	[ ]	[ ]

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
7. I do not feel threatened when others talk about computers.	[ ]	[ ]	[ ]	[ ]
8. I don't think I would do advanced computer work.	[ ]	[ ]	[ ]	[ ]
9. I think working with computers would be enjoyable and stimulating.	[ ]	[ ]	[ ]	[ ]
10. I feel aggressive and hostile/ unfriendly toward computers.	[ ]	[ ]	[ ]	[ ]
11. I am sure I could do work with computers.	[ ]	[ ]	[ ]	[ ]
12. Figuring out computer problems does not appeal to me.	[ ]	[ ]	[ ]	[ ]
13. It wouldn't bother me at all to take computer classes/ courses.	[ ]	[ ]	[ ]	[ ]
14. I'm not the type to do well with computers.	[ ]	[ ]	[ ]	[ ]
15. When there is a problem with a computer run that I can't immediately solve, I would stick with it until I have the answer.	[ ]	[ ]	[ ]	[ ]
16. Computers make me feel uncomfortable.	[ ]	[ ]	[ ]	[ ]
17. I am sure I could learn a computer language.	[ ]	[ ]	[ ]	[ ]
18. I don't understand how some people can spend so much time working with computers and seem to enjoy it.	[ ]	[ ]	[ ]	[ ]
19. I would feel at ease/ comfortable in a computer class.	[ ]	[ ]	[ ]	[ ]
20. I think using a computer would be hard for me.	[ ]	[ ]	[ ]	[ ]
21. Once I start to work with the computer, I would find it hard to stop.	[ ]	[ ]	[ ]	[ ]
22. I get a sinking feeling when I think of trying to use a computer.	[ ]	[ ]	[ ]	[ ]

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
23. I could get good grades in computer classes.	[ ]	[ ]	[ ]	[ ]
24. I will do as little work with computers as possible.	[ ]	[ ]	[ ]	[ ]
25. I would feel comfortable/ at ease working with a computer.	[ ]	[ ]	[ ]	[ ]
26. I do not think I could handle a computer class.	[ ]	[ ]	[ ]	[ ]
27. If a problem is left unsolved in a computer class, I would continue to think about it afterwards.	[ ]	[ ]	[ ]	[ ]
28. Computers make me feel uneasy and confused.	[ ]	[ ]	[ ]	[ ]
29. I have a lot of self-confidence when it comes to working with computers.	[ ]	[ ]	[ ]	[ ]
30. I do not like talking with others about computers.	[ ]	[ ]	[ ]	[ ]

SECTION II: GENERAL INFORMATION

Please put an X the blank which applies to you.

1. Your **Age** is:

[ ] 9 [ ] 11 [ ] 13 [ ] 15 [ ] 17
[ ] 10 [ ] 12 [ ] 14 [ ] 16 [ ] 18/19

2. Your **Grade** in School is: [ ] 4 [ ] 8 [ ] 12

3. Your **gender** is: [ ] Female [ ] Male

4. Do you have a **computer at home**? (This does NOT include Nintendo types)
[ ] Yes [ ] No (if you answered No, go on to question 5)

A. If you answered yes, what is the **kind of computer** you have?

[ ] Amiga [ ] Commodore 64 [ ] Macintosh

[ ] Apple IIe [ ] Hewlette/Packard [ ] Radio Shack TR 90

[ ] Apple plus [ ] IBM [ ] Radio Shack Other

[ ] Apple GS [ ] IBM Compatible/ Clone [ ] Texas Instrument

[ ] Other (list) ____________________

B. Who is the person who uses the computer at home **the most?**

[ ] Me [ ] Brother(s) [ ] Sister(s)

[ ] Father/ step-father [ ] Mother/ step-mother

C. For what does he or she **use the computer?** (multiple answers are OK)

[ ] Games [ ] Job Related Work

[ ] Writing [ ] Graphics/ Drawing Programs

[ ] Business/ Recordkeeping [ ] Programming

D. The person who uses the computer **the least** at home is

[ ] Me [ ] Brother(s) [ ] Sister(s)

[ ] Father/ Step-Father [ ] Mother/ Step-Mother [ ] No one uses it

5. At school or at home, how long have you **worked with computers?**

[ ] 1 week or less [ ] 1 year to 2 years

[ ] 1 week to 1 month [ ] 2-3 years

[ ] 1 month to 6 months [ ] 3-5 years

[ ] 6 months to a year [ ] more than 5 years

6. At school or at home, what have you **done with the computer?** (multiple answers are OK)

[ ] Games [ ] Learning Skills (Computer Assisted Instruction)

[ ] Writing [ ] Graphics/ Drawing Programs

[ ] Business/ Recordkeeping [ ] Programming

7. **In the future you** may use the computer for: (multiple answers are OK)

[ ] Games [ ] Job Related Work

[ ] Writing [ ] Graphics/ Drawing Programs

[ ] Business/ Recordkeeping [ ] Programming

Thank you for your help!!

