SINGLE-GENDER CLASSES AND COMPUTER-ASSISTED INSTRUCTION: A STUDY OF THE COMPUTER ATTITUDES OF MIDDLE SCHOOL GIRLS

by

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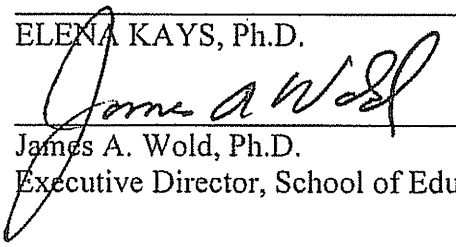

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Abstract

The study examined the effects of three instructional settings on computer attitudes of sixth grade girls in the areas of computer enjoyment, computer importance, motivation and persistence, and computer stereotypes. The girls participating in the study were assigned to three types of classes: traditional social studies classes using a textbook as the primary instructional tool; instruction delivered using computer-assisted instruction in a mixed gender setting; and girls who participated in a single-gender computer-assisted instructional setting. Quantitative data were collected from 76 participants using an online survey. Data were analyzed using the chi-square statistic to determine significant differences in the attitudes towards computers of the three groups of girls. Open-ended comments from the participants in focus group discussions were organized into significant themes. The girls also completed a drawing to identify their perceptions of characteristics of individuals who have computer skills and those who are lacking computer skills. The combination of these three activities was used to determine if there was a relationship between the nature of the instructional setting and the computer attitudes of the sixth grade girls participating in the study. The results of the study indicated that the computer-assisted instructional setting affected attitudes towards computers in the areas of computer enjoyment and computer importance. Similar effects were not found in the single-gender setting. Comments from the focus group conversation revealed a need for mentoring to increase girls' interest in pursing degrees in the area technology and computer science.

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CHAPTER 1. INTRODUCTION

Introduction to the Problem

Working knowledge of technology and its uses are rapidly becoming a requirement for citizens of the 21st century. Basic computer skills are frequently used on a daily basis to transact business, communicate, gather information, and conduct day to day activities. However, not all groups in society equally share the benefits of technology. The digital divide is a term used to describe the inequitable use of computer technology. According to Gorski (2002) this term "has traditionally described inequalities in access to computers and the Internet between groups of people based on one or more social or cultural identifiers such as race or gender" (p. 28). Ensuring equal access to technology for all people regardless of race, gender, or socioeconomic status requires proactive initiatives to address the specific needs of groups not equally represented in careers with a technology focus.

In today's society individuals who lack computer skills and confidence in their ability to use and apply technology will be at a distinct disadvantage in the job market where computer skills are becoming a filter for career options. Data from the United States Department of Commerce (2002) comparing the percentage of workers over the age of 18 using computers at work in 1993, 1997, and 2001 show an increase in usage by both men and women, as well as Caucasians, African Americans, and Hispanics (see Table 1).

Table 1: Percent of Workers, 18 Years and Over, Using Computers on the Job by Gender and Race

	1993	1997	2001
Men	40.3	44.1	48.5
Women	52.4	56.5	60.7
Caucasian	48.7	53.8	59.0
African American	36.2	40.0	43.8
Hispanic	29.3	30.2	32.4

An increasing number of women and men are using computers in the work place but how they are using them differs. Data in Table 2 show a greater percentage of males using all computer applications except in the area of word processing or desktop publishing. Most significant is the difference in the number of men and women who are using computers for programming.

Table 2: The Use of Computer in Workers Over the Age of 18 in 2001

	Spreadsheets and Data Bases	Internet/ E-mail	Calendar Schedule	Graphic Design	Programming	Word Processing
Male	65.1	75.4	55.4	32.1	20.5	64.5
Female	60.1	69.1	51.1	26.0	10.5	69.7

The percent of women in the Information Technology field working as computer programmers, computer system analysts, and computer scientists, with at least a bachelors' degree continues to decrease. According to the National Science Foundation 33.4% of the workers in Information Technology fields were women in 1990. This figure decreased to 29.1% in 1995, 28.5% in 2000 and 26.1% in 2001. To reverse this trend there is a need to determine strategies to encourage young women to pursue degrees in computer science. If not, women could be limited in the amount of influence in determining how technology will be used in the future. "Women must be part of the design teams who are reshaping the world, if the reshaped world is to fit women as well as men" (Margolis & Fisher, 2003, p.3).

> Along with technology's power come responsibilities to determine what computing is used for and how it is used…the conversations among computer scientists should not be isolated to all-boys clubhouses; women's voices and perspectives should be part of these conversations. For this to happen women must know more than how to use technology; they must know how to design and create it. (Margolis & Fisher, 2003, p. 3)

While there is a danger in generalizing characteristics and traits of boys and girls, they often view the use of computers differently. Specifically, Ogletree & Williams (1990) found that the difference is in how boys and girls perceived the use of computers which begins as early as third grade. Boys generally viewed the computer as a recreational toy, used to play games or create. Girls tended to view the computer as a tool used to accomplish a task, such as in the use of word processing (Ogletree & Williams, 1990). The difference in perceptions could be due to boys' early and more frequent use of video games. They may feel more comfortable and less anxious exploring computers. As a result "many boys enter school with a great deal of formal and informal computing experience" (Margolis & Fisher, 2003, p. 40). The perceptions of

computer use can begin before a child enters schools. The early and frequent use of computers at home tends to increase the level of confidence in children's ability to use computers when entering schools.

The type of activities available to girls and boys in the home can impact future attitudes. Using the computer for purposes other than gaming, such as art and media production programs may stimulate the interest of girls in computers. Generally the design of the majority of video games in the past has appealed more to boys than girls. "Boys between the ages of 8 and 14 have been the major players of computer game systems such as Nintendo or Sega, however as the use of computers has expanded beyond the use of games differences in the amount of time spent on the computers at home is decreasing" (Subrahmanyam, Kraut, Greenfield & Gross, 2000, p. 123). Aligning the use of computer applications with girls' natural interests in collaboration and communication may increase the interest of girls using computers in technology oriented careers.

Middle school and high school years can be a turbulent period for boys and girls as they transition from children to adolescents. Interactions between adolescent boys and girls grow in complexity during this time and can affect their attitudes and even their academic performance. In addition to the obvious changes from childhood to adolescence, concerns of equity in education have led to studies about the effect of gender on education. Societal and cultural expectations may in part be responsible for how girls view the use of computers. In spite of progress towards gender equity, computer science is still viewed by many girls as a career more appropriate for men than women. This attitude towards computers may impact what courses girls perceived as important to prepare for a future career. Advanced courses in math, science, and computers are essential to prepare students for careers in computer sciences.

> However, in middle school girls begin to opt out of math and science and start to question the relevancy of these subjects to their lives. It is at this crucial time when the seeds of doubt are sown-doubts that have broad implications for years to come. (Furger, 1998, p. 142)

Generally girls have not taken advantage of technology classes offered in high school that would prepare them for careers in the field of computer science. Statistics from a 1998 survey demonstrate that "high school boys predominate in all kinds of computer classes (design and technology, programming, desktop publishing, artificial intelligence) except for word processing, where girls predominate" (AAUW Educational Foundation Commission on Technology, 2000). This trend will continue unless girls begin to feel comfortable exploring computers in ways similar to that of boys. Currently "technology is generally considered a male endeavor related to math and science" (Salomone, 2004, p. 104).

In middle school when girls are beginning to question their role in society one suggested strategy is to offer girls the opportunity to participate in single-gender learning environments. In his study of gender and schools Sax (2005) found that in coed schools "girls tend to be cautious about going into subjects or activities which are essentially boys' things" (p. 243). A benefit for participation in single-gender classes is that girls may feel more comfortable assuming roles typically thought of as predominately masculine. Further research is needed to determine if participation in single-gender classes which incorporate the use of computer-assisted instruction affects the way girls view computer use. This study will provide insight into whether the use of alternative instructional settings will encourage girls to view computers as tools for both women and men.

Statement of the Problem

Sherry Turkle, co-chair of the American Association of University Women's (AAUW) Commission on Technology, Gender, and Teacher Education, reported that rather than "computer phobic," girls are "computer reticent" (Turkle, 2000). "Very early in life computing is claimed as male territory. The claiming is largely the work of a culture and society that links interest and success with computers to boys and men" (Margolis & Fisher, 2003, p. 4). The gender gap in attitudes towards computers may have an impact on girls interested in entering computer science fields.

At an early age, boys generally spend more time playing computer and video games developing familiarity and comfort with technology when begin school. "Girls, whether consciously or subconsciously, tend to recognize computer games as sexist and excessively violent. It is therefore not surprising by the time girls enter school, they demonstrate less interest in computer technology than boys" (Salomone, 2003, p. 104). The general lack of interest of girls in advanced computer applications is reflected by the small number of young women choosing to pursue careers in computer science. Men will continue to dominate the high paying field of computer science unless girls have the opportunity to explore computer use with instruction specifically designed to meet their needs in a supportive environment.

In middle school, girls begin to struggle with their role in society. "An adolescent today is like an explorer without a compass in a trackless wilderness, unsure of the path or the destination" (Sax, 2005, p. 236). Will girls who have the opportunity to participate in single-gender classes using computers have a different attitude towards the use of computers than girls in coeducational classes? Research is needed to determine if opportunities to participate in

computer-assisted instruction in single-gender classes will foster an increased interest in the area of computer technology. The increased interest in computers could impact girls' decision to take advanced computer courses and consider pursing careers in the field of computer science.

Background of the Study

Eight years ago, only four public schools in the United States offered single-gender educational opportunities. For the 2005-2006 school year, at least 193 public schools in the United States offer gender-separate educational opportunities (National Association for Single Sex Publication, 2005). This rise in single-gender educational environments may indicate an increased awareness of differences in how boys and girls learn. A 2003 report issued from Dartmouth Medical School found "girls and boys are hardwired to be different, and how our society's neglect of gender differences has caused great harm" (Sax, 2005, p. 249). A critical age when girls and boys are especially susceptible to society's depiction of the roles of women and men occurs when students are in middle school. In gender-separate girls' settings teachers "devise lesson plans that address girls' interests, coordinate activities to make technology real to them, and matriculate young women who are confident, capable, eager users of the tools of their time" (Furger, 1998, p. 141).

Current brain-based research reveals differences in boys and girls which may explain differences in how computers are used. Sax (2005) identifies risk-taking as a critical difference in boys and girls. Boys, in general, enjoy participating in risk-taking activities for the feeling of excitement. Although willing at times to participate in risk taking experiences, most girls do not seek out these situations. This risk-taking attitude directly relates to decisions that impact their

future roles in society. "Boys systematically overestimate their own ability, while girls are more likely to underestimate their abilities" (Sax, 2005, p. 43). From an early age cultural expectations contribute to boys' overestimation of their abilities. The media support this attitude as males featured as the hero of television, movies, novels, and characters in video games save the female in the story. This risk taking attitudes in males contributes to their success in the business environment, where risk taking helps them to move up the corporate ladder. Rather than risk taking, girls tend to more motivated to use the computer to express themselves, communicate with others, and use the computer to collaboratively solve problems (Cone, 2001).

In addition to underestimating their abilities, girls face societal expectations of what are appropriate roles for women. Girls in single-gender environments receiving support may be more willing to take risks and attempt to try new things. Girls with the opportunity to explore computers without the presence of boys and participate in activities based on their natural interest may increase their willingness to pursue fields with a technology focus. According to McCain and Jukes (2001) as future employees in the workplace facing the increased use of applications of technology, girls must learn how to shift from merely recalling content to using technology to access information to solve problems. To facilitate these changes girls must feel confident in the use of the Internet and technology to access information to make decisions and collaboratively work to solve problems (McCain & Jukes, 2001). To be competitive in a society that requires the use of technology to solve problems and improve current practices, more women need to feel confident to enter the field of computer science and technology. Gender-separate educational opportunities may be most beneficial in middle school as girls at this critical age seek to set goals and identify their roles in society.

Purpose of the Study

The purpose of the study was to examine the effects of three instructional settings on computer attitudes of sixth grade girls in the areas of computer enjoyment, computer importance, motivation and persistence, and computer stereotypes. The girls participating in the study were assigned to three types of classes: traditional social studies classes using a textbook as the primary instructional tool; instruction delivered using computer-assisted instruction in a mixed gender setting; and girls who participated in a single-gender computer-assisted instructional setting.

In the first phase, quantitative research questions were used to compare computer attitudes to the type of instructional setting. The instructional settings in the study were traditional, computer-assisted instruction, and single-gender computer-assisted instruction. In the second phase, qualitative interviews were used to probe significant themes constructed from the results of the quantitative survey comparing girls' attitudes towards computers and type of instructional setting.

Rationale

Currently a gender gap is apparent in the number of young women receiving degrees in careers with a technology focus. This gap will result in fewer women participating in conversations about the design of future technological applications. This lack of representation of women may significantly impact how technology will be used in the future. To reverse this trend there is a need to determine how to increase girls' interest in computers and advanced application of technology. One possible strategy is to offer single-gender opportunities to design

activities and instruction based on girls' natural interests and learning styles to increase their interest in computers. A review of the literature indicates that limited research has been completed in the areas of gender differences in computer attitudes and the effects of single-gender education in computer- assisted learning environments. Widespread implementation of single-gender classes has been limited, making long term systemic studies to determine the benefits of single-gender education a challenge. This study, which will examine girls' attitudes towards computers in different instructional settings, will add to the current body of knowledge. The results of the study provided information that will enable middle schools to evaluate programs to ensure progress towards computer equity and encourage girls to value the importance of computers when selecting courses and majors in high schools and college.

Research Questions and Hypothesis

To determine if single-gender instructional settings and the use computer-assisted instruction will impact girls' attitudes towards computers the following questions were the focus of the study.

1. What are the differences in computer attitudes between sixth grade girls who participate in classes utilizing computer-assisted instruction and sixth grade girls in traditional class settings?

Hypothesis: Girls who have the opportunity to participate in computer-assisted instruction will have a more positive attitude towards computers than girls in traditional classrooms in which content is predominately presented through textbook and lecture.

2. What are the differences in computer attitudes between sixth grade girls who participate in computer-assisted instruction in single-gender classes and sixth grade girls who participate in mixed gender classes using computer-assisted instruction?

Hypothesis: Girls who have the opportunity to participate in computer-assisted instruction in a single-gender setting will have a more positive attitude toward computers than girls who participate in computer-assisted instruction in mixed gender classrooms.

Significance of the Study

Findings from the report conducted by the Association of American University of Women's Educational Foundation Commission of Technology, Gender and Teacher Education reveal the following statistics in regard to gender and technology which indicate the need to research the gender gap in computer technology (AAUW Educational Foundation Commission on Technology, 2000, p.42):

1. Girls represent 17% of the Computer Science Advanced Placement test takers, and less than one in ten of the higher level Computer Science Advanced Placement tests takers.
2. Women represent approximately 20% of the Information Technology professionals.
3. Women receive less than 28% of the computer science bachelor's degrees, down from a high of 37% in 1984. Computer science is the only field in which women's participation has actually decreased over time.
4. Women make up just 9% of the recipients of engineering-related bachelor's degrees.

According to Chandler-Olcott and Mahar (2003) research indicates there is a gender gap between males and females in their enrollment in college degree programs with a technology focus, employment in technology-related fields, and interest in technology. There is a need to determine how to best support middle school girls who begin to opt out of advanced math and science opportunities at this age as they struggle with societal expectations for women. This study examined single-gender class settings and computer-assisted instruction as strategies to determine their affect on the attitudes of girls in the areas of computer enjoyment, computer importance, motivation and persistence, and computer stereotypes. Currently the research of single-gender education is inconclusive. Much of the evidence that has been gathered to support single-gender education is anecdotal and confined to specific groups of children, making a study difficult to replicate. The results from this study can be used to determine the strategies that could be used in middle schools to increase girls' attitudes towards the use of computers.

