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# Gender differences in computer attitudes and utilization in grades 4, 8, and 11

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by

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# CHAPTER I. INTRODUCTION

## Background

The uses for and importance of computer skills and knowledge are expanding because of the increased availability of computers in society. Clearly the present generation of children is growing up in the computer era and they need to become familiar with the personality of the flashing cursor, and the role it plays in modern society (Harvey & Wilson, 1985). With the growing number of microcomputers and the increasing need for computer knowledge in a variety of career areas, becoming familiar with microcomputers is very important for children. Familiarity with microcomputers comes about after working on the computer and feeling comfortable doing so. Unfamiliarity with computers can cause anxiety in people because they are unsure of the impact the computer may have on their lives (Levin & Gordon, 1989).

Although computer usage is also increasing in schools, research has suggested that boys may have more positive attitudes and more experiences with computers than girls (Levin & Gordon, 1989). Some of these differences in how boys and girls use and feel about the computer have evolved at school, at home, from others or from within the students themselves. These possible gender differences in computer attitudes and utilization need to be investigated and treatment provided to remediate this, if a problem is identified.

Many researchers have reported that boys and girls do feel differently about computers and the ways they use them (Becker, 1987;

Chen, 1986; Lockheed, 1985; Demetrulias, 1985; Swoope, 1985; Schubert, 1984; Miura, 1983)). One difference that has been cited was in the area of computer programming. Boys showed more confidence in programming whereas girls showed more confidence in the application of word processing (Lockheed, 1985).

In addition to differences in programming, concerns about the equality between the genders on the amount of time and usage of the computer in the classroom has also been raised. Schubert (1984) stated:

> Recent reports of equity concerns in computer learning show a gender gap in the computer classroom. This gender gap appears in opportunities and in attitudes. Females have fewer opportunities than males to use computers at school and at home, and receive less encouragement to learn about computers or join computer clubs.

Schubert also cited concerns about the gender differences in opportunities and attitudes in the classroom. Lockheed and Frakt (1984) indicated that opportunities may be the most significant of the two problems when they stated: "early studies indicate that if boys are gaining an edge in computer technology, it is not due to sex differences in interest toward or understanding of the relevance of computers but to sex differences in access to and use of computers."

There are, however, conflicting results in the research on gender differences in the attitudes towards and utilization of the computer. Numerous research articles have reported a significant difference

between males and females in their attitudes towards computers (Becker, 1987; Chen, 1986; Demetrulias, 1985; Lockheed, 1985; Swoope, 1985; Schubert, 1984; Miura, 1983). However, there were also reports that found no significant difference between the genders in their attitudes (Harvey & Wilson, 1985; Enochs, 1984).

The source of the observed gender difference on computer attitudes and/or skills is very complex and may be due to both internal and/or external factors in the students. Some of the factors that may be involved are: experiences or participation in computer courses, home environment, availability of appropriate role models, parental attitudes and self-efficacy (Chen, 1986; Miura, 1986a; Collis, 1985b; Demetrulias, 1985; Lockheed, 1985). Regardless of the reasons, there does appear to be a possible difference between the genders in computer attitudes and utilization and they are worthy of further study.

## Computer Attitudes

The attitudes of pupils at the onset of their computer instruction may very well affect their success in future computer courses (Levin & Gordon, 1989). It is therefore essential to determine these attitudes prior to computer instruction so that steps can be taken to counteract negative attitudes toward the computer.

Gender differences in computer attitudes may also be affected by the grade level of the students. It has been found that there is a difference of opinion between boys and girls on how they feel about the

computer and this difference increases as the students' grade level increases (Demetrulias, 1985; Swoope, 1985; Miura, 1983).

It has also been observed that as grade level increased, confidence with computers decreased (Smith,1987). This finding, though, was independent of the student's gender.

In a study investigating the effect of gender and computer experience on attitudes toward computers, Loyd, Loyd and Gressard (1987), found that increased computer experience decreased anxiety and increased positive attitudes. An increased positive attitude toward computers is the goal for all students, but females may need extra encouragement not only in school but at home in order to gain needed computer experience.

## Self-efficacy

For females, the idea of "We can, but I can't" could be a possible explanation for differences between genders in attitudes toward the computer in the school and at home. Girls hold strong beliefs about equality of skills and abilities on the computer as a group but these beliefs decrease in the individual female. Chen (1986) found a contrast between girls' strong feelings that females are and should be as competent with computers as men and their more negative feelings regarding their own personal involvement with computers.

The "We can, but I can't" paradox can also be examined in terms of self-efficacy. Self-efficacy is defined by Bandura (1977a, 1977b) as the assessment of one's ability to complete a particular task. Bandura

suggests that perceptions of self-efficacy regarding a task can influence the choice to engage in that task, the effort that will be used in performing it, and the persistence that will be shown in accomplishing it.

In addition to Bandura's definition, Miura (1986b) states self-efficacy as the belief that one can execute successfully a certain course of behavior. Miura (1986b) believes that if we accept Bandura's premises affecting perceptions of self-efficacy, intervention strategies will necessarily have to focus on raising computer self-efficacy among females.

## Computer Utilization

Students use computers in many different ways: to play games, write papers, letters, or stories, do school work, and/or program. The results of a national survey on school uses of microcomputers were reported by Becker in 1987. The study included 2,331 elementary, middle, and secondary schools. Becker found that boys used school computers more than girls did, although not everywhere and not in all respects. Where computers were used either before or after school, boys outnumbered girls 3 to 1. Boys also dominated elective programming activities in elementary school and game playing in middle and high school. Girls dominated in high school word processing, most of which occurred in business education courses where girls made up most of the enrollment (Becker, 1987).

Lockheed (1985) found similar results in a study she conducted. Males were found to spend significantly more time playing computer games and programming than females. Boys were also shown to spend only slightly more time using computers as word processors or for other applications (Lockheed, 1985).

Research by Chen (1986) found that gender differences were less striking in courses where computers were used for applications such as computer-assisted instruction, games, simulations or word processing. The question that comes to mind is that if there is little difference between the genders in computer application courses, is there a difference in computer programming courses?

Computer programming classes have been one of the areas that most clearly differentiate males from females. As the researchers Chen, Lockheed, and Becker have shown, there does not seem to be a gender difference in application courses but as students progressed in school Chen (1986) and Lockheed (1985) found differences began to appear in computer programming courses.

In upper level programming courses, there is also some difference in the results of research on the enrollment of females. Becker (1987) reported that enrollments in elective programming classes in the middle and high schools were roughly evenly split between males and females whereas Chen (1986) found that there were higher proportions of males in the more advanced programming classes.

Possible explanations for gender differences in programming were found by Lockheed (1985) and included:

1. The demands of programming, which stress rules and winning, were incompatible with socialized female values.
2. Parental economic and personal support for programming was less positive for girls than for boys.
3. Teachers unconsciously discriminated against girls in programming classes, providing boys with greater opportunities for computer use than they provide female classmates.

The explanations by Lockheed identifying reasons why there may be differences in computer programming abilities between males and females could also be generalized to other areas. Two additional areas where the above explanations could be generalized include home environment and role models for students. Without proper support and influence from home, school and peers, students could be misled in their ideas and feelings about computers and in their attitudes on who can and cannot use the computer.

Home environment is another area of concern when looking at gender differences involving utilization of computers. Chen (1986) reported that computers were found more frequently in boys' homes than in girls'. Miura (1986a) found that if there was a computer in the home the user was more likely to be a boy than a girl. It also has been documented that parents do not purchase computer games for girls as frequently as they purchase them for boys (Lockheed, 1985).