SURVEY OF ATTITUDES TOWARD LEARNING ABOUT AND WORKING WITH COMPUTERS

Ralston TEACHERS AND ADMINISTRATORS

We have spent the last eight years learning about and using computers in the Ralston Schools. This survey is about people's attitudes and feelings about computers and about working with computers.

It should take you about ten minutes to complete this survey. **All answers are confidential.**

Please return the survey to the building envelope when you are finished.

SECTION I: COMPUTER ATTITUDE SCALE

On the next two pages are a series of statements. Consider the computers you have used at work or at home; do not consider the Nintendo type computers. There are no correct answers for these statements.

You are to mark how much you agree or disagree with the ideas expressed. Mark an **X** in the parentheses under the label which is closest to how you feel about the sentence.

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
1. Computers do not scare me at all.	[ ]	[ ]	[ ]	[ ]
2. I'm no good with computers.	[ ]	[ ]	[ ]	[ ]
3. I would like to work with computers.	[ ]	[ ]	[ ]	[ ]
4. Working with a computer would make me very nervous.	[ ]	[ ]	[ ]	[ ]
5. Generally I would feel OK about trying a new program on the computer.	[ ]	[ ]	[ ]	[ ]
6. The challenge of solving problems with a computer does not appeal to me.	[ ]	[ ]	[ ]	[ ]
7. I do not feel threatened when others talk about computers.	[ ]	[ ]	[ ]	[ ]

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
8. I don't think I would do advanced computer work.	[ ]	[ ]	[ ]	[ ]
9. I think working with computers would be enjoyable and stimulating.	[ ]	[ ]	[ ]	[ ]
10. I feel aggressive and hostile toward computers.	[ ]	[ ]	[ ]	[ ]
11. I am sure I could do work with computers.	[ ]	[ ]	[ ]	[ ]
12. Figuring out computer problems does not appeal to me.	[ ]	[ ]	[ ]	[ ]
13. It wouldn't bother me at all to take computer classes/courses.	[ ]	[ ]	[ ]	[ ]
14. I'm not the type to do well with computers.	[ ]	[ ]	[ ]	[ ]
15. When there is a problem with a computer run that I can't immediately solve, I would stick with it until I have the answer.	[ ]	[ ]	[ ]	[ ]
16. Computers make me feel uncomfortable.	[ ]	[ ]	[ ]	[ ]
17. I am sure I could learn a computer language.	[ ]	[ ]	[ ]	[ ]
18. I don't understand how some people can spend so much time working with computers and seem to enjoy it.	[ ]	[ ]	[ ]	[ ]
19. I would feel at ease in a computer class.	[ ]	[ ]	[ ]	[ ]
20. I think using a computer would be hard for me.	[ ]	[ ]	[ ]	[ ]
21. Once I start to work with the computer, I would find it hard to stop.	[ ]	[ ]	[ ]	[ ]
22. I get a sinking feeling when I think of trying to use a computer.	[ ]	[ ]	[ ]	[ ]
23. I could get good grades in computer classes.	[ ]	[ ]	[ ]	[ ]

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
24. I will do as little work with computers as possible.	[ ]	[ ]	[ ]	[ ]
25. I would feel comfortable working with a computer.	[ ]	[ ]	[ ]	[ ]
26. I do not think I could handle a computer class.	[ ]	[ ]	[ ]	[ ]
27. If a problem is left unsolved in a computer class, I would continue to think about it afterwards.	[ ]	[ ]	[ ]	[ ]
28. Computers make me feel uneasy and confused.	[ ]	[ ]	[ ]	[ ]
29. I have a lot of self-confidence when it comes to working with computers.	[ ]	[ ]	[ ]	[ ]
30. I do not like talking with others about computers.	[ ]	[ ]	[ ]	[ ]

SECTION II: GENERAL INFORMATION

Please put an **X** the blank which applies to you.