Definition of Terms

For the purpose of this inquiry, the following terms are important:

Single-gender classes are defined as classes that include only boys or girls in a public middle school setting.

Mixed gender classes are defined as classes that include both boys and girls in a public middle school setting.

Traditional classes are defined as classes that do not incorporate the use of computers for daily instruction and rely primarily on textbooks for instruction.

Computer-assisted instruction is defined as the use of computers to complement traditional learning methods. In this study the social studies classes incorporating computer-assisted instruction have a one-to-one ratio of computers to students in the class. Blackboard is used as the Web tool to organize instruction.

Assumptions and Limitations

This study makes the following assumptions:

1. Girls participating in the study have been exposed to computer use during the school year.
2. Girls in traditional social studies classes have less computer experience than girls participating in computer-assisted instruction.

This study has the following limitations:

1. The study is limited to the sixth grade students of one middle school in South Carolina.
2. There is no available control group to use to compare girls in single-gender classes who do not participate in computer-assisted instruction and girls in single-gender classes who do have the opportunity to participate in computer-assisted instruction.

Nature of the Study

Survey research, utilizing a mixed method approach was used in this study. Surveys and focus groups were used to collect data from sixth grade girls to determine the impact of single-gender classes and computer-assisted instruction on the attitudes towards computers. Girls from

traditional social studies classes, computer-assisted instruction of social studies in single-gender classes, and computer-assisted instruction of social studies in mixed gender classes completed an online survey and participated in focus group discussions. The survey included quantitative questions to determine attitudes towards computers, social aspects of computer use, and perceptions concerning computer use. Questions were designed to collect data on frequency and type of computer use, as well as computer and video game use. The survey was given to 76 sixth grade girls. Thirty-four of the girls participated in traditional sixth grade social studies classes and 42 girls participated in sixth grade social studies classes that utilized computer-assisted instruction.

Small groups of girls were invited to participate in tape recorded focus group discussions to obtain their thoughts and perspectives concerning the use of computers. These small group conversations occurred during the girls' social studies classes in an informal environment. Questions were prepared in advance to ensure consistency for each of the focus groups. The information collected from the focus group discussions provided a context for the study and gave depth to the information collected in the surveys. The questions were brief, clear, reasonable, and easy for sixth grade students to understand. The goal of the focus groups was to engage students in conversation to give them the opportunity to share their feelings about their participation in computer-assisted instruction, class environments, and attitudes concerning the use of computers.

Through the use of mixed methodology, a combination of both qualitative and quantitative methods of research was used. The results of the proposed study provide statistical data on the attitudes of girls towards computers in traditional classes; computer-assisted learning

environments, and single-gender classes. The study also provides a glimpse into the thoughts and opinions about computers expressed by these sixth grade girls.

Organization of the Remainder of the Study

The remainder of the study includes a literature review in Chapter two to provide examples of previous research and studies conducted to analyze computer attitudes in girls. The literature discusses possible reasons for differences in how males and females perceive the use of computers and possible implications for the future. In chapter three, the methodology chapter describes in detail how the study was conducted and the plan used to analyze data. Chapters four and five describe the collection of the data, analysis, results, conclusions, and recommendations.

CHAPTER 2. LITERATURE REVIEW

Introduction

The use of computers impacts all aspects of life in the 21st century. Computer equity is essential in order for all citizens to take full advantage of the benefits of technology which currently shape our environment and culture. Although most people would state that women and men have equal opportunities in all careers, a gender gap in computer attitudes still exists and impacts future career opportunities. The question to be examined in terms of gender equity is how to ensure that women feel as confident as men in their ability to use technology in any future career. The Commission on Technology, Gender, and Teacher Education describes the success of achieving gender equity in the area of technology as:

> a commitment to lifelong technology learning with all that that implies: an ability to adapt to rapid changes, interpret critically the wealth of electronic information, experiment without fear, an assume a variety of roles beyond that of end user or consumer. (AAUW Educational Foundation Commission on Technology, Gender, and Teacher Education, p. iv)

The examination of the literature review will show there are many factors that contribute to the complex problem of closing the gender gap in technology. Brain scans are currently revealing new information concerning differences in the brains of boys and girls. These differences in conjunction with society's portrayal of gender roles are impacting how boys and girls view the use of computers and their importance in their lives. The early use of video and computer games sets the stage for the development of attitudes towards the use and function of computers. The ability to utilize all features of computers may impact future career opportunities and the earning potential of individuals in today's society. Therefore it is critical that educational institutions provide leadership to ensure that all students have opportunities to develop

confidence in their ability to use computers in a variety of ways. The literature review will include the following sections: gender differences, gender stereotypes, gender and computer attitudes, early use of computer and video games, role of the media, middle school students, career choices, gender equity, and single-gender instructional settings.

Gender Differences

Advances in neuroscience and computerized brain imaging technology have enabled scientists to obtain new insights into the properties and functions of the brain. Educational researchers are beginning to utilize this information to make connections between learning theories and classroom teaching practices. Explaining behavioral differences in boys and girls is a topic currently debated as educators and scientists seek to determine which characteristics can be attributed to cultural expectations and which are based on physiological differences. "Research into gender and education reveals a mismatch between many of our boys' and girls' learning brains and the institutions empowered to teach our children" (Gurian & Stevens, 2004, p. 22). The chemical, hormonal, and functional differences in boys and girls brains directly impact how they learn. Sax (2005) stated, "there are no differences in what girls and boys can learn. But there are big differences in the best ways to teach them" (p. 106). According to Sax (2005) in learning environments girls respond through collaboration with others in group activities; prefer reading books with relationships relating to the feelings and emotions of the characters; enjoy role playing as they are able to articulate thoughts and emotions; and respond well to risk taking in a safe supportive environment.

In the past when differences in how boys and girls learn, interact with each other, and process information has been suggested, girls appeared to be viewed as the inferior sex. Actually, both boys and girls may not reach their potential if instruction is not designed with consider differences in how boys and girls learn. According to Sax (2005), educators are taught to instruct both boys and girls in the same manner and any differences in learning are viewed as socially constructed, rather than biologically based. One solution suggested by Sax (2005) is to break down gender stereotypes by providing opportunities for single-gender instruction. In order to adequately meet the needs of both boys and girls simultaneously in a coeducational setting one of the sexes will be shortchanged.

> Coed schools tend to reinforce gender stereotypes whereas single-sex schools can break down gender stereotypes. There is now very strong evidence that girls are more likely to take courses such as computer science and physics in girls-only schools than in coed schools. Boys in single-sex schools are more than twice as likely to study art, music, foreign languages, and literature as boys of equal ability attending comparable coed schools. (Sax, 2005, p. 243)

However, the AAUW does not feel single-gender settings are necessary to address the gender gap in computer use. The organization recommended to decrease the gender gap in computer science teachers need to encourage girls in the use of computers, provide equal computer access for both boys and girls in the classroom, and provide opportunities for girls to explore multiple uses of computers (AAUW, 2000). Researchers seeking to determine the effectiveness of single-gender education when compared to coeducational settings have not been able to provide definitive evidence to support the use of single-gender educational settings. However, results from studies from different countries suggest that adolescent girls who attend single-sex schools may experience academic and social benefits (Cairns, 1990; Granleese &

Joseph, 1993; Jackson & Smith, 2000; Lawrie & Brown, 1992; Riordan, 1990; Stables, 1990; Streitmatter, 1999; Wong, Lam, & Ho, 2002).

As the access to technology is rapidly expanding in homes and in schools there is a need to carefully examine effective strategies to ensure that both girls and boys benefit from opportunities to explore the use of computers and their potential impact on all aspects of life. "Among households with children ages 2 to 17, home computer ownership jumped from 48% in 1996 to 70% in 2000, while connections to the Internet catapulted from 15% to 52% over the same 5-year period (Shields & Behrman, 2000, p. 4). Data collected from the US Department of Commerce, Census Bureau show that both girls and boys are utilizing computers both at school and home (see Tables 3 and 4).

Table 3: Percent of Elementary/Secondary Students Using Computers at School

	October 1993 elementary/secondary students	October 1997 elementary/secondary students	September 2001 10 to 14 year olds
Males	59.9%	71%	90%
Females	60.5%	69.9%	90.6%

Table 4: Percent of Elementary/Secondary Students Using Computers at Home

	October 1993 elementary/secondary students	October 1997 elementary/secondary students	September 2001 10 to 14 year olds
Males	24.3%	43.2%	69.1%
Females	24.7%	42.5%	69.4%

Gender Stereotypes

Society in general still operates under the assumption that "boys invent things, and girls use things that boys invent" (Margolis & Fisher, 2003, p. 12). "The near absence of women's voices at the drawing board has pervasive effects. Workplace systems are built around male cultural models and entertainment software fulfills primarily male desires" (Margolis & Fisher, 2003, p. 3). Nature versus nurture is often debated when gender stereotypes are examined. Do the traits that differentiate males and females occur naturally or does society play a significant role in creating stereotypes of male and female behavior? As soon as a child is born, "society rules" dictate activities, clothes, toys, and perceptions about expected behaviors of males and females.

A study conducted by the National Coalition for Women and Girls in Education examined the development of gender roles. The study found that by the time, children are six or seven years of age, they have developed clear ideas about gender, based on what they see in the world (Gunn, 1994). At this age, most children choose to play with other children of the same sex. By the time children are eight to ten years old they begin expand their understanding of gender roles and are not as rigid in their perception of possible careers for women and men. Although playgroups consist of both boys and girls at this age, children still prefer to spend time with friends of the same sex (Gunn, 1994). Upon reaching adolescence, boys and girls become preoccupied with the expected roles of men and women, communicated through society and their peer group. These subtle messages may directly affect their behavior and choice of activities and course selection in high school.

Gender and Computer Attitudes

In study of 500 high school students, boys and girls were surveyed about their technology interest, competence, access, and use. The results of the survey showed that "eighty-two percent of the respondents indicated that school computers were used equally by boys and girls and two-thirds stated that girls and boys were equally competent in the use of computers" (Castell & Bryson, 1998, p. 236). In addition to answering the multiple-choice questions, students were asked to sketch an illustration of computer expert and give the whiz a name. The students were also asked to sketch a person who just cannot learn computer skills and give this "computer whizn't" a name. In contrast to the opinions of gender equity in computers in the data collected from the multiple choice survey questions, 71% of the computer whiz drawings were male, 18% were female, and 11% the sex could not be determined (Castell & Bryson, 1998). These conflicting results could be the result of students giving what is perceived as "acceptable" responses to the multiple choice survey questions rather than their actual beliefs and perceptions.

Gender stereotypes supported by society may be one explanation for the gap between the interests of males and females in computer science fields. Difference in home access and the design of video and computer games can affect the attitudes of children early in life. If parents and children view computers as appropriate "toys" for boys, girls may not be as likely to explore computers. Early access to computers and video games may give young children more self-confidence with computers when entering school. Clark and Millard (1998) cite the findings of several studies (Drambrot *et al.*; Harvey & Wilson, 1985; Collis & Williams, 1987; Levin & Gordon, 1989; Martin, 1991; Kirkman, 1993) that show that "compared to females, males were

more enthusiastic toward computers; more confident with them, and rated themselves better at using them" (p. 82).

Rabasca (2000) discussed attitudes and behaviors that may explain why boys are more adept with technology. Girls view the computer as important tool for verbal communication, sending e-mails, and visiting chat rooms rather than activities that involve problem-solving activities to understand technology. "As adults, women talk about technology to create, men talk about the power it gives them. Women ask technology for flexibility, men ask it for speed. Women talk about using computers to share ideas; men talk about the autonomy it grants them" (Rabasca, 2000, p. 1).

Early Use of Computer/Video Games

One of children's earliest exposures to technology is through playing video and computer games. Playing games are often gateways to computer literacy, which can potentially have an impact on future career choices. "Although boys and girls spend almost the same amount of time using their computers, boys spend an average of thirty one minutes a day gaming as compared to just eight minutes a day for girls" (Children Now, 2001, p. 2). "Approximately 75-80% of the sales revenue generated by the $10 billion game industry is derived from male game industry. The widespread success of video games with young boys has resulted in almost total market penetration" (Nzegwu, 2000). If the game industry is to expand the market to include girls as consumers, the design of games must reflect the interests of girls.

The competitive design of the current top selling games feature action, adventure, driving or flying, fighting, airborne combat, sports, role playing, and simulations which appeal to boys,

but not to most girls. A troubling feature of many of these games is how females are portrayed. Lara Croft in Tomb Raider and Joanna Dark of Perfect Dark, not only do not appeal to girls because of the violent nature of the game but also create a role model with physical features that portray an unrealistic view of women.

> Research indicates that boys enjoy high levels of competition, confrontation, and violence; fast, repetitive action; beating the clock; and racking up points to achieve a high score. On the other hand, findings suggest that girls prefer games with in-depth narratives and characters; the ability to design or create; the possibility for social interaction both on the screen and between players; and the ability to explore different activities within the same game. (Murray & Kliman, n.d.)

The current debate in the software industry is to whether to design games that will appeal to both boys and girls or continue to design games with a specific gender in mind. In response to the need to create computer games that address the interest of girls, at least four software companies are designing games that cater specifically to girls. Mattel Media, Her Interactive, Girl Games, Inc., and Girl Tech have each sponsored research studies to determine what appeals to girls in electronic games. The results of the research and focus groups revealed that "girls enjoy identifying with the characters, would rather create than destroy something, and like to win through collaborative rather than competitive methods" (Murray & Kliman, n.d.).

Examples of games popular with both boys and girls are *Where in the World is Carmen Sandiego?, Myst,* and *SIMS*. These games, which both boys and girls enjoy, include characters that are involved in solving problems. The game industry is currently attempting to address the disparity between the interests of boys and girls. While women in the video game industry agree that a gender gap exists, there is disagreement on the appropriate solution. One approach assumes that girls and boys want something essentially different from a video game so the solution is to increase the types of games that will appeal to girls. An analysis of several studies

(Agosto, 2002; De Jean, Upitis, Koch, & Young, 1999; Inkpen et al., 1994; Kafai, 1996, 1998; Lawry et al., 1994; Miller, Chaika, & Groppe, 1996; Subrahmanyam & Greenfield, 1998) found the following characteristics are often present in computer games girls' report they enjoy (Girls Tech: Electronic Information Resources for Girls and Young Women, n.d.):

1. Games that avoid the conflict between good and evil
2. Games that center on story line and character development
3. Games that are not competitive in nature
4. Games that use real-life locales
5. Games that feature strong female characters who are in charge of decisions and action
6. Games that enable users to play the role of the main character, either through self-identification or through the power to make decisions
7. Games that focus on human relationships
8. Games with some educational value, as opposed to those designed purely for entertainment
9. Games containing nonviolent action
10. Games that reflect girls' common play patterns

Nzegwu (2000) discusses the dilemma for the designers. "In designing girl-only games, the developers ensure that boys will not play with girl-targeted games, once again ghettoizing girls' interests" (p. 3). The opposing view is to modify boys' games to include stronger female characters. The challenge in this strategy is to include female characters that girls will relate to, unlike many of the females featured in current games. The interests of the video game industry

are based on marketing decisions to enhance profits, rather than increasing girls' use of video games to improve computer attitudes and use in schools. Recognizing the difference in how boys and girls learn and the importance of equity in the area of computer use, schools must examine current models of technology integration to meet the needs and interests of both boys and girls.

Furger (1998) explores the question "Does Jane Compute?" She challenges parents and educators to examine the obvious and subtle message girls receive about their abilities to not only use the computer as a tool but also understand how to use technology to design and create. "The relationship between boys' comparatively higher interest in computer games and their comparatively larger representation in high-power computer jobs is not accidental. Computer and video games provide an easy lead-in to compute literacy and so those children who aren't playing them at young ages may end up disadvantaged in later years" (Cassell & Jenkins, 1998, p. 11).