Parental encouragement for computer-related activities also seemed to be an important factor for both boys and girls. However,

research has shown (Hess & Miura, 1985), that this encouragement was given more to boys than to girls.

Television and magazine advertisements for home computers that feature boys using and learning from computers, as well as a lack of interesting software for girls, also contribute to the subtle message that computer-related activities are more suitable for males.

## Role Models

Girls have fewer role models that involve computers to identify with than do boys (Sanders, 1984). Collis' study (1985a) confirmed that there is a presence of negative attitudes of females towards computer users. Throughout her survey she found that girls tended to endorse a stereotyped, somewhat negative view of computer users. When asked, girls would describe computer users as male rather than female (Collis, 1985a). The teachers in computer courses and computer-related courses are generally male and this may indicate to girls that computers are more for the males than for females (Sanders, 1984). Girls need more exposure to appropriate role models to realize that females can be valid computer users.

Demetrulias (1985) found also that most of the teachers who introduce students to computers are males. Seventy three percent of the teachers who did not use computers were female (Demetrulias, 1985). Counselors and teachers can have either a positive or negative influence on computer course-taking, and it would appear that this encouragement is more often directed to boys than to girls. In the

classroom, Sanders (1984) found that teachers unconsciously discriminated against girls in programming classes by providing boys with greater opportunities for computer use than they provided female classmates.

With the dynamic nature of the computer, field research on gender differences in computer usage and attitudes requires constant upgrading. Much of the current literature concerning gender differences in students' attitudes toward and usage of computers is in need of revision because of the increasing availability and expanding uses of computers in the schools and at home. Greater availability of computers and more opportunities for use in schools may change gender differences previously measured.

Much of the current literature on gender differences points at programming as a major area of difference. In recent years, however, programming has become an increasingly smaller part of the K - 12 computer curriculum. With increased availability and decreased emphasis on programming as an entry activity, it appears possible that gender differences may be decreasing.

## Statement of the Problem

The primary problem of this study was to investigate the existence of gender differences in computer attitudes and utilization of students in grades 4, 8, and 11.

This study also examined the possible differences between the genders in attitudes and utilization at different grade levels. Students,

both girls and boys, in elementary school find the computer exciting and non-threatening. There are indications, however, that in high school these feelings change differentially for girls and boys (Smith, 1987). Girls become more inhibited whereas the boys continue to excel.

In the majority of existing studies on gender differences, researchers have based their background information on the studies done in mathematics and computer programming. There are now enough computer application studies documented that research can begin to base findings on these experiences.

There is also a need to update the information regarding students' uses of the computer in today's school. Preliminary data on gender differences involving the computer is now beginning to be dated. New information and statistics are needed to provide accurate and current data that can be used to facilitate a decrease in gender differences.

## Purpose of the Study

Given the dynamic nature of computer use in homes and schools, attitude variables and the factors affecting them could be changing rapidly. There is a need for continuing research on student attitudes toward computers and factors that might be affecting these attitudes. The purpose of this study is to provide this update by surveying students in grades 4, 8, and 11 on their attitudes and utilization of the computer both in school and at home. Specifically, this study was

designed to determine if students' gender is related to computer attitudes and/or utilization.

In addition, this study is designed to provide preliminary information about the reasons for conflicting results from other studies researching gender differences on the computer. Possible conflicting results could be due to the rapidly changing uses and attitudes of students toward the computer because of the growing availability of computers at home and in the schools.

## Research Hypotheses

The primary research hypotheses of this study were:

1. There is no significant difference between males and females in their interests toward computers.
2. There is no significant difference between males and females in their self-efficacy toward computers.
3. There is no significant difference among the three grades, 4th, 8th, and 11th, in their interests toward computers.
4. There is no significant difference among the three grades, 4th, 8th, and 11th, in average self-efficacy scores.
5. There is no interaction effect of the student's grade level and gender as measured by the students' interests in computers.
6. There is no interaction effect of the student's grade level and gender as measured by the students' self-efficacy composite score.

7. There is no relationship between the student's gender and ownership of a computer at home.

## Limitations

This study was conducted in a school district ten miles west of Des Moines, Iowa. The majority of the school district's population were students from the town and surrounding housing developments in the area. Less than five percent of the school population was from the rural farming area. Therefore, the generalizability of the study is limited to classes and school districts with similar characteristics.

The research involved a female administrator, who was also the researcher; therefore her presence may have limited the study.

# CHAPTER II. REVIEW OF THE LITERATURE

This review has been divided into two sections. The first section, attitudes, summarizes current work on attitudes toward computers. This section contains information on the relationship between grade level and student attitudes. It also includes work on self-efficacy and the influence it has on computer learning. The utilization section, section two, concentrates mainly on how students use the computer both in the home and at school and the role models with whom students identify.

## Section I: Computer Attitudes

The way a student perceives and feels about the computer can be a determining factor as to how often or for what purpose the student will use the computer. A positive attitude toward computers can facilitate learning about them and contributes to productivity and more usage. Having a negative feeling about the computer, however, can increase anxiety and lessen productivity.

A research study was done by Collis (1985b) in British Columbia, Canada on 1,800 eighth- and twelfth-grade students' attitudes toward computers. The results of her study were:

1. Sex differences were clearly established with respect to attitudes toward computers, and it was also shown that these differences were established in grade eight.

2. The mean scores on items: "Microcomputers are easy to use" and "It would be hard for me to learn how to program a computer", showed that males were more self-confident than females about their potential with computers.
3. Females responded with greater positive conviction than males on the item: "Females have as much ability as males when learning to use computers".

Collis found that by the eighth grade attitudes between the genders towards computers had changed. It has been shown that grade level alone can be a factor in the difference in attitudes toward the computer.

## Grade Level

Many times boys and girls can have a difference of opinion on how they feel about the computer and this difference increases as the students' grade level increases (Demetrulias, 1985; Swoope, 1985; Miura, 1983). Demetrulias (1985) studied twelve schools selected at random from an area surrounding Peoria, Illinois. The schools included six public and two private elementary schools, one public junior high, and three public senior high schools representing both rural and urban schools.

Results from the study indicated that the percentage of students who used microcomputers in schools decreased substantially from the grade schools to the senior high school level. Clearly, these differences were more controlled by school and the students themselves. Also it

was found that male users exceeded the female users at each grade level (Demetrulias, 1985).

Smith (1987) did a study of all levels of students on their efficacy and sex typing attitudes toward computers in two different schools. One group of Smith's subjects were from a single scientific community school district in a Southwestern state which had had an educational computing curriculum in place for almost two years for all levels. The second group of subjects were from a primarily rural area of a Southwestern state. Schools in the second group were from two different school districts which were at various states of implementation of computer education.

The results from the first group showed that elementary students felt a higher sense of efficacy than junior high and high school students. The study also found no statistically significant differences between genders and no interaction effects.

The results from the second sample group also showed that elementary students were more confident than middle school students, who in turn were more confident than high school students.

Smith's findings indicated that as grade level increases, independent of gender, confidence with computers decreases. Collis (1985b), however, found a difference between the genders in their confidence with computers. This decrease in confidence, particularly in females, could possibly be due to their self-efficacy.

## Self-efficacy

Self-efficacy is yet another factor influencing computer learning. Self-efficacy is defined as:

1. the expectation that one can produce certain behaviors; these behaviors, in turn can lead to desired outcomes (Bandura, 1977b)
2. the belief that one can execute successfully a certain course of behavior (Miura, 1983)
3. the power to produce a desired effect or result (Guralnik, 1980)

Bandura outlined four important sources of information affecting perceptions of self-efficacy. The first source identified was performance accomplishment. If a person has had a positive experience with an activity, self-efficacy increases.