1. **Age:** [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] 51 +

2. **Building Role:**
   ____ Teacher
   ____ Administrator
   ____ Coordinator/ Supervisor/ Director
   ____ Specialist (Art, PE, Music, Reading, SPED)

   Building Level:
   ____ Central Office
   ____ Elementary ____ Grade
   ____ Middle School
   ____ High School

3. **Gender:** [ ] Female [ ] Male

4. Do you have a **computer at home?** (This does not include Nintendo types)

   [ ] Yes [ ] No

   (If you answered **No**, go on to question 5.
   If **Yes** was your answer, please continue.)

A. If you do have a home computer, mark the **kind of computer.**

[ ] Amiga [ ] Commodore 64 [ ] Macintosh

[ ] Apple IIe [ ] Hewlette/ Packard [ ] Radio Shack TR 90

[ ] Apple plus [ ] IBM PC jr. [ ] Radio Shack other

[ ] Apple GS [ ] IBM Compatible/Clone [ ] Texas Instrument

[ ] Other /Please List ______________________

B. Who is the person who uses the computer at home **the most?**
[ ] Me [ ] Son(s) [ ] Daughter(s)

[ ] Husband [ ] Wife [ ] Other __________

C. For what does he or she **use the computer?** (multiple answers OK)
[ ] Games [ ] Job Related Work

[ ] Writing [ ] Graphics/ Drawing Programs

[ ] Business/ Recordkeeping [ ] Programming

D. The person who uses the computer **the least** at home is
[ ] Me [ ] Son(s) [ ] Daughter(s)

[ ] Husband [ ] Wife [ ] No one else uses it

5. At home or at school, how long have you **worked with computers?**
[ ] 1 week or less [ ] 1 year to 2 years

[ ] 1 week to 1 month [ ] 2-3 years

[ ] 1 month to 6 months [ ] 3-5 years

[ ] 6 months to a year [ ] more than 5 years

6. At home or at school, what have you **done with the computer?**
(multiple answers are OK)

[ ] Games [ ] Job Related Work

[ ] Writing [ ] Graphics/ Drawing Programs

[ ] Business/ Recordkeeping [ ] Programming

7. **In the future** I will use the computer for (multiple answers are OK)
[ ] Games [ ] Job Related Work

[ ] Writing [ ] Graphics/ Drawing Programs

[ ] Business/ Recordkeeping [ ] Programming

APPENDIX B

LETTER FROM DR. LOYD REGARDING

THE COMPUTER ATTITUDE SCALE

UNIVERSITY OF VIRGINIA
1819

BUREAU OF EDUCATIONAL RESEARCH
CURRY MEMORIAL SCHOOL OF EDUCATION
405 EMMET STREET, RUFFNER HALL

August 14, 1985

Ms. Virginia C. Grogan
3454 South 82nd Street, #4
Omaha, NE 68124

Dear Ms. Grogan:

In response to your letter, enclosed please find a copy of the Computer Attitude Scale. This scale consists of three ten-item subscales, Computer Anxiety, Computer Confidence, and Computer Liking. The scales may be scored in the following way. All "strongly agree" responses are coded as "1," "slightly agree" as "2," "slightly disagree" as "3," and "strongly disagree" as "4." The responses for the positively worded items (as shown in the table below) are then recorded so that 1=4, 2-3, 3-2, and 4=1. This scoring strategy results in higher scores on the Computer Anxiety subscale corresponding to lower anxiety and higher scores on the Computer Confidence and Computer Liking subscales corresponding to higher confidence and liking. In general, a higher score corresponds to a more positive attitude toward computers.

A breakdown of the items of the Computer Attitude Scale by subscales and direction (positive or negative wording) is presented below.

Computer Attitude Scale Items

Subscale	Positive	Negative
Computer Anxiety	1, 7, 13, 19, 25	4, 10, 16, 22, 28
Computer Confidence	5, 11, 17, 23, 29	2, 8, 14, 20, 26
Computer Liking	3, 9, 15, 21, 27	6, 12, 18, 24, 30

Ms. Virginia C. Grogan
August 14, 1985
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Please feel free to use this instrument in your work. We would be interested in hearing about your findings.

Sincerely,

Brenda H. Loyd

Brenda H. Loyd

Clarice Gressard

BHL/lwc

Enclosure