Role of the Media

Messages about gender roles are reinforced at an early age by the media. "Boys' commercials are fast paced, outdoors and rugged, usually involve something on wheels, often depict aggression, and employ music with a fast tempo and a distinctive beat" (Knupfer, Rust, & Mahoney, 1996, p. 2). In contrast commercials for products targeting girls are "slower paced, indoors and sweet, usually involve dolls or fashion messages, often depict emotion and caring for others and employ music with sweet, calm undertones" (Knupfer et al., 1996, p. 2). The media are often reflections of the attitudes of society. The majority of computer magazine subscribers and purchasers of computer hardware and software are men (Sanders & Stone, 1986). Men who

are predominately featured in magazines and television advertisements for computers intentionally or unintentionally convey the message that computers are for men. Women featured in these types of advertisements are generally in a passive role, watching someone else (usually a man) demonstrating or using a computer reinforcing the idea that computers are for men. Advertising intentionally or unintentionally may be in part responsible for perpetuating gender bias in our cultures (Gooler, 1986; Nye, 1991). In a review of advertisements for computers, studies reveal that the media is often communicating gender stereotypes about people using technology as predominately men (Knupfer, Kramer & Pryor, 1997; Ware & Stuck, 1985; Sanders, 1998; Knupfer, 1998; Knupfer, Rust & Mahoney, 1997).

An example of the media promoting gender stereotypes of computer use can be seen in a commercial selling DSL Internet access. In the commercial the mother and daughter are waiting for the overworked father to come home to help with a school project that requires the use of the Internet. In the home of the family that has the DSL connection the father sits at the computer looking up the information for the school project as the daughter looks over his shoulder. The paper is done quickly and the father is praised for his proficiency as the mother looks on. In the home of the family who is unfortunate enough to have a dial up connection, the father wearily sits at the computer complaining how the project will take all night as the daughter sits beside him. While the father is searching for the information, the mother uses the phone, much to the dismay of the father, as she unknowingly disconnects the access to the Internet. The next morning the father and daughter are both shown falling asleep in the car as they prepare to leave the house. The unspoken message the commercial communicates may be that the father figure in the household is the computer expert and the one in the family that has the capability to

understand how the Internet works as well as the computer expert who can help the daughter with homework assignments requiring computers.

Middle School Students

Gender stereotypes may affect the behavior and attitudes of middle school students who are struggling to identify their roles at this critical time. It is during this time that adolescents struggle with identity question such as "who am I?" and "what am I good at?" (Margolis & Fisher, 2003). A major shift occurs in the perception of gender in middle school as girls and boys struggle to identify their role in society. One concern is girls of this age who begin to view math, science, and computers as areas that boys are more interested in than girls.

Sanders and Stone (1986) presented strategies to neuter the computer, ensuring equal access and opportunities for girls and boys in the field of computer science. They recommend integrating the computer into the curriculum, scheduling computer use in the class for all students, using girls to demonstrate computers in class, and having students analyze how the computer software and the media contribute to promoting sexism (Sanders & Stone, 1996). This is especially important for adolescent girls as the gender gap usually begins to show up at the middle school level because this is the age of puberty.

> Adolescents are figuring out what is means to be men and women in this society, and their conclusions are naturally not yet very subtle. Behavior that seems especially characteristic of the opposite sex becomes forbidden at this age. To fit in with the all-powerful peer group adolescents adopt the accepted role norms with almost fanatic fidelity. (Sanders & Stone, 1986, p. 13)

Career Choices

The National Science Foundation reports that in 1975 the number of women receiving a BA in computer science was only 19%. Concerned by this statistic an emphasis on closing the gender gap in math and science was a focus in schools around the country. By 1984, the number of women earning degrees in computer science increased to 37%. Unfortunately, since that time there has been an alarming decrease in numbers of women attaining degrees in the field of computer science. In 2001, the number of women attaining a bachelor's degree in computer science has decreased to 28%. According to the annual Taulbee Survey conducted by the Computing Research Association in 2003-2004 data from the United States and Canada show 18.5% of the PhD's in computer science were earned by women and 25.4% of the Master's in computer science. This gap may reflect the gender expectations of career paths for both boys and girls.

> Women are heavily concentrated in a narrow range of occupations traditionally considered appropriate for them. Sixty percent of all women working outside the home are working in clerical, service, or professional positions, and more than sixty percent of these professional women are in female-intensive fields such as school teaching or nursing. (Leidel,1995, p. 7)

Computer jobs in which women are well represented are in clerical positions, using word processing, which are traditionally low paying fields. Data from 2004 published by the US Department of Labor, Women's Bureau indicated that 38% of women in the workforce are in management or professional positions, 35% are employed in sales or office work, and 20% are in service occupations. According to the US Department of Labor, computer scientists and computer analysts are two of the five fastest growing, highest paying job categories. Although women make up 46% of the workforce the majority of these high paying jobs in the computer

industry are filled by men. “Women in these positions will bring something different to the equation than men. We need a diversified pool of talent creating the tools that men, women, boys and girls, will be using well into the twenty-first century” (Furger, 1998, p. 178). While girls are taking more math and science courses during senior high and college, they are not pursing careers in math or science fields, typically in male dominated professions. This is also true careers with a technology focus. There is a danger that gender stereotypes may continue to affect the attitudes and access of computers for girls.

Gender Equity

The American Association of University of Women Educational Foundation sponsored a symposium bringing together scholars who have studied educational experiences of both boys, and girls in schools. *Beyond the Gender Wars* (2001) summarizes key concepts from the meeting. As panel members shared research on the psychological development and experience of both boys and girls in schools, topics such as gender and social equity were discussed. In terms of encouraging girls to enter fields currently under represented by women, the panel members in the symposium discussed possible reasons and solutions to this problem. In the discussion of equitable education, some researchers noted the difference between what is technically available to boys and girls and what students themselves perceive as available or possible. To support girls in entering math, science, and technology fields, schools may need to consider why girls are reluctant to enter these careers and what strategies can be implemented to change the perception of girls towards computers.

The National Council for Education Technology conducted a project to examine the small number of girls entering information technology careers and identified what factors are present when girls do succeed. Clark and Millard (1998) identified the following factors that may contribute to the reluctance of girls entering technology careers: girls are more likely to take on more passive roles when working alongside boys; girls lack access to women role models excelling in the computer science fields; a lack of awareness on the part of careers advisors and teachers, impacts advice given to girls concerning future opportunities; an inflexible attitude toward women by employers and recruitment practices in the area of computer science that do not encourage or target women; and a lack of parental and social encouragement that influences girls' attitudes toward computers. In order to address these concerns, opportunities to use technology should match the interests of girls. "The computer as a tool to express themselves seems to be a primary motivator in girls claiming technology for themselves. Creating hypermedia presentations, authoring their own web pages, and using digital cameras for self-portraits personally involves girls in technology" (Cone, 2001, p. 179).

Teacher attitudes and their own level of computer confidence can either serve as a role model for girls or support the notion that boys have ability that is more natural. For example, using boys to set up computers can unconsciously communicate that boys are more competent than girls are. A sound argument for single-gender classes when computer skills are the focus of learning is preventing boys from taking over computer-based tasks to "help" the girls. A focused effort is necessary to encourage girls to pursue computer use past the basic functions. The Leading Young Women to the Sciences and Technology Project in conjunction with the Girl Scouts of America received funding through Toyota USA Foundation to develop institutes,

materials, and methods to encourage young women to enter computer, science, and technology fields. The Girls Tech Model was developed after analyzing literature and research on gender studies (Agosto, n.d.). The model includes the following eight criteria that can be used to evaluate resources that relate to promoting gender equity in computer use (Agosto, n.d.):

1. Confidence-resources that offer strong encouragement to help counteract a lack of confidence in their computer abilities.
2. Collaboration-resources that avoid competition when studying and learning, such as quiz game formats.
3. Personal Identification-resources that involve role-playing and connect lessons and problems to their personal life.
4. Flexibility-resources that have multiple navigational paths and more than one correct answer.
5. Contextuality-resources that present information in a narrative or story format.
6. Social Connectivity-resources that enable contact with live individuals that present information in terms of human relationships.
7. Inclusion-resources that support the idea that women can be successful in all careers, including those thought of as typically male dominated professions.
8. Graphic and Multimedia Context-resources presented using multimedia applications rather that text-based print.

To develop positive attitudes toward computers, parents and childcare workers should provide opportunities for both boys and girls to engage in computer activities at an early age.

Schools can play a role by providing parenting education and an awareness of the importance of early experiences with computer activities for both boys and girls. Teaching attitudes and teaching styles are critical. Learners benefit from opportunities to build on personal experiences and test out ideas in a supportive framework. This calls for a decrease in competitiveness and an increased focus on collaboration in the classroom.

Single-Gender Instructional Settings

One challenge to changing girls' attitudes towards computers is to address the correlation between gender and computer use. "Many girls do not believe that they are good at math or computer science but those that are good at computers may not believe that they are good at being girls" (Bush, 1996, p.126). To facilitate a change in adolescent girls' attitudes towards computers, schools must evaluate the culture of the school and create opportunities to support all students, but especially girls, in becoming confident masters of technology. Concerned about the number of girls enrolling in technology electives, Washington Middle School in Olympia, Washington implemented a program to increase girls' interests in computers by "offering an all-girls class combing technology skills with subject matter that adolescent girls typically find interesting-such as nutrition, eating disorders, career exploration, and women's self defense" (Salomone, 2003, p. 226). Before offering the class twice as many boys as girls enrolled in technology electives in the eighth and ninth grade. After seven years, the program's success can be supported by the almost equal number of boys and girls selecting these technology courses.

Opportunities for girls to explore interests and abilities with computers in single-gender settings may help girls to overcome gender stereotypes during the critical adolescent years. Girls

in the single-gender setting can be encouraged to take a risk and attempt to try something new and perhaps uncomfortable in a supportive environment. The American Association of University Women Educational Foundation (1998) stated that more research was needed to determine the long-term impact of single-sex education. The report suggested that the following successful practices and qualities common to single-sex education could benefit coeducational settings as well: a focus on core academics, small class size, qualified teachers, sufficient funding, and parental involvement. The results of a longitudinal study (Harker & Nash, 1997) of single sex education in New Zealand researchers indicated similar concerns relating to the conclusions of the study comparing student achievement in single-sex educational settings and coeducational settings. "Fundamental differences may exist between coeducational and single-sex schools in terms of: the emphasis placed upon academic excellence; teacher attitudes; class sizes; school competitiveness; resources; school policies regarding discipline and control; and other school-related factors" (Woodward, Fergusson & Horwood, 1999, p. 142).

Summary

It is clear that knowledge and the ability to use computers is an essential to life in the 21st century. Both females and males are using computers more at home, school, and the workplace. However, men and men tend to use computers in different ways; women view the computer as a tool to use to accomplish a task, where men often enjoy experimenting and playing with a computer, which may lead to interest in programming. This suggests that women are not hesitant to use computers but as indicated by the decreasing number of women obtaining degrees in computer science, they are not interested in fields that require programming. This lack of

representation of women in the field of computer science may affect the voice women will have in future applications of computer use in all aspects of society.

The review of literature recognizes there are differences in computer attitudes in boys and girls. Gender differences, stereotyping, computer game design, the media, and societal expectations are significant factors that may contribute towards the development of how girls' view computers. Girls in middle school are at an age that is particularly vulnerable to succumbing to stereotypes unless specific interventions are provided to support girls. Single-gender settings are one suggested strategy to provide girls with opportunities to explore and expand on personal strengths. However, there is limited research in the literature concerning the effect of using single-gender instructional settings as a strategy to create a shift in the way girls view computers and careers with a technology focus.

CHAPTER 3. METHODOLOGY

Introduction

A significant gender gap in the number of advanced degrees in computer science indicates that there are fewer women in the fields of computer programming and design. In middle school, girls tend to become more sensitive to societal expectations of women and as a result begin to perceive careers in the areas of math, science, and computers as a male domain. There is a need for schools to evaluate programs, which encourage girls' confidence in their abilities to use computers to increase their interest in careers incorporating advanced computer science.

Purpose

The purpose of the study was to examine the effects of three instructional settings on computer attitudes of sixth grade girls in the areas of computer enjoyment, computer importance, motivation and persistence, and computer stereotypes. The girls participating in the study were assigned to three types of classes: traditional social studies classes using a textbook as the primary instructional tool; instruction delivered using computer-assisted instruction in a mixed gender setting; and girls who participated in a single-gender computer-assisted instructional setting.

Research Questions and Hypothesis

To determine if single-gender instructional settings and the use computer-assisted instruction will affect girls' attitudes towards computers the following questions were the focus of the study.

1. What are the differences in computer attitudes between sixth grade girls who participate in classes utilizing computer-assisted instruction and sixth grade girls in traditional class settings?

Hypothesis: Girls who have the opportunity to participate in computer-assisted instruction will have a more positive attitude towards computers than girls in traditional classrooms in which content is predominately presented through textbook and lecture.

2. What are the differences in computer attitudes between sixth grade girls who participate in computer-assisted instruction in single-gender classes and sixth grade girls who participate in mixed gender classes using computer-assisted instruction?

Hypothesis: Girls who have the opportunity to participate in computer-assisted instruction in a single-gender setting will have a more positive attitude toward computers than girls who participate in computer-assisted instruction in mixed gender classrooms.

Sources of Data

Two sources of data were collected in this study that combined quantitative and qualitative analysis. Girls completed a survey that included open and closed response questions. In addition to the completion of the survey, the girls also participated in a focus group to share their opinions about the use and importance of computers. As part of the focus group, girls also

completed drawings to illustrate their perceptions of characteristics of an individual with computer skills and a person who does not have computer skills.

Role of the Researcher

The researcher was employed as a curriculum specialist in the school where the research was conducted. She was familiar with the students, teacher, and was responsible for randomly scheduling the students into instructional settings at the beginning of the school year. The researcher was directly responsible for monitoring the completion of the surveys and conducting the focus group discussions.

Population and Sample

A sample of middle school girls represents the population of middle schools who are involved in infusing technology into the curriculum. The participants of the study are sixth grade girls in a middle school in Columbia, South Carolina. Thirty-four percent of the girls in the study were Caucasian and 66 % were African American. Nineteen percent of the girls in the study scored below the 25th percentile on the reading section of the Measures of Academic Progress (MAP), a nationally normed test. Thirty-six percent of the girls scored between the 25th and 50th percentile. Thirty-five percent of the girls score between the 50th and 75th percentile and 10% of the girls scored above the 75 percentile.

Thirty-four girls in the study were randomly assigned to traditional sixth grade social studies classes, which rely on textbooks as the primary instructional resource. Forty-two girls were randomly assigned to social studies classes utilizing computer-assisted instruction as the

primary vehicle for content delivery. In this setting, there was a one-to-one ratio of students to computers. The girls assigned to the social studies classes utilizing computer-assisted instruction were further divided into single-gender (22 girls) or mixed gender classes (20 girls). The girls' attitudes toward computers in these three different instructional environments were explored using mixed methodology.

Ethical Considerations

All procedures were followed as outlined in the research proposal approved by the IRB. Students with permission to participate in the study in each instructional setting had equal access and the opportunity to receive instruction that met the requirements designated by the South Carolina State Department of Education as defined by the Social Studies Curriculum Standards. Students invited to participate in the study were not required or coerced to be a part of the study and did not receive extra credit or a grade as compensation for participation in the study.

Data Collection Strategies

Creswell (2003) describes two general strategies that can be used in mixed methodology. A sequential procedure is used when one method is used to expand or support the results of another method. A researcher may begin with a quantitative data collection method and follow-up with a qualitative method to explain the results. A concurrent procedure is used when the researcher collects data using both qualitative and quantitative methods at the same time. The data are then combined to interpret, analyze, and communicate the results of the study.