Seeing others succeed or fail was a second source of information that could affect perceived self-efficacy. For males there were more successful role models in computer-related courses, while for females there were relatively few (Demetrulias, 1985).

Perceptions of self-efficacy were also affected by a third source of information; verbal persuasion. Girls were not actively encouraged by teachers, counselors, or parents to participate in a computer-related course (Miura, 1986a, Collis, 1985a).

A final source of information that could contribute to the development of self-efficacy expectations is emotional arousal. Students

were more likely to feel positive about an experience if they were not highly anxious.

Collis (1985a) and Chen (1986) also discussed self-efficacy in terms of the "We can, but I can't" paradox. Girls believe that women together are capable, but they personally are not competent on the computer. This could be a possible source of considerable psychological conflict for young girls.

Collis' study in 1985 of 8th and 12th graders in Canada, found that in the area of self-efficacy a typical female believed that women in general were capable, but that she, as an individual, was not competent or likely to be a computer user. When asked to react to the statement "Females are just as capable as men when learning how to use a computer", girls in both grades strongly endorsed all items of that type, whereas boys were more likely to check the "uncertain" response. When the girls were asked to assess their own personal ability with the computer, however, their attitudes shifted downward.

Chen (1986) affirmed the results of Collis' study. He found that there was also a contrast between girls' strong feelings that females are and should be as competent with computers as men and their more negative feelings regarding personal involvement with computers. These conflicting feelings in females could be a source of hindrance in their utilizing the computer to its fullest potential.

On self-efficacy items, Smith's (1987) survey showed both that females had high scores indicating a strong belief in the ability of both the sexes to use computers or to have computer careers. But, despite

this expressed attitude that females can do as well as males, females' confidence in their computer skills appeared to decrease with age.

Attitudes toward computers may be influenced by the way students utilize the computer.

## Section II: Computer Utilization

Students utilize the computer in many different ways: to play games, write papers, and/or for programming. Studies have shown that there is a difference in this computer usage between boys and girls (Becker, 1987; Chen, 1986; Lockheed, 1985). Girls tend to use the computer more for applications whereas the boys use it more for games or programming.

Chen (1986) examined gender differences in experiences and attitudes toward computers in five California Bay Area high schools. A random sample of 1,138 secondary students completed the questionnaire. He found that boys were more likely to have taken a computer programming course before and during their high school years; computers were found more in the boys' homes; and that boys had more favorable attitudes about computers.

Chen's findings also showed that enrollments in a computer programming course, both before and during high school, showed a higher percentage of boys than girls. As the level of difficulty of the course increased, the ratio between male and female enrollments in these courses also increased. The only computer usage courses that

females had higher enrollments were in word processing and applications (Chen, 1986).

A national survey on using computers for instruction was conducted in the spring of 1985 by Becker. Student computer use, differences by sex, and differences by ability were three of the areas surveyed. Becker (1987) reviewed the results of this survey, "The Second National Survey of Instructional Uses of School Computers", which was commissioned by the United States Department of Education. The 2,331 schools that were included in the study were selected from a sample of elementary and secondary schools, public and private.

Three findings from Becker's study specific to gender differences on the computer were:

1. Boys outnumbered girls three to one where computers were used either before or after school.
2. Boys also dominated elective programming activities in elementary school and game playing in middle and high school.
3. Girls dominated in high school word processing.

Three major findings from this survey in the area of utilization for all students were:

1. Nearly half of elementary and middle school pupils and about one-third of high school students made some use of computers at school.

2. Typically an elementary school student using computers in a particular week used them for 35 minutes that week, either all on one day or in 10-15 minute sessions on different days.
3. The typical middle school student using computers has slightly more than one hour per week, while the typical high school computer user has nearly two hours.

Becker's findings, specific to gender differences in computer usage, described a male dominance in computer usage. An overall utilization finding was that as the grade level of the student increased, the amount of time spent on the computer also increased.

Student computer utilization encompasses everything from playing games, using it for applications, to computer programming. Chen and Becker have shown that in the areas of games and programming, at all grade levels, males utilize the computer more than females. The only dominate area for females was in applications and this was reported only at the high school level.

Other researchers have reported studies that show no gender differences. In a study of the effects of using a computer for electronic research, Eastman and Krendl (1984) found no gender-related differences in computer programming. In two studies of gender differences in computer programming, Webb (1985) discovered no differences in behavior or learning outcomes between males and females in either study. Similar results were found by Linn (1984) in a study of junior high students learning BASIC.

These studies involved computer programming and suggested that once enrolled in a programming course, females performed as well as males.

## Role Models

Good role models can provide a positive outlook of the computer for both male and female students. However, current role models are not attracting females to the computer. Females are not seeing the computer as a women's thing to do (Fuchs, 1986). Demetrulias (1985) found that 73% of the teachers who did not use computers were female.

In schools, a reason often alleged to account for the computer gender gap is that most computer teachers are male, resulting in a lack of role models of the girls' own gender (Sanders, 1985). Computer teachers are commonly the math teachers in most schools and math teachers are often males. Teachers may also hold the attitude that math is a more male oriented subject. Because of this belief they tend to assume that most girls suffer from math anxiety and therefore do not encourage girls to enroll in computer classes (Collis, 1985a). Counselors and teachers can have either a positive or negative influence on computer course-taking, and it would appear that this positive encouragement is more often directed to boys than to girls.

In addition to teachers and/or counselors being a source of computer using role models, parents can be also. Parents can foster or inhibit the use of the computer for their son or daughter.

Lockheed (1985) stated that in a survey of home use of computers, it was found that 70% of the main users were males and only 25% were females. She also found that parents do not purchase computer games or software for girls as often as they do for boys. One of the possible explanations for not purchasing software or games for girls was because the titles of these packages are usually directed to a male audience (Lockheed and Frakt, 1984). A lot of the software games available for children are aggressive or depict males as the main character. This type of software does not appeal to the majority of females, so parents do not purchase it for females.

Other findings showed that boys' parents actively support their sons' interest, while girls' parents were more skeptical about investing relatively large sums of money to purchase microcomputers (Collis, 1985a). Parents may still view the computer as a technical machine and are not sure their daughter is interested in them. Because of this doubt, parents become cautious in their decision to purchase a computer for their daughter.

## Summary

This chapter provided a review of the current research about gender differences in computer utilization and attitudes. The variables of: grade level, home environment, role models and computer self-efficacy were identified as possible contributing factors to the area of gender differences.

With the increasing availability and utilization of computers in schools, research in gender differences must be continually updated. Many of the causal factors cited in the literature are changing and results from these changes must be continually measured.

# CHAPTER III. PROCEDURES

## Subjects

The subjects consisted of fourth, eighth, and eleventh grade students in the Waukee Community School District in Waukee, Iowa. Waukee is a community ten miles west of Des Moines, Iowa and with a population of approximately 2,227 people. The majority of the school district's population consisted of students from the town and surrounding housing developments in the area. Less than five percent of the school population was from the rural farming area.

One hundred eight subjects (49 females and 59 males) completed the computer attitude and utilization survey. The subjects were from the elementary, middle and high schools in Waukee.

In the spring of 1988, the elementary school population consisted of 371 students, kindergarten through fourth grade. There were thirty-one fourth graders (10 females and 21 males) who completed the survey. The students were from two different homeroom classes. The overall state composite percentile rank for the entire fourth grade class was approximately 67.

In the spring of 1988, the middle school had approximately 280 students, fifth through eighth grade. Thirty-five eighth graders (13 females and 22 males) completed the survey. The students were from two different general eighth grade math classes. The overall state composite percentile rank for the entire eighth grade class was 82.

The population of the high school in the spring of 1988 was 295 students. Waukee's high school consisted of the grades nine through twelve. There were forty-three eleventh grade subjects (26 females and 17 males) from two different American history classes that completed the survey. The overall state composite percentile rank for the entire eleventh grade class was 92.

## Instrument

### Computer Attitude and Utilization Survey

The survey was conducted on May 24, 1988. Both fourth grade classes were surveyed in the morning and the eighth and eleventh grade classes were surveyed in the afternoon. Students had the option of not participating in the study if they so desired or if their parent(s) desired them not to participate.

The survey consisted of questions modified from surveys by Collis (1985a, 1985b) and Schubert (1984) involving similar subjects and testing similar theories. Some of the demographic questions were taken from Schubert's 1984 IDEAS survey which was used to help classroom educators improve computer learning opportunities for students. Demographic and attitudinal questions were also taken from Collis' 1985 survey which was performed to contribute to a clearer understanding of sex-related differences in attitudes of secondary school students toward computers. Some demographic and attitudinal survey questions were also formulated by the researcher.

Each grade level received the same survey. The reading level of the survey had been tested to see if it was at an appropriate level for the subjects involved and it was found to be acceptable. A sample of the survey is included in Appendix A.

The survey was designed to obtain computer attitude and utilization information from female and male students in the three different grades. It was comprised of two parts; demographic information and attitudinal information pertaining to microcomputers. The demographic information contained two background questions and nineteen utilization (8 home and 11 school) questions. The background questions profiled gender and grade level. The home and school utilization questions included: type of computer used, usage of the computer, assistance with computer questions, amount of time spent using the computer, and description of the people having the greatest knowledge of computers in school. The students had the opportunity to choose from one of the answers supplied on the survey or to input their own response.

The eighteen attitude questions surveyed attitudes toward various types of computer usage, self-efficacy issues and important use of the computer. Students were asked to answer the items using a Likert scale of 1 'strongly disagree', 2 'disagree', 3 'not sure', 4 'agree', 5 'strongly agree'. For most questions, higher scores indicated greater agreement and a more positive attitude toward that item. However, the responses to questions 7,10,11,12,14, and 18 were recoded to reflect

the wording of the questions so that all responses followed the same format.

A factor analysis was performed on the 18 Likert scale questions. The procedure used the correlation between the eighteen items in the survey to statistically determine the significant factors. In particular the author used the principal axis factoring procedure to extract the factors. Following the extraction, the resulting factors were rotated using the Varimax rotation to help examine the resulting factors. The following seven guidelines, outlined by Kang (1987), were used in considering the significant factors and the items that loaded on a particular factor. Factors and items that did not meet these guidelines were not selected.

Guidelines used for the selection of a factor were:

1. Eigenvalue of each factor should be one (1) or greater.
2. Percentage of variance explained in each factor should be about 4% or greater for the initial statistics.
3. Cronbach's alpha, as an estimate of reliability of items forming each factor, should be .60 or greater.
4. The factors extracted within each area should be independent or with a very low correlation.

Guidelines for the selection of items for a factor were:

1. Factors should be formed by including items with factor loading of .40 or greater.
2. Composite or items forming each factor should be similar in content as far as possible.

3. Previous studies of factor analysis relating to the research should be considered.

Results of the principal axis factoring factor analysis can be found in Table 1 for the 18 Likert scaled items from the survey. After examining the results and considering the guidelines outlined above, two factors were identified: 1) interest; 2) self-efficacy. The first factor, interests, had nine items loading on it. These 9 items examined the student's interests toward using the computer for fun and/or as a tool. The second major factor was self-efficacy and had four items loading. There were five items that did not load high enough or not group together to be identified as another major factor. In order to detect respondents with response sets, the Likert Scale was reversed for some of the questions on the survey. Therefore some survey items are stated differently in the results than they were stated in the survey. These items have been marked on the tables for clarity. Items 3, 5, 8, 11, and 15, were not used since they had item loading less than .40.

Following the factor analysis the author calculated a reliability index using all 18 items and each of the two factors extracted from the analysis. The internal reliability of the instrument was calculated using Cronbach's coefficient alpha (Borg & Gall, 1983). The overall reliability on the instrument was calculated to be .89. Breaking it down into the two main factors, the reliability for the interest factor was .88 and the reliability for the self-efficacy factor was .70. The sample size of ninety, which was lower than the sample size of one hundred eight which

completed the survey, was used because not every student answered all eighteen questions.

The first factor, interests, accounted for 36.7% of the total variance and the second factor, self-efficacy, accounted for an additional 8.9%.

Table 1: Factor analysis for attitudinal items

| Factor | Item | | Item Loading |
|---|---|---|---|
| 1 | Interest | | |
| | Q 1: | Computers are exciting | .74 |
| | Q 2: | I would use the computer more than anyone at home | .46 |
| | Q 4: | Computers are fun | .74 |
| | Q 6: | I enjoy working with computers | .81 |
| | Q 7: | Computer will never interest me[a] | .78 |
| | Q 10: | Working with computers is not my idea of a good time[a] | .64 |
| | Q 14: | Computers are boring[a] | .74 |
| | Q 17: | I might go into an occupation where I use the the computer a lot | .46 |
| | Q 18: | Computer games are boring[a] | .56 |
| 2 | Self-efficacy | | |
| | Q 9: | Computers are easy to use | .64 |
| | Q 12: | I would be hard for me to learn to program a computer[a] | .48 |
| | Q 13: | I am confident in my ability to work on the computer | .80 |
| | Q 16: | Compared to my classmates, I do very well on the computer | .62 |

[a]Items that were recoded.

## Procedure

A week prior to the study, students were given a consent letter to take home to their parent(s) to be signed and returned giving

permission for the student to participate in the survey. The letter to the parent(s) generally explained the study and requested their consent. A copy of this consent letter is included as Appendix B.

The Iowa State University Committee on the Use of Human Subjects in Research reviewed this project and concluded that the rights and welfare of the human subjects were adequately protected and that the risks were outweighed by the potential benefits, that confidentiality of data was assured and that informed consent was obtained by appropriate procedures. A copy of the Human Subjects form is included in Appendix B.

The survey was administered on May 24, 1988 in the subjects' classrooms. At each grade level the survey was passed out to the subjects who had returned their consent letters signed by their parent(s). Brief instructions were given by the researcher on how to fill out the survey. A review of the Likert scale options was also given to maximize the appropriate usage of the scale on the different questions. The fourth graders took approximately 15 minutes to complete the survey with the eighth and eleventh graders taking approximately 10 minutes.

## Analysis of Data

The data were analyzed using the Statistical Package for the Social Sciences, SPSSx (1986). There were two steps in the data analysis: 1) preliminary analyses, and 2) hypothesis testing. The preliminary analysis used the frequencies subcommand to examine the frequencies

of various response for all items in the survey. The statistical test that was used to test six hypotheses was a two by three factorial analysis of variance with the two gender levels and the three grade levels as the main effects. The seventh hypothesis was tested using a chi-square test comparing student's gender to ownership of a home computer.