A sequential approach was used to collect data for this study. The initial data collection was used for quantitative analysis. To determine the differences in how girls view computers 76 sixth grade girls at a middle school were surveyed. The survey created was a combination of the Computer Attitude Questionnaire and Part B of the Computer Attitude survey. These two surveys were developed and used previously in studies of computer attitudes with elementary, middle, and high school students. The first survey used as a resource was developed from The Young Children's Computer Inventory created in 1990 for use in a multinational study on computer use in young children (Knezek & Miyashita, 1992). This Likert-type questionnaire consists of 52 items and included seven scales measuring computer importance and enjoyment, study habits, empathy, motivation/persistence, and computer seclusion. The Young Children's Computer Inventory was revised and included in a supplement for use by middle school educators. This Computer Attitude Questionnaire includes 62 Likert-type items to measure attitudes and feelings towards computers in students in grades four through eighth. The Computer Attitude Questionnaire, cited as a resource in multiple research studies, was pilot tested with 240 students in grades 1-8 in a public school system in Texas in 1993. For the purpose of this study, exact questions from the Computer Attitude Questionnaire for Middle School in the areas of computer enjoyment, computer importance, and, motivation and persistence were used.

The second resource used to construct the survey for this study was one used to measure attitudes towards computers and computer experience. This survey was developed for use with high school students in Canada to determine the computer training needed for freshmen entering college (Temple & Lips, 1989). This survey rated the participants' experience, ability,

knowledge, and confidence on a variety of Information Technology applications. For the purpose of this study, only selected questions from Part B (Computer Attitudes) which measure computer attitudes were used.

Validity of the Survey Instrument

The survey created for this study (Appendix A) included 49 Likert-type items as well as open response questions designed to collect data on the amount of time spent on the computer at home, uses of the computer, Internet access, and time and type of computer/video games played. Exact questions from the surveys used in previous research studies in the areas of computer importance, computer enjoyment, motivation/persistence, and computer stereotypes were used for data analysis. Questioned used from the Computer Attitude Questionnaire were previously assigned to a categories of computer enjoyment, computer importance, and motivation and persistence for the purpose of data analysis by the original developers of the survey. The researcher used the assigned category from the previous data analysis for the questions used from this source. The questions from Part B, the Computer Attitude survey were assigned a category based on their content and the researcher's discretion (see Table 5).

Table 5: Data Analysis of Survey Questions

Research Questions	Questions on Survey	Statistical Test
Computer Enjoyment	1,2,4,5,9,10,19,24,30,32,34,39,40,42,47	Chi-Square
Computer Importance	3,6,7,8,11,18,20,21,29,38,43,45	Chi-Square
Motivation and Persistence	13,14,15,16,17,31,35,36,44,49	Chi-Square
Computer Stereotypes	12,22,23,25,26,27,28,33,35,41,46,48	Chi-Square

The first draft of the survey for this study was piloted by a group of 20 seventh grade girls. These girls provided feedback on wording of the questions and their ability to accurately respond to the questions. The comments were then used to modify the survey after the pilot test. The results of the survey were used to help create questions for the focus groups (Appendix B).

Data Collection

To determine the effectiveness of single-gender computer-assisted instruction data was collected from sixth grade girls in three settings: traditional social studies classes, mixed-gender social studies classes using computer-assisted instruction, and single-gender social studies classes using computer-assisted instruction. All girls enrolled in the sixth grade traditional social studies classes and the social studies classes utilizing computer-assisted instruction were given a permission form (Appendix C) in class by the researcher. The girls were asked to take the form home and return the form with a parent signature indicating permission for their daughter to participate in the study. The researcher collected the forms as they were returned and gave additional forms to girls who lost the original form.

The 76 girls returning parent permission forms to participate in the study were given a pass to report to a computer lab during their social studies class period. Students were greeted by the researcher and instructed to give their honest feedback to questions on the survey relating to their attitudes and opinions concerning computer use. Each girl logged onto the computer and accessed the online survey through the school website. After completing the survey, the girls returned to class. The girls were reminded that they would be attending a focus group the following week. The researcher obtained the electronic results from the survey and used the information to refine questions for the focus groups.

Focus groups representing the three instructional settings were conducted to support or elaborate on the attitudes towards computers in the areas of computer enjoyment, computer importance, motivation/persistence, and computer stereotypes. The questions created for the focus groups helped to support and extend data collected from the surveys in the four areas, as well as created a context for the study. The week following the computer survey, the girls were assigned a time during their social studies class period to attend a focus group to discuss computer attitudes. Over a period of four school days, eight 50-minute focus groups sessions were conducted. Groups were assigned class period with girls in the same type of instructional setting. Focus groups consisted of groups of 8-10 girls depending on the number of girls assigned to the class period. Sixty-eight girls participated in the focus group discussions. Eight girls did not attend due to absence on the day of the assigned focus group.

The focus groups began with a greeting and an invitation to share thoughts and opinions. Girls were given a sheet of paper divided in two sections, one labeled computer whiz, and the other labeled computer whizn't. Using a marker the girls were instructed to draw a person that

represents a person who is a computer whiz, someone who is good at using computers, and a computer whizn't, someone who is not good at using computers. While the girls were drawing, the researcher offered refreshments. Following the drawing activity, the researcher informed the students that the session would be tape recorded for helping the researcher to remember the comments made in the focus groups. The researcher used a question guide (Appendix B) to guide the discussion to enable a comparison of responses from girls in all focus groups. The sessions were informal and girls were eager to share their thoughts and enjoyed participating in the focus group.

Analysis of Surveys

Cross tabulation, charts were used to compare the three instructional settings with percent of girls who answered definitely, probably, maybe, and not at all in each of the four categories. Data analysis was performed using the Statistical Package for Social Sciences (SPSS) 13.0 for Windows to complete a chi-square, a nonparametric statistical test to determine if there is a significant relationship between the independent variable, the instructional setting, and the dependent variable, the attitudes towards computers in sixth grade girls in the areas of computer enjoyment, computer importance, motivation/persistence, and computer stereotypes. A confidence level of 95% was used to determine the alpha value of .05. The degrees of freedom used for analysis was calculated to be 6. The statistical significance of the relationship between the independent and dependent variables was identified as greater than 12.593, the χ^2 table value using an α value of .05, *d.f.* of 6. The relationship between the variables was identified as

significant if the calculated chi-square values were greater than the table value and the *p*-value was greater than the alpha value of .05.

Focus Group Analysis

During the focus group, the researcher tape-recorded the girls' responses to the questions. The researcher transcribed the conversations of each group, separating comments into three groups to represent the three instructional settings. After reading the student comments, several times comments were analyzed to look for repeated statements and patterns to identify common themes. A key was created to create a symbol to designate each theme. After the themes were identified, the researcher reviewed each comment and marked each comment with a symbol to designate the theme or themes the response represented. Significant themes were identified and comments were grouped to support the theme for each instructional setting.

In addition to questions in the Focus group, the activity described by Castell and Bryson (1998) in the literature review was replicated. Girls were asked to draw a "computer whiz" and a "computer whizn't". In the high school setting when girls and boys were instructed to draw these models, the results conflicted with their responses to multiple-choice surveys. Castell and Bryson explained that these conflicting results could be the result of students giving what is perceived as "acceptable" responses to the survey questions rather than their actual beliefs and gendered perceptions. Thee researcher analyzed the drawings with a method similar to the one used to identify themes from the girls' responses to focus group questions. The drawings were examined several times by the researcher looking for common characteristics. Drawings were grouped by the instructional setting and characteristics were listed in a chart. The traits from each picture

were recorded in a chart and analyzed for patterns or themes comparing the results to each instructional setting. Common themes were identified and illustrated with scanned examples of the pictures. The results of this activity were used to compare to the opinions expressed in the survey and focus groups discussion.

Validity of Data Collection and Analysis

To collect data for quantitative analysis, an online survey was made available to the girls through the district server using Zara Interactive, a provider of online surveys. Itemized results for each question on the survey were available 24 hours after all surveys were completed. Results were also available in an EXCEL spreadsheet, which was exported into Statistical Package or Social Sciences 13.0 for Windows for analysis. The researcher utilized the services of a calculus instructor to review the analysis of the data. To collect data for the qualitative analysis, the researcher used a list of questions to ensure consistency for each focus group. Focus groups were recorded with a digital tape recorder. Tapes were downloaded and transcribed using a computer to guarantee accuracy of quotations.

Summary

The combination of both quantitative and qualitative methods provides data, which were used to determine themes and trends as the voice of girls communicated their thoughts concerning the use of computers. The combination of these results offers information, which can help schools to identify the impact of single-gender classes and computer-assisted instruction on computer attitudes of girls in middle school. Using only quantitative or qualitative methods

would limit the scope of the results. This study adds to the available literature and can be used by middle schools to design and evaluate programs to support girls as they explore computers and their possible impact on career opportunities.

CHAPTER 4. DATA COLLECTION AND ANALYSIS

Introduction

To examine the effect of single-gender classes and computer-assisted instruction and the computer attitudes of middle school girls the study examined the following questions:

1. What are the differences in computer attitudes between sixth grade girls who participate in classes utilizing computer-assisted instruction and sixth grade girls in traditional class settings?
2. What are the differences in computer attitudes between sixth grade girls who participate in computer-assisted instruction in single-gender classes and sixth grade girls who participate in mixed gender classes using computer-assisted instruction?

Purpose of the Research

The purpose of the study was to examine the effects of three instructional settings on computer attitudes of sixth grade girls in the areas of computer enjoyment, computer importance, motivation and persistence, and computer stereotypes. The girls participating in the study were assigned to three types of classes: traditional social studies classes using a textbook as the primary instructional tool; instruction delivered using computer-assisted instruction in a mixed gender setting; and girls who participated in a single-gender computer-assisted instructional setting.

Data Collection Methods

Quantitative data were collected from 76 participants using an online survey. Data were analyzed using the chi-square test to determine significant differences in the attitudes of the three

groups of girls. Open-ended comments from the participants in focus group discussions were organized into significant themes. The girls also completed a drawing to identify their perceptions of characteristics of individuals who have computer skills and those who are lacking computer skills. The combination of these three activities was used to determine if there was a relationship between the nature of the instructional setting and the computer attitudes of the sixth grade girls participating in the study.

Presentation of the Data Collected

Seventy-six girls completed questions in the open response section of the survey. The open response items on the survey were designed to collect data on the access to the computer and Internet at home, as well as identify the time and type of use. A majority of girls, as shown in Table 6, had both computers and access to the Internet at home. This reflects the culture of this middle school, which is committed to the integration of technology. The school provides checkout laptops for students to use overnight if they do not have access to a home computer. Students frequently used computers to complete assignments or access resources on the Internet to support instruction in class. The majority of teachers consistently used Blackboard to provide online resources and instructional support to students. The results from the computer-assisted instructional setting (CAI), single-gender computer-assisted instruction (SG CAI), and classes using traditional instruction (Traditional) are compared in charts and tables in the following sections.

Table 6: Question 51 and 52: Number of Girls with Computers at Home and With Internet Access

Setting	Computers at Home	Internet at Home
CAI	85.0%	75.0%
SG CAI	100%	86.4%
Traditional	94.3%	85.7%

The girls in the computer-assisted social studies class use their computers at home more often than the girls in the other two groups (see Table 7). The largest difference in the groups is in the number of girls in computer-assisted instruction using the computer at home five or more hours, 26.3% compared to only .05% of girls in the single-gender computer-assisted class and .03% of girls in the traditional social studies class. Percentages can be found in Table 7.

Table 7: Question 53: Number of Hours Girls Use Computers at Home

Setting	0-1 hours	2-3 hours	3-4 hours	5 or more
CAI	21.1%	57.9%	15.8%	26.3%
SG CAI	31.8	50.0%	13.6%	0.05%
Traditional	29.4%	41.2%	26.2%	0.03%

The girls in computer-assisted environments in both single-gender and mixed gender spend more time playing computer games than girls in traditional social studies classes. The largest difference in the three groups was in the number of girls in computer-assisted instruction

spending 4 or more hours playing computer games at home, 15.8% compared to 4.5% of girls in the single-gender computer-assisted class and .07% of girls in the traditional class setting (see Table 8).

Table 8: Question 54: Number of Hours Girls Play Computer Games at Home

Setting	1 hour	2 hours	3 hours	4 or more hours
CAI	52.6%	26.3%	5.2%	15.8%
SG CAI	54.5%	36.4%	4.5%	4.5%
Traditional	57.6%	33.3%	0.03%	0.07%

The total number of hours the girls reported playing video games at home for the three groups was approximately equal. The largest difference was in the number of girls in the single-gender computer-assisted instructional group playing video games at home four or more hours, 13.6% as compared to 4.5% of girls in the computer-assisted classes and 0% of girls in the traditional studies classes (see Table 9).

Table 9: Question 55: Number of Hours Girls Play Video Games at Home

Setting	1 hour	2 hours	3 hours	4 or more hours
CAI	63.2%	26.3%	4.5%	4.5%
SG CAI	59.1%	18.2%	4.5%	13.6%
Traditional	78.8%	21.2%	0%	0%

Using cross tabulation charts to complete the chi-square analysis five questions were identified as demonstrating a significant relationship between the classroom setting and computer attitudes of girls. Four of the questions were in the category of computer enjoyment and one in the category of computer importance. Question 18 in the category of computer importance asked the girls to respond to the statement "I can learn more from books than from a computer." Responses indicate the girls' perception of the importance of using computers to learn. It was determined there is a significant relationship between the instructional setting and the response to this question with a χ^2 (6, N=76) = 14.038, p=0.029. Sixty-five percent of girls in the computer-assisted instructional environment responded "not at all" to this statement, which reveals their positive attitude towards the importance of computers. Responding to the same statement, 42.8% of girls in the single-gender computer-assisted environment disagreed with the statement that more could be learned from books than computers. For girls in the traditional class, which do not have daily one-on-one access to a computer the number of girls, responding "not at all" was 34.3% (see Table 10 and Table 11).

Table 10: Question 18: I Can Learn More From Books Than From a Computer

	Definitely	Maybe	Probably	Not At All	Total
CAI	0	4	3	13	20
SG CAI	0	12	0	9	21
Traditional	4	14	5	12	35
Total	4	30	8	34	76

Table 11: Chi-Squared -Question 18: I Can Learn More From Books Than From a Computer

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.038(a)	6	0.029
Likelihood Ratio	17.747	6	0.007
N of Valid Cases	76		

Questions 24, 34, 39, and 42 surveyed the girls' attitudes in the area of computer enjoyment. Question 24 asked girls to respond to the statement "people who like computers are not very sociable." Reponses to this question indicate the girls' perception about people who enjoy using computers. It was determined there is a significant relationship between the instructional setting and the response to this question with a χ^2 (6, N=76) = 18.051, p=0.006. More girls in the computer-assisted instructional environments disagreed with this statement; 75% of the girls in the mixed gender computer-assisted classes, as compared to 33.3% of the girls in the single-gender computer-assisted class. In contrast, only 28.6% of the girls in the traditional classroom disagreed with the statement (see Table 12 and Table 13).

Table 12: Question 24: People Who Like Computers Are Often Not Very Sociable

	Definitely	Maybe	Probably	Not At All	Total
CAI	2	1	2	15	20
SG CAI	2	11	1	7	21
Traditional	1	6	7	21	35
Total	5	18	10	43	76

Table 13: Chi-Squared- Question 24: People Who Like Computers Are Often Not Very Sociable

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.051(a)	6	0.006
Likelihood Ratio	18.205	6	0.006
N of Valid Cases	76		

Question 34 asked the girls to respond to the statement "computers are fun." The responses to this question relate to the girls' willingness to use and explore computers. It was determined there is a significant relationship between the instructional setting and the response to this question with a χ^2 (6, N=76) = 16.130, p=0.013. Eighty-five percent of the girls in the class utilizing computer-assisted instruction in a mixed gender setting definitely agreed with this statement. Unlike responses to the previous questions, more girls in the traditional instructional setting demonstrated positive attitudes towards computers than girls in the single gender computer-assisted environment. 80% of the girls in the traditional social studies definitely agreed

with the statement "computers are fun" compared to only 42.9% of the girls in the single-gender computer-assisted social studies classes. For this question, the girls in the mixed gender computer-assisted classes were more like girls in the traditional social studies classes, also consisting for both boys and girls (see Table 14 and Table 15).