## Summary

In this chapter, the methodology used to complete the investigation of gender differences in computer attitudes and utilization was presented. The sample consisted of fourth, eighth, and eleventh grade students from the Waukee, IA school district.

A computer attitude and utilization survey was administered to the participants in May of 1988. The survey was comprised of two parts; demographic information and attitudinal information. There were twenty one demographic questions and eighteen attitude questions. The demographic questions were multiple choice and the attitude questions were rated on a Likert scale from 1, strongly disagree, to 5, strongly agree.

Various statistical procedures were conducted using the data obtained from the students and the results of the survey are reported in Chapter IV.

# CHAPTER IV. RESULTS

In this chapter, the data collected from the sample of students and the analysis of that data are presented. The sample consisted of one hundred eight subjects (49 females and 59 males). Within each grade level there were; thirty-one fourth graders (10 females and 21 males), thirty-five eighth graders (13 females and 22 males) and forty-two eleventh graders (26 females and 16 males). It should be noted that there was more males than females in the study, but more females in the 11th grade group.

## Descriptive Statistics on Computer Utilization

Of the total 108 students, 50 (29 males and 21 females) owned computers at home. The most commonly owned personal home computer was made by Apple, either a Macintosh, IIe, or IIc; IBM computers were second. A summary of the type of machines present in the homes is presented in Table 2.

### Usage at Home

Table 2: Types of home computers

| Type | Frequency | Percentage |
|---|---|---|
| Apple | 14 | 12.8% |
| IBM Clones | 13 | 11.9% |
| Commodores | 9 | 8.3% |
| Radio Shack | 8 | 7.3% |
| Others | 6 | 5.5% |
| No Computer | 58 | 54.1% |
| Total | 108 | 100.0% |

Forty six students (92.0%) out of the 50 students whose homes had a computer, stated they used the computer regularly. Table 3 presents a summary of the various uses of the home computer by the students. Playing games accounted for the greatest use of the computer at home with word processing following closely. Only two fifths of the students stated that they used the computer at home for programming.

Table 3: Uses of the home computer

| Uses | Males | Females | Total[a] |
|---|---|---|---|
| Word Processing | 20 (69%) | 13 (62%) | 33 (66%) |
| Playing games | 25 (86%) | 13 (62%) | 38 (76%) |
| Programming | 12 (41%) | 6 (29%) | 18 (36%) |

[a]Multiple responses were allowed for all students.

Another question asked the students who else in their family used the computer. Each student checked as many people as was appropriate. In Table 4 are summarized the responses. Fathers were found to be users of the computer two thirds of the time at home and brothers nearly one half of the time. Mothers were checked only two fifths of the time as another user of the home computer and sisters were checked approximately one third of the time.

When asked which one person in the home used the computer most, over two fifths of the students responded with themselves. Over a third checked fathers as the most common user, one seventh checked brothers, and finally one tenth of the respondents checked their mother. No one checked that their sister was the single most common user of the home computer.

When asked who they would ask if they had questions or a problem with the home computer about two thirds of the students' checked their father. One fifth said they would ask their mother and no students said that they would ask their sister.

Table 4: Who else uses the computer at home?

| Person | Frequency | Percentage[a] |
|---|---|---|
| Father | 31 | 63.3% |
| Mother | 21 | 42.9% |
| Sister | 17 | 34.7% |
| Brother | 22 | 49.0% |

[a]Multiple responses were allowed for all students.

## Usage in School

Nine out of ten students said that they had used a computer in school. Table 5 shows a breakdown of the amount of time the students used a computer at school.

Table 5: How often do you use the school computer?

| Time | Frequency | Percentage |
|---|---|---|
| More than once a day | 9 | 9.4% |
| Once a day | 25 | 26.0% |
| Twice a week | 25 | 26.0% |
| Once a week | 15 | 15.6% |
| Once every two weeks | 4 | 4.2% |
| Once a month | 18 | 18.8% |
| No answer | 13 | ***** |

The students were then asked for what they used the computer at school. Each student was asked to check all the uses they make of the school computer. A summary of the results are presented in Table 6.

Table 6: How do you use the school's computer?

| Uses | Males | Females | Total[a] |
|---|---|---|---|
| Write papers | 18 | 23 | 41 |
| Play games | 22 | 10 | 32 |
| Program | 8 | 8 | 16 |
| Learn math | 31 | 17 | 48 |
| Learn science | 5 | 1 | 6 |
| Learn social science | 3 | 2 | 5 |
| Other | 7 | 8 | 15 |

[a]Multiple responses were allowed for all students.

The top three answers for both boys and girls on how they use the school computer were to write papers, play games and to program.

Just over half of the students (53.2%) had not taken a computer course before. When asked why not, about one third said no classes were offered, one third had not had time to take a computer class, over one third responded that they had no interest, and less than two percent stated their friends were not in the class as their reason for not taking a computer class.

Finally the students were asked to name two teachers who they thought had the greatest knowledge of computers in their school. The author coded the names by gender. A chi-square test comparing the student's gender to the gender of the teacher is summarized in Table 7. A similar question asked the students to list the two students they thought had the greatest knowledge of the computer and its results are summarized in Table 8.

Each student had the opportunity to supply two names to the question. The answers were then coded by gender and a chi-square test applied.

Table 7: Comparison of student's gender to gender of teacher with the greatest knowledge

| | Responses | | | |
|---|---|---|---|---|
| | 2 Males | 2 Female | 1 Male/1 Female | Total |
| Teacher's Gender | | | | |
| Males | 17 | 22 | 19 | 58 (55%) |
| Females | 23 | 14 | 10 | 47 (45%) |
| Total | 40 (38%) | 36 (34%) | 29 (28%) | 105 (100%) |

Chi-square statistic = 4.37, d.f. = 2, prob. = .13

Table 8: Comparison of student's gender to gender of student with the greatest knowledge

| | Responses | | | |
|---|---|---|---|---|
| | 2 Males | 2 Female | 1 Male/1 Female | Total |
| Teacher's Gender | | | | |
| Males | 32 | 0 | 25 | 57 (56%) |
| Females | 22 | 3 | 20 | 45 (44%) |
| Total | 54 (53%) | 3 (3%) | 45 (44%) | 102 (100%) |

Chi-square statistic = 4.05, d.f. = 2 prob. = .17

## Data Analysis for Hypotheses Testing

Six hypotheses were tested using two separate two by three factorial analyses of variance. The first two by three ANOVA used each student's interest mean score as the dependent variable and the second

two by three ANOVA used each student's self-efficacy mean score as the dependent variable. In each ANOVA there were two main effects, one for gender and one for grade level. An interaction term was also calculated for each ANOVA.

A significant main effect F statistic would mean that there was a significant difference between either the two genders or among the three grade levels. Following a significant grade level F statistic a oneway analysis of variance using a Scheffe´ post hoc test was used to identify significantly different groups. A significant interaction term would imply that the pattern of the main effect of one variable changes as the levels of the second variable change.

The seventh hypothesis was tested using a chi-square test comparing student's gender to ownership of a home computer.

The standard type I error rate, alpha, of .05 was used throughout the research. All statistical tests were calculated using SPSSx on Iowa State University's mainframe computer system.

Using the items identified in the factor analysis, two mean scores were calculated, one for interest and one for self-efficacy. The interest score was a composite mean score for the subject's ratings on nine items from the survey. The self-efficacy score was the composite mean score for the subject's ratings on four items from the survey. Mean scores were calculated instead of a composite sum score so that the resulting score would be in the same range, one to five, as the initial survey.

The tables necessary for testing the seven hypotheses discussed in chapter three are presented below. Table 9 presents the mean scores of the interest composite score for the various groups. The results for the two by three factorial analysis of variance using the composite interest score as the dependent variable are presented in Table 10.

Computer Attitudes

Table 9: Composite interest group means and sample sizes

| | | Grade Level | | | |
|---|---|---|---|---|---|
| | Statistic | 4th | 8th | 11th | Overall |
| Male | | | | | |
| | M[a] | 4.29 | 3.4 | 3.67 | 3.81 |
| | SD[b] | .582 | 1.078 | .833 | .922 |
| | N[c] | (21) | (22) | (16) | (59) |
| Female | | | | | |
| | | 4.25 | 3.65 | 3.51 | 3.70 |
| | | .696 | .925 | .683 | .749 |
| | | (10) | (13) | (26) | (49) |
| Overall | | 4.28 | 3.53 | 3.57 | 3.76 |
| | | .610 | 1.014 | .738 | |
| | | (31) | (35) | (42) | (108) |

[a]M = mean.

[b]SD = standard deviation.

[c]N = sample size.

Table 10: ANOVA comparing gender and year in school on the composite interest mean score

| Source of Variation | Degree of freedom | Sum of Square | Mean Square | F Statistic | Prob of F |
|---|---|---|---|---|---|
| Main Effect | | | | | |
| Gender | 1 | 0.004 | 0.004 | 0.007 | 0.94 |
| Grade | 2 | 11.180 | 5.590 | 8.40 | 0.00** |
| Interaction | | | | | |
| Gender by Grade | 2 | 0.530 | 0.260 | 0.40 | 0.67 |
| Residual | 102 | 67.900 | 0.670 | | |
| Total | 107 | 79.960 | 0.750 | | |

**Significant at a probability of < .01.

The probability for the F statistic for the main effect of grade level is judged to be significant as shown by Table 10.

The group means for the composite score on the factor self-efficacy is presented in Table 11 and the two by three factorial analysis of variance with the self-efficacy composite score as the dependent variable is presented in Table 12.

The seventh hypothesis was tested using a chi-square test comparing student's gender to ownership of a home computer and those results are presented in Table 13.

Table 11: Composite self-efficacy group means and sample sizes

| | | Grade level | | | |
|---|---|---|---|---|---|
| | Statistic | 4th | 8th | 11th | Overall |
| Male | | | | | |
| | M[a] | 3.65 | 3.19 | 3.11 | 3.33 |
| | SD[b] | .819 | 1.042 | .885 | .941 |
| | N[c] | (21) | (22) | (16) | (59) |
| Female | | | | | |
| | | 3.15 | 3.30 | 3.21 | 3.22 |
| | | .827 | .998 | .503 | .716 |
| | | (10) | (13) | (26) | (49) |
| Overall | | 4.49 | 3.23 | 3.17 | 3.28 |
| | | .842 | 1.012 | .666 | |
| | | (31) | (35) | (42) | (108) |

[a]M = mean.

[b]SD = standard deviation.

[c]N = sample size.

Table 12: ANOVA comparing gender and year in school on composite self-efficacy mean score

| Source of Variation | Degree of freedom | Sum of Square | Mean Square | F Statistic | Prob of F |
|---|---|---|---|---|---|
| Main Effect | | | | | |
| Gender | 1 | 0.080 | 0.080 | 0.120 | 0.73 |
| Grade | 2 | 1.710 | 0.850 | 1.200 | 0.31 |
| Interaction | | | | | |
| Gender by Grade | 2 | 1.830 | 0.910 | 1.290 | 0.28 |
| Residual | 102 | 72.400 | 0.710 | | |
| Total | 107 | 76.250 | 0.710 | | |

Table 13: Comparison of student's gender to ownership of a home computer

| | Student's Gender | | | |
|---|---|---|---|---|
| Ownership | Male | Female | Total | |
| Yes | 29 | 21 | 50 | (46.3%) |
| No | 30 | 28 | 58 | (53.7%) |
| Total | 59 (54.6%) | 49 (45.4%) | 108 | (100.0%) |

Chi-square statistic = .43, d.f. = 1, prob. = .52

## Testing the Research Hypotheses

Hypothesis one:

There is no significant difference between males and females in their attitudes toward computers.

Reviewing Table 10, ANOVA using interest as the dependent variable, it was noted that the probability of the F statistic for the main effect of gender was .94, therefore there was no significant difference between genders on the attitude composite score. Reviewing the group means by gender, found in Table 9, it can be noted that the overall male group mean was 3.81 and the females' group mean was 3.70. Differences can only be attributed to sampling error.

Hypothesis two:

There is no significant difference between males and females in their self-efficacy toward computers.

The second ANOVA, found in Table 12, shows a F probability for the main effect of gender as .73. The overall means for the males was 3.33 and for females it was 3.22. Again the researcher concludes that there is no significant difference between the genders on their composite self-efficacy score and hypothesis two is accepted.

Hypothesis three:

> There is no significance difference among the three grades, 4th, 8th, and 11th, as measured by the students' attitudes in computers.

Referring to Table 10, it can be seen that the probability for the F statistic for the main effect of grade level was .00 using the subject's computer interest score as the dependent variable. This F statistic was judged to be significant, probability less than .01, and therefore the researcher concludes that there is a significant difference between at least two of the three grade level overall means. To identify where the difference lay, the researcher followed up the significance test with a oneway analysis of variance using a Scheffe´ post hoc test. The post hoc test identified grade four as significantly higher than either grades eight or eleven. There was no significant difference between the overall mean scores for grades eight and eleven. The overall mean score for grade four was 4.25, grade eight it was 3.65 and for grade eleven it was 3.51.

Hypothesis four:

There is no significant difference among the three grades, 4th, 8th, and 11th, in average self-efficacy scores.

The main effect of grade level using the composite self-efficacy score was not significant since the calculated F probability was .31 (Table 12). Therefore the researcher concludes there is no difference between the group grade level means for the dependent variable of self-efficacy.

Hypothesis five:

There is no interaction effect of the student's grade level and gender as measured by the students' attitudes in computers.

Reviewing the interaction term from the first analysis of variance, Table 10, it was concluded that there was no interaction between grade level and gender. By reviewing the group means it can be noted that in both males and females the scores dropped as the grade level increased.

Hypothesis six:

There is no interaction effect of the student's grade level and gender as measured by the students' self-efficacy composite score.

Table 12 shows an F probability for the interaction term to be .28. Therefore the researcher concluded that there was no interaction

between grade level and gender as measured by the subject's self-efficacy score. Differences in the group means, presented in Table 11, could only be attributed to sample error.

Hypothesis seven:

> There is no relationship between the student's gender and ownership of a computer at home.

Table 13 summarizes the frequencies of the student's gender and home computer ownership. A chi-square test statistic was used to decide if there was a significant difference between the frequencies of the responses. There was found to be no significant difference in home computer ownership between the genders.

## Summary

Testing of the hypotheses revealed a significant difference in one of the seven hypotheses. It was found fourth graders had a more positive attitude toward the computer than either the eighth or eleventh graders. For the other six hypotheses, there were no significant differences between the genders in attitudes toward the computer and self-efficacy.

# CHAPTER V. CONCLUSION

This chapter presents a brief summary of the study. Discussion of the results and suggestions for further research are also provided.

## Summary

The purpose of this study was to survey students in grades 4, 8, and 11 on their attitudes and utilization of the computer both in school and at home. Specifically, the study was designed to determine if the students' gender was related to computer attitudes and/or utilization. Also this study was designed to provide additional information about the reasons for conflicting results from other studies examining gender differences on the computer.