Table 14: Question 34: Computers Are Fun

	Definitely	Maybe	Probably	Not At All	Total
CAI	17	0	3	0	20
SG CAI	9	7	4	1	21
Traditional	28	3	4	0	35
Total	54	10	11	1	76

Table 15: Chi-Squared- Question 34: Computers Are Fun

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.130(a)	6	0.013
Likelihood Ratio	17.172	6	0.009
N of Valid Cases	76		

Question 39 asked the girls to respond to the statement "I would rather spend an evening doing something new with a computer than go out with friends." The responses to this question indicate the girls' willingness to explore new uses of the computer. It was determined there is a

significant relationship between the instructional setting and the response to question 39 with a χ^2 (6, N=76) = 14.851, p=0.021. Only 25% of the girls in the mixed gender utilizing computer-assisted instruction disagreed with this statement, while 80.9% of the girls in the single-gender class utilizing computer-assisted instruction disagreed. The number of girls in the traditional classroom setting disagreeing with the statement was 45.7% (see Table 16 and Table17).

Table 16: Question 39: I Would Rather Spend an Evening Doing Something New With a Computer Than Go Out With Friends

	Definitely	Maybe	Probably	Not At All	Total
CAI	2	10	3	5	20
SG CAI	0	4	0	17	21
Traditional	4	11	4	16	35
Total	6	25	7	38	76

Table 17: Chi-Squared- Question 39: I Would Rather Spend an Evening Doing Something New With a Computer Than Go Out With Friends

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.851(a)	6	0.021
Likelihood Ratio	18.141	6	0.006
N of Valid Cases	76		

Question 42 asked the girls to respond to the statement "computers are boring." Responses are an indication of how much the girls enjoy using computers. It was determined there is a significant relationship between the instructional setting and the response to this question with a χ^2 (6, N=76) = 16.764, p=0.01. Girls in the mixed gender classes, both computer-assisted instruction and traditional instruction demonstrated a more positive response to computers. Ninety-five percent of the girls in the mixed gender class utilizing computer-assisted instruction disagreed with the statement "computers are boring" and 85.7% of girls in the traditional social studies class disagreed with the statement. The number of girls disagreeing with the statement in the single-gender computer-assisted instructional environment was significantly lower at 57.1% (see Table 18 and Table 19).

Table 18: Question 42: Computers Are Boring

	Definitely	Maybe	Probably	Not At All	Total
CAI	0	0	0	19	20
SG CAI	2	3	3	12	21
Traditional	0	0	0	30	35
Total	2	10	3	61	76

Table19: Chi-Squared- Question 42: Computers Are Boring

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.764(a)	6	0.010
Likelihood Ratio	16.903	6	0.010
N of Valid Cases	76		

Although there was not a significant relationship between the instructional setting and the girls' attitudes towards computers for question six and ten, the result of the chi-square test indicates at strong relationship. Question number 6, in the area of computer importance asked the girls to respond to the statement "I would work harder if I could use computers more often." It was determined there was a close relationship between the instructional setting and the response to this question with a χ^2 (6, N=76) = 11.877, p=0.065. Sixty-five percent of the girls in mixed gender computer-assisted instructional settings definitely agreed with this statement, revealing their high opinion of the importance of computers. Girls who definitely agreed with this statement in the single-gender computer-assisted instructional setting were 28.6%. Girls in the traditional social studies classes definitely agreeing with this statement was 42.9% (see Table 20 and Table 21).

Table 20: Question 6: I Would Work Harder if I Could Use Computer More Often

	Definitely	Maybe	Probably	Not At All	Total
CAI	13	5	0	0	20
SG CAI	6	7	2	2	21
Traditional	15	15	0	0	35
Total	34	13	27	2	76

Table 21: Chi-Squared- Question 6: I Would Work Harder if I Could Use Computer More Often

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.877(a)	6	0.065
Likelihood Ratio	11.619	6	0.071
N of Valid Cases	76		

Question 10 asked the girls to respond to the statement "I believe that the more often teachers use computers, the more I will enjoy school." Responses to this question indicate the girls' perception of the importance of computers and learning. It was determined there is a close relationship between the instructional setting and the response to this question with a χ^2 (6, N=76) = 12.397, p=0.054. Seventy-five percent of the girls in the computer-assisted environment definitely agreed with the statement, revealing their positive attitude towards the use of computers in school. Girls in the single-gender computer-assisted class that definitely agreed

with the statement were 42.9%. The number of girls in the traditional social studies class that definitely agreed with the statement was 34.3% (see Table 22 and Table 23).

Table 22: Question 10: I Believe That the More Often Teachers Use Computers, The More Often I Will Enjoy School

	Definitely	Maybe	Probably	Not At All	Total
CAI	15	4	0	0	20
SG CAI	9	3	3	3	21
Traditional	12	11	5	5	35
Total	36	14	18	8	76

Table 23: Chi-Squared- Question 6: I Would Work Harder if I Could Use Computer More Often I Will Enjoy School

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.397(a)	6	0.054
Likelihood Ratio	14.761	6	0.022
N of Valid Cases	76		

Focus Group Analysis

Questions for the focus group were designed to facilitate a discussion on computer enjoyment, computer importance, motivation and persistence, and computer stereotypes.

Communication, convenience, interaction with computers, and the impact on future careers are four common themes, which occurred in the focus group conversations.

Communication

In response to questions pertaining to what they enjoyed most about using computers the majority of the girls discussed the importance of communication and the use of e-mail, instant messaging, and chat rooms in their lives. When asked how their life would be different if one day all computers disappeared the girls instantly responded with comments about how they would not be able to use the computer to talk to their friends. Many girls shared that "now that I use the computer to talk to my friends using instant messaging and e-mail I do not use the phone as often." Other girls stated, "If you have a friend or family member who moves out of town you can keep in touch with them by using the computer." Girls felt this was a major difference in the way boys and girls use computers. "Girls like to use computers to talk; boys use computers to play games." Without the use of computers, the girls recognized how different communicating with friends would be, having to rely only on the use of the telephone, or writing letters to communicate with friends. "We wouldn't be able to instant message-it would change the way we talk to people." Many girls also discussed the use of chat rooms. Although there were concerns about safety, they stated, "chat rooms are fun and girls enjoy having conversations with other people using the computer."

Convenience

During the conversation, the girls clearly understood how their life is made easier and more convenient by having access to computers. The girls discussed how much easier they find using the Internet for research, rather than using books. Many girls stated that "it would be much harder if I had to find the information for a project in a book-it is much easier finding information using the computer." The girls find typing rather than having to handwrite assignment helps them in school. "I like doing projects using computers; you don't have to write-you can type. You don't have to read books to do the research." When asked to identify what they would change about how a computer works or is used most of the girls discussed what would make computer use more convenient. They wanted to have "faster downloading times, no pop-ups or viruses." The girls also expressed the desire for computers to be smaller in size. One girl stated, "make the size of the computer smaller so you can carry it like a purse." The use of touch screens and voice recognition was also discussed as possible improvements in computers. "I want to be able to say something and the computer type it." "I want the computer to talk back to me-it would be company for me." When asked how their life would be different if we all lost access to computers one day, the girls' responses illustrates how dependent on computers they feel. They recognize the importance of computers on day-to-day living. "I would freak out." "Nothing would be able to work." "People would be stuck because everything needs computers to work."

Interaction with Computers

The interaction with a computer and access to information were identified as what kept girls interested in using the computer. The girls identified the challenge and interaction with the computer as a major reason as to what motivated them to continue to work on a computer program or game. The girls discussed the types of games they enjoy. "I like the SIMS games because you can control what it does. You can build and create. This is a hard game but I just keep on trying." The girls felt that there were differences how boys and girls use computers for entertainment. "Girls like appropriate games-real life games like SIMS." "Boys like brainless activities-they play games that don't make you think-they are just violent." Many of the girls were not interested in the same games boys enjoy.

The girls shared that "clicking" or the hands-on activity of using a computer and interacting with information helps them to learn. "Looking at the computer screen helps you pay attention and know what is going on." In the discussion of hands-on use of computers as a motivator, reading was discussed. Most students shared that they enjoy reading information on a computer rather than in a book. They like the ability to use the mouse to highlight text and look at related sites for additional information. "You are encouraged to learn more on a computer. It is more like a hands-on activity because you don't have to listen to someone else read-you aren't just wandering around." Another girl supported this thought by sharing; "When I read a couple of paragraphs in a book I wonder what I just read? I understand more when I read on the computer." In the area of motivation and persistence challenge, interaction with the computer, and access to information were recurring themes. The access to a wide range of materials was also identified as a factor in motivating students. "When people write books it takes a couple of

years for it to be published but the information on the Internet is newer." "There is a lot more information you can find using on the computer than using books." One girl sums up what she likes about computers; "I like having more options-there are no limits to what you can do.

Impact on Future Careers

The girls recognized how the use of computers will affect future careers. "Computers will help people in researching to find cures for diseases, scientists in other countries will work together to find new things." Using computers to help keep them safe was discussed in terms of careers to solve or stops crimes. "Police can use computers to catch criminals." "Robots will be in homes in the future making sure you do the right things." Girls also saw the field of education changing; "You will be able to learn anything in the world you want to instantly." "Computers will change the way we have school. You will be able to go to school at your house."

When asked about their own personal career goals and how computers would be used very few girls mentioned a use of computers outside of the use for organization or convenience. Most uses of computers mentioned involved making appointments, keeping track of information about clients, billing clients, e-mailing, or using the computer for research and advertising. This may be a reflection of their understanding of computer use in careers as they have seen or how computers are used based on their personal experiences. However, the girls felt computers would be instrumental in creating new inventions. One area was the expansion of shopping from home. "You will be able to order food on computers and buy a house on a computer." They predicted that computers would become more powerful and "ask Jeeves will be like a real person, a

hologram." Other girls felt that one-day computers would be so advanced they could "drive cars" and "do your hair."

Although the girls recognized the importance of computers in future careers, no girl expressed a desire to pursue a career using advanced computer applications. The girls felt that being a computer programmer "sounds too hard." They felt that "you would wind up getting sick of computers and not liking them." More than one girl felt that being a computer programmer was a stressful job. "Computer programmers get too stressed, their heads hurt, and they can get a mental breakdown." One girl in the computer-assisted mixed gender class made a statement that reflects the conflict girls feel about careers in the field of computer science. When asked whether any girls would be interested in becoming a computer programmer she stated, "I would and I wouldn't. This is a silly thought but when you get married and have kids will they think a computer programmer is a cool job? It's not like a mom being a lawyer on a case."

When asked to use a word to describe a computer the responses indicated thoughts about which traits the girls believed were essential to being good at using computers. They used terms such as smart, amazing, awesome, interesting, intelligent, and useful. Some of the negative words used to describe a computer are frustrating, confusing, difficult, slow, and uncooperative. When asked to describe a computer as a person there was an agreement across all groups that the person would be very smart, wear glasses, stay in the library during lunch, lack social skills, dress like a nerd, act like a geek, and but could do anything.

Draw a Person Analysis

As part of the focus group, the girls were instructed to draw a person who represented a computer whiz, a person with computers skills and a computer whizn't, a person who did not have computer skills. The drawings of a person that represents a computer whiz had common themes of intelligence, life success, happiness, and computer competency. The validity of these particular themes were based on the1983 study, *Draw-a-Scientist Test,* (DAST) that Chambers developed in order to determine the stereotypical perceptions of elementary students. Chambers collected data from 4,807 students, on the premise that these young students lacked the vocabulary and skills necessary to describe a scientist; however, they could draw their perceptions to characterize how a scientist would look. He discovered their images of scientists were mostly stereotypic until they reach fifth grade.

Based on this study, Chambers (1983) identified seven characteristics that were common in the students' drawings. For instance, these students typified scientists as having lab coats, eyeglasses, facial hair, scientific instruments, symbols of knowledge (books, filing cabinets), instruments of technology, and captions, such as "eureka", "private," "top secret" or "keep out" in their drawings. Chambers noted that of the 4,807 students assessed, only 28 depicted a scientist as being female.

Intelligence was represented by the inclusion of glasses on the majority of computer whiz figures (Appendix D). The girls also often included report cards labeled with an "A," or books, or sayings on their clothing representing intelligence. Life success was often depicted with graduation hats, or showing the computer whiz with quotes about competence (Appendix E). More drawings of the computer whiz figures had smiles on their faces when compared to the

computer whizn't figures. Computer competency was illustrated by figures that had symbols on T-Shirts, quotes, or action that demonstrated computer skills unlike the computer whiz figures.

There were a higher percentage of girls in the single-gender computer-assisted setting that drew males as a computer whiz, 52.6%, as compared to 30% of male figures drawn by girls in mixed gender computer-assisted classes, and 44.8% male figures drawn by girls in traditional classes (see Table 24).

Table 24: Results of Computer Whiz Draw a Person Activity

	SG CAI N=19	CAI N=20	Traditional N=29
Female	47.4%	70.0%	51.7%
Male	52.6%	30.0%	44.8%
No Gender	0%	0%	3.5%
Has Glasses	73.7%	55.0%	62.1%
No Glasses	26.3%	45.0%	37.9%
Positive Comments	21.1%	50%	48.3%
Negative Comments	0%	0%	0%
No Comment	78.9%	50.0%	51.7%

This pattern is repeated in the drawings of the computer whizn't. Seventy-nine percent of the girls in the single-gender class drew females as a computer whizn't as compared to 55%

female figures drawn by girls in the mixed gender computer- assisted environment and 48.3% female figures drawn by girls in the traditional class environment (see Table 25).

Table 25: Results of Computer Whizn't Draw a Person Activity

	SG CAI N=19	CAI N=20	Traditional N=29
Female	78.9%	55.0%	48.3%
Male	21.1%	45.0%	48.3%
No Gender	0%	0%	3.4%
Has Glasses	5.3%	10%	6.9%
No Glasses	94.7%	90.0%	93.1%
Positive Comments	0%	0%	0%
Negative Comments	26.3%	55.0%	58.6%
No Comment	73.7%	45.0%	41.4%

The drawings of a computer whizn't represent common themes of non-academic pursuits such as sports or shopping, no computer knowledge, and a lack of intelligence. Computer whizn't figures were dressed and labeled as sports figures, or interested in activities (see Appendix F, Appendix G, Appendix H). When pictures of computers were included in the drawings of the computer whizn't figures they included representations of a lack of computer

skills and knowledge (see Appendix I, Appendix J). The figures displayed a lack of computer skills or intelligence with their actions or labels draw around the figure.

One of the key characteristics of a person who has computer skills is intelligence. As expressed in the focus group discussions and illustrated in the drawings of people who have computer skills, the majority of the girls expressed the opinion that having computer skills require a person to be intelligent or that if you have computer skills you are smart (see Figure 1). Both characters are female but the girl with computer skills is an "A student" while the one lacking in computer skills is a "C student."

Figure 1. The computer whiz is more intelligent than the computer whizn't.

In the focus group, discussions the girls expressed the feelings that if you had computer skills you would do better in life, have more opportunities, and make more money (see Figure 2). The computer whiz, is named Happy Haley, dressed in a t-shirt with a smiley face, is happy with her computer skills. The computer whizn't, Sad Sally, is dressed in a t-shirt labeled "my life is hopeless," is unhappy with thoughts of her lack of computer skills.