The population consisted of students in fourth, eighth, and eleventh grades from the Waukee Community School District in Waukee, Iowa. One hundred eight subjects (49 females and 59 males) completed the computer attitude and utilization survey.

The computer survey was administered to the participants in May of 1988. It was designed to specifically obtain computer attitude and utilization information from female and male students in the three different grades.

The survey was comprised of two parts: demographic information and attitudinal information. There were twenty-one demographic questions and eighteen attitude questions. The demographic questions

were multiple choice and the attitude questions were rated on a Likert scale from 1, strongly disagree, to 5, strongly agree.

From the demographic information it was found that the home computer was used for word processing, playing games and programming. Word processing and game playing were also in the top three uses of the school computer along with learning math. Besides the students' themselves, fathers and brothers were the major users of the computer at home. Mothers and sisters were not checked very often as major users of home computers.

Seven hypotheses were developed and tested. The statistical test that was used to test six hypotheses was a two by three factorial analysis of variance with the two gender levels and the three grade levels as the main effects. The seventh hypothesis was tested using a chi-square test comparing student's gender to ownership of a home computer.

Significant difference was found between at least two of the three grade levels on students' attitudes toward computers. Grade four was significantly higher than either grades eight or eleven. There were not, however, significant differences between the three grade levels on students' computer self-efficacy.

Males were not found to have more positive attitudes and self-efficacy toward computers than females. There was also no interaction effect of the students' grade level and gender on their computer interests or computer self-efficacy.

There was no significant difference in home computer ownership between the grades. It should also be noted that there was no

significant gender differences in computer ownership. Of the 50 students who owned a home computer, 29 were males and 21 were females.

Finally when asked which teachers and students have the greatest knowledge of computers in the school, there was no significant difference in the number of male or female teachers named. However, it was found that all students thought their male peers had more knowledge about computers than female peers.

Thus the results indicate that for the students in this study, there were no significant gender differences in interests toward computers or computer self-efficacy. There were, however, significant differences found between grade levels on computer attitudes and on the gender of students identified as having the most computer knowledge.

## Discussion

In general, earlier research has shown a greater difference between males and females on attitudes and utilization of the computer than was found in this study. There are several possible explanations for this difference.

Collis' research study done in 1985, stated that sex differences were clearly established with respect to attitudes toward computers, and it was also shown that these differences were established by grade eight. Some of the differences were that males were more interested in computers than were females, and were less likely to be negative toward the impact of computers on society (Collis, 1985b). In contrast

to Collis' study, no significant differences were found in this study between the genders in their attitudes toward computers. One possible explanation of this difference is that this study was conducted in 1988 and Collis' study was conducted in 1984. In the four years between the two studies, there have been significant changes in the amount and type of computer utilization and availability in schools.

Availability of computers in schools has increased greatly. In a recent study by Becker (1989), he found 98% of the schools surveyed had computers. He also noted that since 1985, the number of computers in schools had more than doubled.

In the area of utilization, Becker's results showed an increase in computer tool usage but a decrease in computer programming. Only 12% of the reported computer usage for middle and high schools was in computer programming and elementary schools' percentage was even less. In agreement with Becker's study, this study also showed a decrease in the amount of computer programming. For both genders in this study, the top three uses of the school computer were word processing, learning math, and playing games. Programming was rated fourth by both male and female students.

This study did find significantly more positive attitudes toward the computer in fourth graders than either eighth or eleventh graders. This result coincides with Smith's (1987) findings that elementary students felt a higher sense of confidence toward use of computers than did junior high and high school students.

In the area of self-efficacy, Collis (1985a) and Chen (1986) found that there was a contrast between girls' strong feelings that females are and should be as competent with computers as men and their more negative feelings regarding personal involvement with computers. This study, however, found no significant differences between the genders or at any grade level in the area of self-efficacy.

Grade level differences may be due to historical differences; that is, 8th and 11th graders may have had less computer experience than 4th graders. Also, fourth graders may perceive their computer abilities and interest more positively than older children.

Descriptive statistics indicate that females are gaining more access to computers. This is a positive finding and may indicate that females will continue to opt for more computer experiences given their increased utilization of computers. As more females become more involved in programming, more educational programs appealing to both genders may be developed. This may help females develop more interest, utilization and ability with computers.

## Recommendations for Future Research

Thirty-one fourth graders, thirty-five eighth graders, and forty-three eleventh graders participated in the study. The sample size per grade was small. Validity of the results could be strengthened by using a larger number of subjects for future research as Becker (1986), Chen (1986) and Collis (1985a, 1985b) did in their research surveys. The

results of this study suggest the need for a large scale study updating data on gender differences in computer attitudes and utilization.

This study indicated computer utilization has changed in females. A study of greater depth and detail on female computer utilization might be pertinent in computer gender difference research.

Finally, since this study showed that there was a difference between the grades in attitudes toward the computer, further research can assess whether results from this study continue to hold and can investigate possible causes for the observed differences between the grades.

Clearly with the increasing number of computers in the school and at home, this study needs to be replicated with a larger sample size and include a number of various size school districts.

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# APPENDIX A.

# STUDENT SURVEY

Computer Attitude and Utilization Survey
of Grades 4, 8, and 11
Spring 1988

Please check the appropriate response.

BACKGROUND INFORMATION:

1. ____Male _____Female

2. What grade are you in? ____4 ____8 ____12

HOME:

3. Do you have a computer at home? ____Yes ____No(go to # 10)

4. If yes, what kind of computer do you have at home?
   - ____ Apple
   - ____ IBM pc
   - ____ Commodore
   - ____ Radio Shack
   - ____ Other: (Please list the name _____)
   - ____ Macintosh
   - ____ Zenith
   - ____ Texas Instruments

5. Do you use the computer at home?
   - ____ Yes (go to #5a)
   - ____No (go to #6)

   5a. What do you use the computer at home for? (Check all that apply)
   - ____ to write papers, letters or stories
   - ____ to play games
   - ____ to program
   - ____ other: _____

6. If you don't use it, why not? (Check all that apply)
   - ____ don't like to use it.
   - ____ don't know how to use it.
   - ____ don't have time to use it.
   - ____ am not allowed to use it.
   - ____ other: _____

7. Who else uses the computer at home? (Check all that apply)
   - ____father ____mother
   - ____sister ____brother
   - ____other: _____

8. Is there one person that uses the computer the most in your house?
   - ____Yes ____No

   8a. If yes, who is it?(Check only 1)
   - ____father ____mother
   - ____sister ____brother
   - ____yourself
   - ____other: _____

9. When you have a question or problem on the computer that you can't solve, who helps you at home? (check all that apply)
   ____mother ____father
   ____brother ____sister
   ____friend

SCHOOL:

10. Have you used a computer at school? ____Yes ____No

11. If yes, how often do you usually use the computer at school?:
   ____ more than once a day
   ____ once a day
   ____ twice a week
   ____ once a week
   ____ every two weeks
   ____ once a month

12. When you are working at school on the computer, about how long do you usually work?
   ____ less than 15 minutes
   ____ 15-30 minutes
   ____ 30 minutes - 1 hour
   ____ more than 1 hour

13. What do you use the computer in school for? (Check all that apply)
   ____ to write papers, letters or stories
   ____ to play games
   ____ to program
   ____ to learn math
   ____ to learn science
   ____ to learn social studies
   ____ other: _____

14. Have you taken a computer course before?
   ____Yes (go to #16) ____No

15. If you have <u>not</u> taken a computer course, why not?
   (Check all that apply.)
   ____ None was offered.
   ____ I haven't had the time.
   ____ I haven't had the interest.
   ____ None of my friends were taking computer classes.
   ____ Other reason: _____

16. Are you taking a computer course now?
   ____Yes ____No (go to # 18)

17. If yes, why did you decide to take the course? (Check all that apply.)

____ I like computers and want to know more about them.
____ My mother wanted me to take it.
____ My father wanted me to take it.
____ My teacher or counselor wanted me to take it.
____ My friends were signing up for it so I did too.
____ I think I need to know about computers for a future job.
____ It is a requirement.

18. If no, would you like to take a computer course in high school?

____Yes ____No

19. If you need to ask a person for help on the computer in school, whom do you ask? (Check all that apply.)

____ the teacher
____ a female friend
____ a male friend
____ another student who knows the subject well.

20. Which of the following can you do? (Check all that apply.)

____ load a disk into a computer.
____ use the keyboard.
____ play video games on a computer.
____ play educational games on a computer.
____ use word processing to write stories, letters, or school papers.
____ use to draw pictures or graphs.
____ write some simple computer programs.
____ Other experiences: _____

21. What teachers have the greatest knowledge of computers in your school? (Name 2)

Mr. _____
Mr. _____
Ms. _____
Ms. _____

22. What students have the greatest knowledge of computers in your school? (Name 2)

_____
_____

The following statements have to do with how you feel about the computer. Circle 1 if you strongly disagree with the statement, circle 2 if you disagree, circle 3 if you aren't sure how you feel, circle 4 if you agree with the statement, and circle 5 if you strongly agree.

Be sure just to circle one answer for each statement.

1 = strongly disagree  2 = disagree  3 = not sure  4 = agree  5 = strongly agree

Using the above scale, how would you answer the following:

| | strongly disagree | | not sure | | strongly agree |
|---|---|---|---|---|---|
| 1. Computers are exciting. | 1 | 2 | 3 | 4 | 5 |
| 2. If my family had a home computer, I would probably use it more than anyone else. | 1 | 2 | 3 | 4 | 5 |
| 3. Girls and boys are equal in ability when learning to use a computer. | 1 | 2 | 3 | 4 | 5 |
| 4. Computers are fun. | 1 | 2 | 3 | 4 | 5 |
| 5. It is important for both girls and boys to learn how to use a computer. | 1 | 2 | 3 | 4 | 5 |
| 6. I enjoy working with computers. | 1 | 2 | 3 | 4 | 5 |
| 7. Computers will never interest me. | 1 | 2 | 3 | 4 | 5 |
| 8. The more I use the computer, the more confident I feel. | 1 | 2 | 3 | 4 | 5 |
| 9. Computers are easy to use. | 1 | 2 | 3 | 4 | 5 |
| 10. Working with computers is not my idea of a good time. | 1 | 2 | 3 | 4 | 5 |
| 11. You have to be smart to like computers. | 1 | 2 | 3 | 4 | 5 |
| 12. It would be hard for me to learn to program a computer. | 1 | 2 | 3 | 4 | 5 |
| 13. I am confident in my ability to work on the computer. | 1 | 2 | 3 | 4 | 5 |
| 14. Computers are boring. | 1 | 2 | 3 | 4 | 5 |
| 15. I like playing games on the computer. | 1 | 2 | 3 | 4 | 5 |
| 16. Compared with my classmates, I do very well on the computer. | 1 | 2 | 3 | 4 | 5 |
| 17. I might go into an occupation where I use the computer a lot. | 1 | 2 | 3 | 4 | 5 |
| 18. Computer games are boring. | 1 | 2 | 3 | 4 | 5 |

# APPENDIX B.

# HUMAN SUBJECTS FORM

# AND PARENTAL PERMISSION LETTER

INFORMATION ON THE USE OF HUMAN SUBJECTS IN RESEARCH
IOWA STATE UNIVERSITY
(Please follow the accompanying instructions for completing this form.)

1. Title of project (please type): Gender Differences as Measured by Computer Attitudes and Utilization in Grades 4, 8, and 11.

2. I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are properly protected. Additions to or changes in procedures affecting the subjects after the project has been approved will be submitted to the committee for review.

Kimber Poppen Sullivan — Typed Named of Principal Investigator
5/9/88 — Date
[signature] — Signature of Principal Investigator

N158 Lagomarcino Hall — Campus Address
294-9997 — Campus Telephone

3. Signatures of others (if any)

| | Date | Relationship to Principal Investigator |
|---|---|---|
| — | 5/9/88 | Major Professor |
| | | |

4. ATTACH an additional page(s) (A) describing your proposed research and (B) the subjects to be used, (C) indicating any risks or discomforts to the subjects, and (D) covering any topics checked below. CHECK all boxes applicable.

RECEIVED MAY 10 '88 ISU GRADUATE COLLEGE

- ☐ Medical clearance necessary before subjects can participate
- ☐ Samples (blood, tissue, etc.) from subjects
- ☐ Administration of substances (foods, drugs, etc.) to subjects
- ☐ Physical exercise or conditioning for subjects
- ☐ Deception of subjects
- ☒ Subjects under 14 years of age and(or) ☒ Subjects 14-17 years of age
- ☐ Subjects in institutions
- ☐ Research must be approved by another institution or agency

5. ATTACH an example of the material to be used to obtain informed consent and CHECK which type will be used.

- ☐ Signed informed consent will be obtained.
- ☒ Modified informed consent will be obtained.

6. Anticipated date on which subjects will be first contacted: Month 5 Day 18 Year 88

Anticipated date for last contact with subjects: Month 6 Day 3 Year 88

7. If Applicable: Anticipated date on which audio or visual tapes will be erased and(or) identifiers will be removed from completed survey instruments:

Month — Day — Year —

8. Signature of Head or Chairperson — Date — Department or Administrative Unit

[signature] 5-10-88 — Professional Studies

9. Decision of the University Committee on the Use of Human Subjects in Research:

☒ Project Approved ☐ Project not approved ☐ No action required

George G. Karas 5/16/88 [signature]

Iowa State University of Science and Technology Ames, Iowa 50011

Instructional Resources Center
Quadrangle North

May 18, 1988

Dear Parents:

As a graduate student in Professional Studies in Education at Iowa State University, Ames, Iowa, I am interested in studying gender differences in girls' and boys' attitudes and utilization of the microcomputer. Results from this study should help teachers understand how to facilitate optimum computer experience for both girls and boys.

For the study, students will be asked to complete a survey. Completion of the survey should take approximately 15 minutes. It will include items measuring demographic information, microcomputer participation and experience, and attitudes toward the microcomputer. The survey will not ask for any names or any other means of student identification. Students will only be identified by an ID # for data analysis and this number will be destroyed as soon as the study is completed.

If you are interested in the outcome of the study, I will be most willing to share the results with you at the conclusion of the study. Should you have any further questions, please do not hesitate to contact me (515) 294-6840, or Dr. Ann Thompson (515) 294-5287.

Please sign and return the bottom portion of this letter to your child's teacher by Tuesday, May 24.

Thank you for your cooperation.

Sincerely,

Kimber Poppen Sullivan

Kimber Poppen Sullivan
Graduate Student

Approved by,

Ann D Thompson

Dr. Ann D. Thompson
Major Professor

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Please circle your appropriate response.

I do / do not wish my child _____ to participate in the computer utilization and attitude survey.

_____
Signature

_____
Date