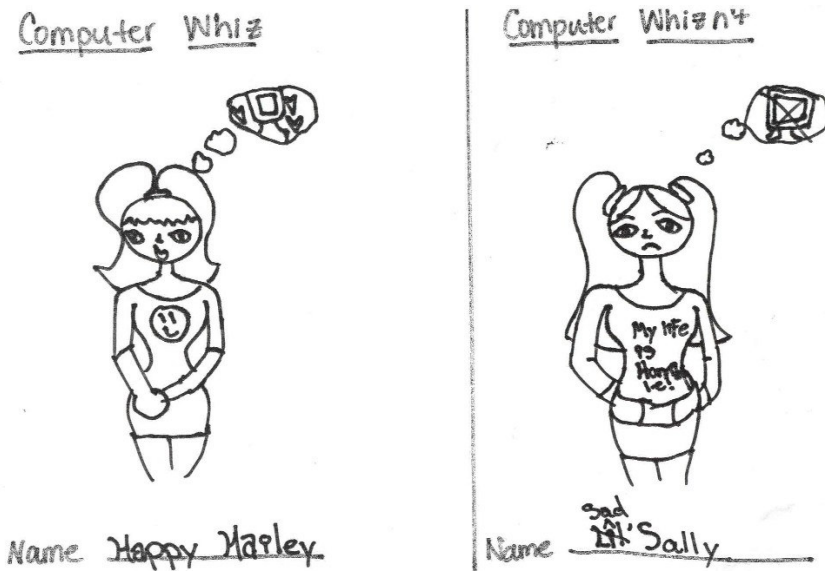

Figure 2. The computer whiz is happy because she has computer skills as opposed to the computer whizn't that is not happy because she does not have computer skills.

Figure 3 illustrated the stereotypical thoughts about the characteristics of a person who has computer skills. As discussed in the results of the focus group discussions, no girls expressed a desire to be a computer programmer. One of the reasons given was the perception that a computer expert was a "geek" and to a middle school student "not cool." Additional illustrations of the girls' representations of the characteristics of a computer whiz and a computer whizn't

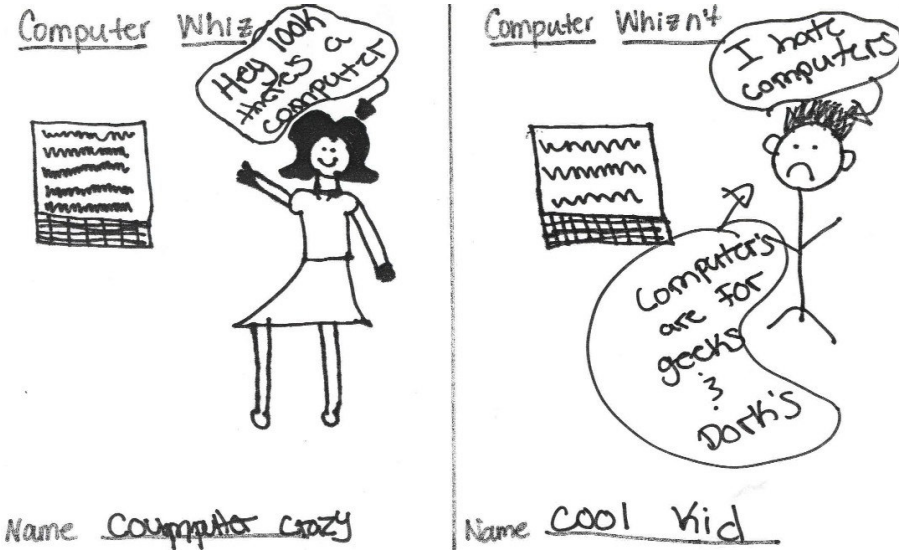

Figure 3. Computers are for geeks not cool kids.

Summary of Analysis of the Data Collected

The results of the quantitative data collected suggest there is no significant relationship between the nature of the instructional setting and the computer attitudes of sixth grade girls participating in the study in the areas of motivation and persistence or in the area of computer stereotypes. However, the results indicated that computer-assisted instructional settings affected the computer attitudes of the sixth grade girls participating in the study in the areas of computer enjoyment and computer importance. Using a chi-square test, in four of the fifteen questions on the survey that measured computer enjoyment the data suggested there was a significant relationship between computer attitudes and the computer-assisted instructional setting. This was also true of one of the twelve questions that measured computer importance.

The qualitative data collected from focus group discussions indicated girls felt computers were most useful for them in the areas of communication, making life more convenient,

accessing information, and preparation for the use in their future careers. The ideas expressed by the girls and the drawings completed that represented a person with and without computer skills indicated that girls in all instructional settings have a preconceived idea of what is required to be successful in a career with a technology focus. Girls in each of the three instructional settings expressed a definite disinterest in pursuing a career in the field of computer science. Although recognizing the positive traits of a person with computer skills they were uninterested in using the skills to pursue advanced technology degrees.

CHAPTER 5. RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The study examined the effects of instructional settings and their impact on computer attitudes of sixth grade girls in the areas of computer enjoyment, computer importance, motivation and persistence, and computer stereotypes. The girls participating in the study were assigned to three types of classes: traditional social studies classes using a textbook as the primary instructional tool; instruction delivered using computer-assisted instruction in a mixed gender setting; and girls who participated in a single-gender computer-assisted instructional setting. Computer attitudes were measured using mixed methodology. Quantitative data were collected from 76 participants using an online survey. Data was analyzed using a chi-square test to determine significant differences in the attitudes of the three groups of girls.

Qualitative data were collected from the participants through focus group discussions. Conversations were recorded and analyzed to determine common themes. In addition to verbal comments from the participants in the study, the girls were also asked to complete a drawing to identify their perceptions of characteristics of individuals who have computer skills and those who are lacking computer skills. The combination of these three activities was used to determine if the instructional setting impacted the computer attitudes of the sixth grade girls participating in the study.

Conclusions from the Data

Two hypotheses were tested in the study. The first hypothesis stated that girls who have the opportunity to participate in computer-assisted instruction would have a more positive

attitude towards computers than girls have in the traditional classrooms in which content is primarily presented through textbooks and lecture. The results of study demonstrated that girls in the computer-assisted instructional environment have a more positive attitude towards computers. The data analysis indicated a significant difference in five of the questions in the quantitative survey. Four of the questions that suggested a significant difference measured computer enjoyment and the other question measured computer importance. The girls participating in the mixed gender computer-assisted instructional setting had a substantially higher percentage of girls expressing a more positive attitude towards computers when answering questions in the area of computer enjoyment and computer importance than girls in the single-gender computer- assisted instructional environment or girls in the traditional class.

The second hypothesis stated that girls who have the opportunity to participate in computer-assisted instruction in a single-gender setting would have a more positive attitude toward computers than girls who participated in computer-assisted instruction in mixed gender classes. The data did not demonstrate that this hypothesis was true. A smaller percentage of girls participating in the single-gender computer-assisted instruction expressed positive attitudes towards computers when answering questions in the area of computer enjoyment and computer importance compared to girls in the mixed gender computer-assisted environment in the responses to the questions that a significant difference was determined.

Communication, convenience, interaction with computers, and the impact on future careers were four common themes identified from the comments of the focus group discussions. There were no significant differences among the comments of the girls in the three instructional settings. All groups of girls expressed similar viewpoints. However, the results of the activity

that asked participants to draw figures for a person with computer skills and a person who does not have computer skills revealed a difference in attitudes between girls in the three groups. Girls in the single-gender computer-assisted instructional environment demonstrated more stereotypical thoughts concerning people who have computer skills and those that do not. When drawing a person who has computer skills a greater percentage of girls in the single-gender environment drew the figure as a male with glasses. When drawing a person who does not have computer skills, more girls in this group drew a female (see Table 24 and Table 25).

Limitations of the Study

The results of the study were limited to a group of sixth grade girls in one middle school. The middle school used in the study is located in a school district recognized as one of the top three districts in the United States for their use of technology. The school's goal of increasing student access to technology is reflected in their purchase of 30 wireless laptops for classroom use, 20 laptops for students to checkout overnight, four computer labs utilized by teachers for class instruction, at least one computer in each classroom, three social studies classes utilizing computer-assisted instruction with 25 computers in each classroom, and interactive whiteboards in all classrooms. More than 85% of the girls in the study have computers at home and more than 75% have Internet access at home (see Table 6). The familiarity and access to computers by all girls in the study may have affected the amount of significant differences in the computer attitudes demonstrated by the girls in the different instructional settings. If the majority of the girls in the study did not have home computers and frequent access to computers at school, the results of the study may have been different.

There is no conclusive evidence showing that just separating students by gender will result in significant gains in achievement. Professional development is an essential element of designing instruction to meet the learning differences of boys and girls. The school used in the study was in the first year of implementing both single-gender content area classes as well as the computer-assisted instructional environment. Providing on-going staff development is essential to differentiating instruction for girls and boys in middle school classrooms in both single and mixed gender settings. Results of the study may have been different if the teacher in the study had more experience in designing instruction to meet the needs of girls, as well as incorporating strategies to specifically increase the interest of girls in computers.

Significance of the Findings

The results of the study indicated that girls who have participated in computer-assisted instruction with access to an individual computer in class have a more positive attitude towards computers in the area of computer enjoyment and computer importance than girls in a traditional classroom environment. However, responses to survey questions of the girls assigned to the single-gender computer-assisted class responded with less positive responses than girls in the mixed gender computer-assisted instructional environment. In response to the two questions that revealed significant differences in computer attitudes, the girls in the mixed gender settings, in both the traditional classroom environment and mixed gender computer-assisted class demonstrated a more positive attitude towards computers than the girls in the single-gender computer-assisted instructional setting. When answering the question “Are computers fun?” and “Are computers boring” the response of the girls in the mixed gender settings demonstrated a

more positive attitude with 80% of participants in these groups disagreeing with these statements (see Table 14 and Table 18). In spite of their access to a computer in a single-gender computer assisted instructional setting, the girls did not show an increased interest in the computer. However, when participating in the focus group discussions the differences in computer attitudes were not apparent. Further research is needed to determine why girls in the single-gender computer-assisted instructional setting did not demonstrate a more positive computer attitude in the area of computer enjoyment as compared to girls in mixed gender computer-assisted classroom environments. If these girls do not enjoy the use of computers, they may not seek future opportunities to expand their knowledge and skills of technology applications.

The themes of communication, convenience, interaction with computers, and impact on future careers identified in the focus group discussions support the research in the literature concerning how girls perceive computers. Girls view computers as a tool to use to support their personal interests, completing a required task, or to make their life easier. Their overwhelming interest in using computers for communicating with friends through e-mail and instant messaging reflects girls' natural interest in maintaining relationships with their peers. The computer games and activities most girls enjoy involve character development and role-playing. This indicates girls' interest in collaboration with others to solve problems rather than a competitive mind set. The girls were interested in a wide range of careers but did not have a clear understanding of how computers would be used in these jobs beyond the use data entry and lower level computer skills. All girls in the study communicated a definite disinterest in pursing a career in computer science.

Carnegie Mellon University conducted interview of students in the field of computer science and those that were not in computer science to determine how people in the field of computer science are perceived. Results of the survey indicated that people in the computer science field are perceived as "super smart, experience work overload, sit in front of the computer all day, talk nothing but computer science" (Margolis & Fisher, n.d.). The views expressed by these students were similar to those expressed by the girls in this study.

This may indicate the need for a mentor program, specifically to expose girls to careers in the area of advanced computer science, but also to expand their knowledge of how computers are used in other fields. Several studies have shown a positive relationship between mentoring of females and retention in math, science, and technology fields (Cohoon, 2001; Robst, Russo & Keil, 1996). As a proactive step to encourage adolescent girls to enter fields with a technology focus, developing relationships with women in the field of computer science providing alternatives to the stereotypical model of a computer scientist may be beneficial. Participating in high school or college visit to shadow women in computer science classrooms would also provide girls the opportunity to expand their understanding of the power and use of computers.

To increase and support girls' interest and participation in advanced computer classes, schools should explore innovative alternatives to traditional computer classes. One such successful program described in the literature review was to develop courses that integrate girls' natural area of interests with technology electives to increase participation by girls in computer courses (Salomone, 2003, p. 226). "While boys seem to be interested in the computer for its own sake, just to see what it can do, girls are more interested in the useful things the computer can do for them" (Sanders & Stone, 1986, p. 25). To expand their knowledge of using a computer,

providing activities for girls to complete which require advanced computer applications may increase their confidence and interest in the power of computers.

Recommendations for Future Research

In order to determine the impact of single-gender instructional settings more research is needed. There is a limited amount of research available on single-gender settings in public schools and if this type of instructional setting affects achievement, self-esteem, and attitudes. Currently, the majority of single-gender schools occur in private or charter schools, so it is difficult to determine if it is the single-gender setting which impacts the results or the characteristics found in these type of settings, such as small class size, high academic standards, parental support, and additional resources. While there has been research concerning computer attitudes of middle school students, there is a gap in research exploring the relationship between computer-assisted instructional environment in a single-gender setting and computer attitudes of girls. Further research is needed to expand the results of the study to include collecting data from girls in single-gender traditional class environments, as well as boys in the three different instructional settings.

Additional research is needed to determine the impact of the instructor's attitude and teaching style on the impact of computer attitudes of girls. What specific strategies do teachers use in a single-gender class to foster increased confidence and willingness to engage in activities traditionally perceived as for males? What is the impact of professional development on the teacher's ability to differentiate instruction to meet the needs of both boys and girls? Is there a

difference having a male or female instructor in a computer class on the attitudes of girls towards computers? How does the presence of males in the class impact the attitude of girls in the class?

To determine the long-term effects of girls participating in computer-assisted instruction data should be collected from girls who continue to participate in computer-assisted instructional environments and mentoring programs to determine the impact on classes selected in high school and majors in college. Similarly, to determine the impact of single-gender instructional environments on the attitudes of girls, data must be also collected for more than one year from girls who choose to remain in the single-gender environment. Although results of the study were not as expected, this study has increased the knowledge in the area of computer attitudes of girls as well as provided a basis for future research.

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APPENDIX A. COMPUTER ATTITUDE QUESTIONNAIRE

Read each statement and then circle the number which best describes how you feel.

	Definitel	Probably	Maybe	Not at all
1) I enjoy doing things on a computer.	4	3	2	1
2) I am tired of using a computer.	4	3	2	1
3) I will be able to get a good job if I learn how to use a computer.	4	3	2	1
4) I concentrate on a computer when I use one.	4	3	2	1
5) I enjoy computer games very much.	4	3	2	1
6) I would work harder if I could use computers more often.	4	3	2	1
7) I know that a computer gives me opportunities to learn many new things.	4	3	2	1
8) I can learn many things when I use a computer.	4	3	2	1
9) I enjoy lessons on the computer.	4	3	2	1
10) I believe that the more often teachers use computers, the more I will enjoy school.	4	3	2	1
11) I believe that is very important for me to learn how to use a computer.	4	3	2	1
12) I feel comfortable working with a computer.	4	3	2	1
13) I think that it takes a long time to finish when I use a computer.	4	3	2	1
14) Working with a computer is very frustrating.	4	3	2	1
	Definitel	Probably	Maybe	Not at all

15) I will do as little work with computers as possible.	4	3	2	1
16) Computers are difficult to use.	4	3	2	1
17) I would hesitate to ask the teacher in a computer lab for help.	4	3	2	1
18) I can learn more from books than from a computer.	4	3	2	1
19) I think that a home computer can be very interesting.	4	3	2	1
20) People managed before without computers, so computers are not really necessary now.	4	3	2	1
21) I would like to learn more about how to use a computer.	4	3	2	1
22) People who like computers are often not very sociable.	4	3	2	1
23) Computers are often not very sociable.	4	3	2	1
24) Computers are exciting.	4	3	2	1
25) I would expect a good athlete to like computers.	4	3	2	1
26) Computers will never interest me.	4	3	2	1
27) I would be embarrassed to tell my friends that I would like to join a computer club.	4	3	2	1
28) If you like science you will like computers.	4	3	2	1
29) The world would be better off if computers were never invented.	4	3	2	1
30) Working with computers is not my idea of fun.	4	3	2	1
31) Typing would be the biggest problem I would have in learning to use a home computer.	4	3	2	1
32) Computers interest me.	4	3	2	1

	Definitel	Probably	Maybe	Not at all
33) You have to be smart to like computers.	4	3	2	1
34) Computers are fun.	4	3	2	1
35) Computers are easy to use.	4	3	2	1
36) If my family had a home computer, I would probably use it more than anyone else in the family.	4	3	2	1
37) Females have as much ability as males when learning how to use a computer.	4	3	2	1
38) I am concerned that people might make computers too powerful in the future.	4	3	2	1
39) I would rather spend an evening doing something new with a computer than go out with friends.	4	3	2	1
40) I enjoy working with computers.	4	3	2	1
41) It would be hard for me to learn how to program a computer.	4	3	2	1
42) Computers are boring.	4	3	2	1
43) If I had the money, I'd buy my own home computer.	4	3	2	1
44) Given a little time and training anyone could learn to use computers.	4	3	2	1
45) Computers are valuable and necessary.	4	3	2	1
46) Computers scare me.	4	3	2	1
47) Computers make me feel uncomfortable, restless, irritable, and impatient.	4	3	2	1
48) People who enjoy work with computers are a bit strange.	4	3	2	1

49) I have a lot of self-confidence when it comes to working with computers.	4	3	2	1

Read the following statements and select the appropriate response.

51) Do you have a computer at home?
A) yes B) no

52) Do you have Internet access at home?
A) yes B) no

53) How many hours a day do you typically spend on the computer at home?
A) 0-1 hours B) 2-3 hours C) 3-4 hours D)5 or more hours

54) How many hours a day do you spend playing games on the computer?
A) 0 hours B) 1 hour C) 2 hours D) 3 or more hours

55) How many hours a day do you spend playing video games?
A) 0 hours B) 1hour C) 2 hours D) 3 or more hours

56) What computer or video games do you enjoy playing?

57) Select the activities that occupy most of your time when using a computer at home.

____ Checking E-mail

____ Instant Messaging

____ Chat Rooms

____ Completing Homework

____ Playing Games

____ Surfing the Internet

____ Creative Projects (Pictures, Burn CDs…)

____ Download/listen to Music

58) Who is your social studies teacher? (Drop down –Krause or Ward)
59) What class period do you have social studies? (Drop Down 1, 2, 3, 6)

APPENDIX B. FOCUS GROUP QUESTIONS

Welcome

Thank you for helping me to find out more about how girls feel about the use of computers. The first thing I want you to do is to sketch a person who represents a computer whiz (someone who is very good at using computers) and a person who represents a computer whizn't (someone who is not good at using computers). Give your characters name. Take about 10 minutes to complete your pictures.

Computer Importance

1. Will computers be more important in the future? Why or why not?
2. In science fiction movies like the new Star Wars movie we see technology and computers used in a very different way from the way we use computers today. In your lifetime how do you see the use of computers changing?
3. If you suddenly lost access to computers-how would that change your life?
4. What do you think your career will be and how important will computers be to experience success in your job?

Computer Enjoyment

1. Do you remember the first time you used a computer? Describe what you did and how you felt.
2. What do you enjoy most about using computers?
3. Are there other activities you enjoy more than using a computer in your free time?
4. If you could change anything about how a computer works or is used what would it be?

Motivation/Persistence

1. If you have a problem with a computer what is the first thing you do?
2. What is the hardest assignment you've ever completed using a computer? How did you do it?
3. Does using a computer help you to learn? If so how?
4. What keeps you interested to keep playing a computer game even if you not winning?

Computer Stereotypes

1. Who enjoys using computers more-boys or girls?
2. What are differences in how boys and girls feel about computers?
3. What are differences in the way boys and girls use computers?
4. If you could choose one word to describe a computer-what would it be?
5. If a computer were a person-describe what kind of person that would be.

APPENDIX C. PERMISSION TO PARTICIPATE IN STUDY

Summit Parkway Middle School
200 Summit Parkway – Columbia, South Carolina 29229
Telephone (803) 699-3580 Fax (803) 699-3682

Parents,

Your daughter has the opportunity to participate in a study exploring computer attitudes in girls. This research will be used in a dissertation as I fulfill the requirements for a Ph.D. in Education from Capella University.

With your permission, your daughter will complete on online survey and participate in a focus group discussion to share her thoughts and opinions about the use of computers. Surveys will not include information that will identify students. Names of the students will not be used to identify the thoughts and opinions shared in focus group discussions.

Surveys and focus group discussions will be conducted during a school day before May 24th. Participation is voluntary and there is no risk to the participants. A copy of the results of the surveys and focus groups discussions will be available for review in the completed dissertation at the beginning of the 2005-2006 school year. Please contact me with any questions or concerns.

I appreciate your cooperation and support.
Julie Amoth

Curriculum Effectiveness Specialist
699-3580 ext. 3131
jamoth@spm.richland2.org

Capella University
Institutional Review Board
225 South 6th Street, 9th Floor
Minneapolis, Minnesota 55402

Name of Student: (please print) _____

Social Studies Teacher:_____ Class Period_____

☐ I give my daughter permission to participate in an online survey and focus group discussion to share thoughts and opinions about the use of computers.

☐ I do not give my daughter permission to participate in an online survey and focus group discussion to share thoughts and opinions about the use of computers.

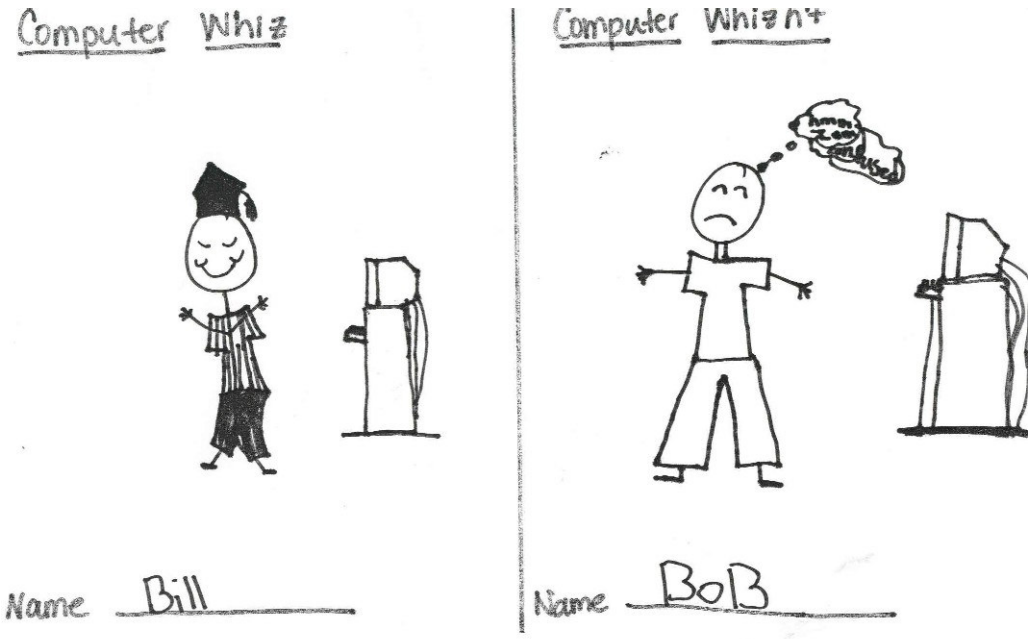
Parent Signature: _____

Student Signature: _____

APPENDIX D. STUDENT DRAWING 4

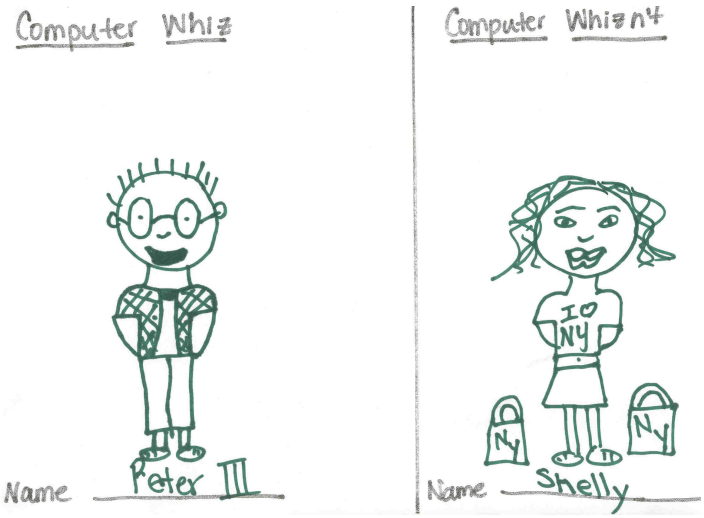
The computer whiz, wearing glasses and a conservative outfit appears more intelligent than the computer whizn't.

APPENDIX E. STUDENT DRAWING 5



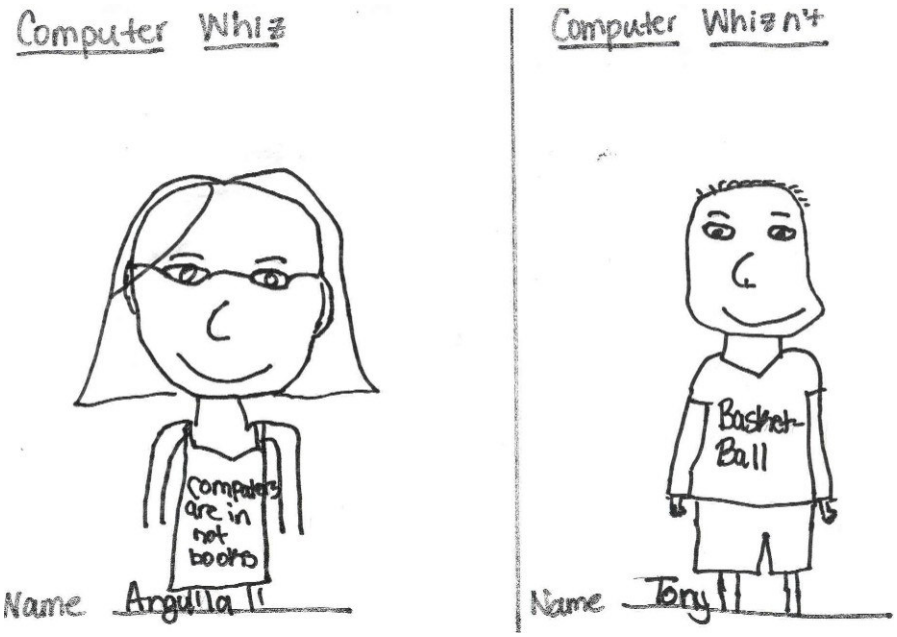
The computer whiz achieves more academic success than the computer whizn't.

APPENDIX F. STUDENT DRAWING 6



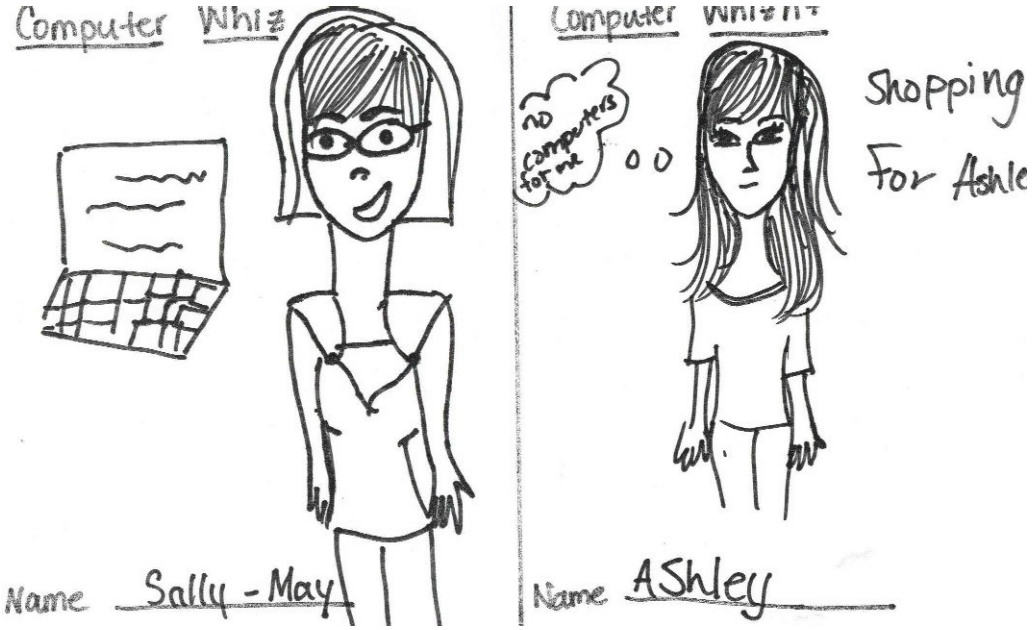
The computer stereotype of a "geek" male as the computer whiz and the computer whizn't as a girl interested in shopping.

APPENDIX G. STUDENT DRAWING 7



A computer whiz recognized the importance of computers (t-shirt labeled computers are in-not books) and a computer whizn't is interested in sports.

APPENDIX H. STUDENT DRAWING 8

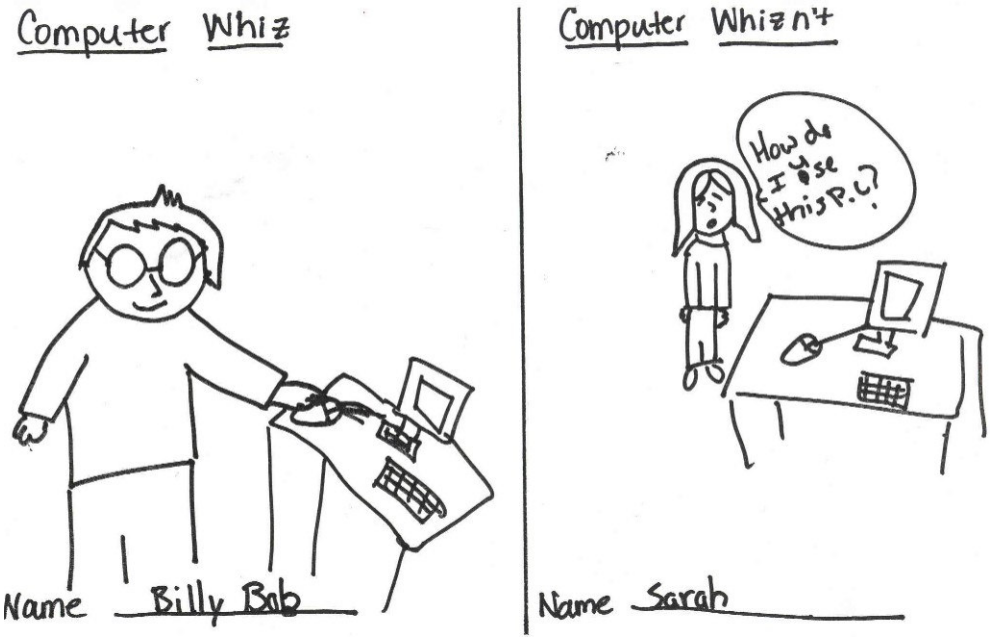


A computer whizn't is more interested in shopping than in computers.

APPENDIX I. STUDENT DRAWING 9

The computer whiz is a serious student and the computer whizn't is less intelligent with limited computer skills.

APPENDIX J. STUDENT DRAWING 10



A computer whizn't does not have computer skills.

APPENDIX K. INSTITUTIONAL REVIEW BOARD APPLICATION

CAPELLA UNIVERSITY
Institutional Review Board
225 South 6th Street, 9th Floor
Minneapolis, Minnesota 55402

Institutional Review Board Application

(When this IRB application is completed, it is to be submitted with the research proposal for the next stage of review. The Provost, or designee, gives final approval. See the checklists at the end of this form to verify that you have completed all of the information for this application.)

Name: Julianne E. Amoth
Date: March 1, 2005
Address: 7 Whiteoak Ridge Court Blythewood, SC 29016
Phone (Work) 803-699-2750 ext. 3806 (Home) 803-691-0607
Email Address: jamoth@spm.richland2.org
Field of Study: Education / Instructional Design of Online Learning
Degree Program: PhD
Supervisor Name: Dr. Elena Kays
Supervisor Title : Mentor
Address: 307 New Jersey Avenue Phillipsburg, New Jersey 08865
Phone (Work) 908-619-0269 (Home) _____
Email Address: ekays@ptd.net
Provost: Dr. James Wold

1/20/05 Fill in date you successfully completed the online IRB Training required modules and optional modules appropriate to research topic

1. **Project Title**: (Use same title as Final Proposal)

Single-Gender Classes and Computer-Assisted Instruction: A Study of the Computer Attitudes of Middle School Girls

2. **Inclusive dates of project**: 3/05 **through** 5/05

3. **Abstract**

The goal of the proposed research study will be to determine the impact of single gender classes and computer aided instruction on the attitudes of middle school girls towards computers. The study will focus the two questions below:

1. What are the differences in computer attitudes between sixth grade girls who participate in classes utilizing computer aided instruction and sixth grade girls in traditional class settings?

Hypothesis: Girls who have the opportunity to participate in computer aided instruction will have a more positive attitude towards computers than girls in traditional classrooms.

2. What are the differences in computer attitudes between sixth grade girls who participate in single gender classes utilizing computer aided instruction and sixth grade girls who participate in mixed gender classes utilizing computer aided instruction?

Hypothesis: Girls who have the opportunity to participate in computer aided instruction in a single gender setting will have a more positive attitude toward computers than girls who participate in computer aided instruction in mixed gender classrooms.

Experimental research, utilizing a mixed method approach will be used in this study. Surveys and focus groups will be used to collect data from sixth grade girls to determine the impact of single gender classes and computer aided instruction on the attitudes of girls towards computers. Girls from traditional social studies classes, single gender computer-aided classes, and mixed gender computer-aided classes will be surveyed and participate in focus groups.

The survey will be designed to include quantitative questions, which will ask questions to determine attitudes towards computers, social aspects of computer use, and perceptions about computer use. Questions will also be designed to collect data on frequency and type of computer use, as well as data on computer and video game use. The survey will be given to one hundred sixth grade girls. Fifty of the girls participate in traditional sixth grade social studies classrooms and fifty girls participate in a sixth grade social studies classes that utilizes computer-aided instruction.

Groups of girls will be invited to participate in focus group discussions to obtain their thoughts and perspectives concerning the use of computer. These small group conversations will occur during the school day in an informal environment. Questions will be prepared in advance to ensure consistency for each of the focus groups. The information collected from the focus group discussions will provide a context for the study and give depth to the information collected in the surveys. The questions will be brief, clear, reasonable, and easy for sixth grade students to understand. The goal is to engage students in conversation to give them the opportunity to share their feelings about their participation in computer assisted instruction, single gender class environments, and attitudes concerning the use of computers.

Through the use of mixed methodology, a combination of both qualitative and quantitative methods of research will be used. The results of the proposed study will provide statistical data on the attitudes of students towards computers in traditional classes, computer aided learning environments, and single gender classes. The study will also communicate the thoughts and opinions expressed by these sixth grade girls about the use of computers.

4. **Participant/Subject Population (or Final Sample to be selected)**

a. Number: Male 0 Female 100 Total 100

b. Age Range: 11 to 12

c. Location of Participants:
(Check all that apply)

____ business

_X _elementary / secondary school

____outpatient

____hospital / clinic

____university / college

____other special institution / agency: specify_____

d. Special Characteristics:
(Check all that apply)

___adults with no special characteristics

___Capella University learner, faculty, and/or staff

___inpatients

___outpatients

___prisoners

_X__students

___other special characteristics:
specify _____

If research is conducted through organizations or agencies, written documentation of approval / cooperation from each agency (e.g., business, school, hospital, clinic) must accompany this application.

e. Recruitment of Participants/Subjects
Describe how participants/subjects will be identified and selected for recruitment. Attach recruitment information (e.g., advertisement, bulletin board notices, and recruitment letters)

Students eligible for participation in the study are sixth grade girls randomly assigned to three instructional settings: traditional social studies classes, social studies classes utilizing computer aided instruction, and single gender computer aided social studies classes.

f. Approval for Use of Records
If participants/subjects are chosen from records (e.g., email address list, postal address list, telephone number list, patient charts, student grades), indicate who approved use of the records. If records consist of medical, students, or other private records, provide the protocol for securing consent of the participants/subjects in the records and approval from the custodian of the records. If appropriate, specify how Standards for Privacy of Individually Identifiable Health Information (the Privacy Rule) under the Health Insurance Portability and Accountability Act of 1996 (HIPAA) have been observed.
See website found at http://privacyruleandresearch.nih.gov/

Participants are not selected from records.

g. Initial Contact with Participants/Subjects
Who will make the initial contact with participants/subjects? Describe how contact will be made.

Students eligible for participation in the study will be sent a letter describing the study and what will be required. Parent and student permission will be requested. All forms granting permission for participation in the study will be filed in the curriculum office on site at the middle school.

h. Inducements or Rewards to Participants/Subjects
Will participants/subjects receive inducements before, or rewards after the study? Include this information in your assent/consent documents. See checklist at the end of this form to verify that you have completed the informed assent/consent documents or the cover to an anonymous questionnaire.
N/A There will be no inducements or rewards given for participating in the study.

i. Activity for Control Group
If some of the participants/subjects are in a control group, describe in detail the activity planned for that group. (This information must be included in the consent/assent forms.)
N/A There is no control group.

5. **Confidentiality of Data**

a. Describe what provisions will be made to establish and maintain confidentiality of data and who will have access to data. If anonymous surveys are distributed, provide all the information that would have been given in an informed consent form as a cover to the survey (see the checklist at the end of this form to verify that you have completed the cover to the survey).

Data collected using computerized surveys will not include personal information that will identify the students. Names of students will not be used in describing the results of focus group discussions. Students' responses to all focus group questions are voluntary. The description of the students' participation in the study will be outlined in the permission form.

b. Where will the data be stored and for how long? Whatever media (e.g., audiotape, paper, digital recording, videotape) are used to record the data, explain who will have access and how long the media will be retained. It is required that data be stored for a minimum of seven years after publication of results (such as a dissertation). If data will be destroyed, describe the secure method for destroying the materials that will maintain confidentiality.

All documents pertaining to the study will be stored in the curriculum office on site at the middle school. The researcher will have access to all data and records of the study. The data will be stored indefinitely.

All documents relating to ethical treatment of human participants/subjects which will be used in the course of the research must be attached to this form. These documents include consent forms, cover letters and other relevant material.

See checklist at the end of this document to verify that the application form has been completed.

Submit completed checked checklists with this application form to your school's designated IRB reviewer.

Signature of Researcher

As a Researcher (e.g., Learner, Faculty Employee, Consultant, Directed Employee/Agent, Independent Contractor, Adjunct Faculty) you certify that:

- The information provided in this application form is correct and complete.
- You will seek and obtain prior written approval from the Committee for any substantive modification in the proposal.
- You will report promptly to your Supervisor any unexpected or otherwise significant adverse events in the course of this study.
- You will report to the Supervisor and to the participants/subjects, in writing, any significant new findings which develop during the course of this study which may affect the risks and benefits to participation in this study.
- You will not begin the research until final written approval is granted.
- You understand that this research, once approved, is subject to continuing review and approval by your Supervisor. You will maintain records of this research according to Supervisor guidelines. Substantive change requires submitting an addendum to a previously approved application. An addendum is a totally new application form with attachments. The cover letter with the addendum describes the changes that were made from the originally approved application.

If these conditions are not met, approval of this research could be suspended.

Signature of the Researcher:

_____ Date_____

Signature of Supervisor

As a Supervisor (e.g., Mentor, Instructor, Practicum Supervisor, Internship Supervisor, Staff Supervisor) you certify that:

- The information provided in this application form is correct and complete.
- You will review and provide prior written approval to your Supervisee for any substantive modification in the proposal. You will inform the committee members appointed to oversee the research and its results.
- You will receive reports from your Supervisee about any unexpected or otherwise significant adverse events in the course of this study. You will inform the committee members appointed to oversee the research and its results.
- You will review research records maintained by your Supervisee until the final written document is produced and approved by you and the oversight committee.
- You will inform the oversight committee about the progress of your Supervisee from the time of developing research questions, through the proposal, IRB application, collection of data, writing results, and completing the documentation of the research.
- You will contact the Lead Subject Matter Expert (e.g., Chair of the Specialization, Faculty Director) if additional review is needed.

- You will make sure that this application has been completed by your Supervisee including all accompanying attachments before signing your name for approval.
- You assume responsibility for ensuring that the research complies with University regulations regarding the use of human participants/subjects in research.

If these conditions are not met, approval of this research could be suspended.

Signature of the Supervisor:

Name _____ Date_____

Title _____

Signature of Provost or Designee
As Provost, or designee, I acknowledge that this research is in keeping with the standards set by the university and assure that the researcher has met all requirements for review and approval of this research.

Signature of Provost or Designee

Name _____ Date_____

Completed forms should be sent as email attachments. Scan signature pages and attach as files. Send email messages with attachments to the designated IRB reviewers in one of the following schools representing your specialization affiliation:

Harold Abel School of Psychology
School of Business
School of Education
School of Human Services
School of Technology

Checklist: Form Completed

Use this form to verify that an application has all the necessary information completed in the Institutional Review Board (IRB) Application

1. __X__ all items answered (use NA where item is Not Applicable)
   __X__ demographics of learner and supervisor
   __X__ #1. Project Title

_X__ #2. Dates of Project
__X__ #3. Abstract (see checklist)
__X__ #4. Population
__X__ #4.a. number
__X__ #4.b. age range
__X__ #4.c. location of participants/subjects
__X__ #4.d. special characteristics of participants/subjects
__X__ #4.e. recruitment of participants/subjects
__X_ #4.f. approval for use of records
__X_ #4.g. initial contact with participants/subjects
__X__ #4.h. inducements or rewards to participants/subjects
__X__ #4.i. activity for non-participants/non-subjects
(e.g., control group)
_X__ #5. Confidentiality of data
__X__ #5.a. establish, maintain confidentiality, access to data
__X__ #5.b. storage/destruction of data
____ signatures
____ researcher
____ supervisor

2. ____ application attachments (use NA where item is Not Applicable)
____ approval from institution housing participants
____ approval from institution housing records
____ assent form for minor participants (see checklist)
____ checklist for extracting information from files or records
__X__ consent form for parent/guardian/adult participant (see checklist)
____ cover letter for mailed consent form
____ cover letter for mailed questionnaire
____ cover information for questionnaire (see checklist)
____ instrument(s) to elicit responses from participants
____ questions to be asked during interviews
____ script/letter/email message to recruit participants
____ other _____

3. _X___ IRB Application complete
action: forward to School designee to review for approval
date of action _____

Checklist: Abstract

Use this form to verify that item #3 has been completed on the Institutional Review Board (IRB) Application

1. The application is for
a. use of human participants in research (including record review) – answer items below and submit to Capella School IRB reviewer

b. use of animal subjects in research (including record review) – contact Capella University IRB Committee before completing application
c. other type of research (specify _____) – contact Capella University IRB Committee before completing application

2. Describe what the proposed research is about, and the research design to be used.
(state, in one or two sentences, the research question to be answered, and any hypotheses to be tested)
(research design choices include: historical, descriptive, developmental, case/field study, correlational, causal-comparative, experimental/quasi-experimental, action)

3. State the research topic; describe what research has previously been done related to this topic; and restate the research question in terms of the implications from the results that are expected to be found.

4. Describe how the data will be collected through one or more of the following:
a. using standardized tests with human participants,
b. interviewing human participants,
c. asking human participants to complete questionnaires,
d. reviewing files containing information about human participants, or
e. some other procedure _____).
(NOTE: attach the tests, interview questions, questionnaire, checklist for record review, or summary of other procedures)
(NOTE: attach documentation from officials who give authorization to access participants, files, or other sources that will provide the data)

5. (Omit for record review)
Describe how the participants will be recruited, and the characteristics of the population that is represented.

6. (Omit for research using human participants)
Specify the characteristics of the records that will be selected.

7. Describe how the sample will be selected.
(specify the type of sampling, such as convenience, periodic, random, snowball, or systematic),
(explain how the process will be conducted),
(specify the number of participants or records in the sample), and
(specify the characteristics of the sample, such as sex, age, and other variables to be studied).

8. (Omit for record review)
Describe how participants will be contacted for recruitment as a participant.
(describe how participants will be identified),
(describe how participants will be approached), and
(describe how participants will be recruited).

(NOTE: attach advertisement, bulleting board notices, recruitment letters, script for telephone call, script for announcement at gatherings, or other documentation supporting the descriptions and explain any inducements to be offered to participants)

9. (Omit for record review or mailed questionnaires)
Describe how informed consent will be provided.
(specify the process of obtaining consent from adults, assent from minors, and/or consent from guardians of minors).
(NOTE: attach the form(s) that will be used to obtain consent and/or assent)
(NOTE: attach the cover letter if mailing the request for the form(s) that will be used to obtain consent and/or assent)

10. (Omit for record review or when informed consent is required)
Describe how the participant will participate.
(specify how participants will have the following information: what they are expected to do, how long their participation will take, who is conducting the research, the topic of the research, the reason for conducting the research, why they were selected, how anonymity will be protected, how data are kept confidential, and how to contact those who will have answers to any questions about the research, i.e., the researcher, the faculty mentor, and Capella University).
(NOTE: attach the cover letter that will accompany the questionnaire)

11. Describe how the data will be analyzed.
(specify the type of quantitative analysis or qualitative analysis, and include a variable code sheet where appropriate).

12. Describe how the data will be stored, for what length of time, who will have access to the data, how it will be available to others, how the data will be destroyed, and how the confidentiality of the data will be maintained.

13. Describe how the results will be interpreted in terms of answering the research questions.

Checklist: Informed Consent/Assent Form

for Participants to Sign

Use this form to verify that a consent form has all the necessary information, if a consent form is to be attached to the Institutional Review Board (IRB) Application.
If the participant/subject is a minor, both an assent form for the participant/subject and a parent/guardian consent form are required.

___X_ 1. name of researcher

___X_ 2. title of researcher

___X_ 3. location of researcher

___X_ 4. reason for conducting research

__ X__ 5. title of research project

__X__ 6. reason person was selected to participate

__X__ 7. explanation of how person was selected to participate

__X_ 8. description of what participant is to do

__X__ 9. length of time participation will take

__X__ 10. how anonymity of participant will be protected

__X__ 11. how data collected will be kept confidential

__X__ 12. benefits to the participant, including any rewards

__X__ 13. risks to the participant, including protections from those risks

__X_ 14. assurance of voluntary participation

__X__ 15. assurance that withdrawing from the research has no consequences

__X__ 16. request that participant print name

__X_ 17. request that participant sign name and date signature

__X__ 18. make provision that participant will receive a copy of the form

__X__ 19. provide the name of the researcher and contact information for questions or concerns

__X__ 20. provide the name of the supervisor and contact information for questions or concerns

_X___ 21. provide the name of Capella University as a contact for questions or concerns using the designated IRB reviewer's contact information

__X__ 22. print the form on letterhead of the organization authorizing the research, or use the header of Capella University, 225 South 6th Street, 9th Floor, Minneapolis, MN 55402

_X___ 23. refer to the person as "participant" rather than "subject"

Checklist: Cover for Questionnaire Used by Participants

Use this form to verify that a cover for a questionnaire has all the necessary information if a questionnaire is to be attached to the Institutional Review Board (IRB) Application

____ 1. name of researcher

____ 2. title of researcher

____ 3. location of researcher

____ 4. reason for conducting research

____ 5. title of research project

____ 6. reason person was selected to participate

____ 7. explanation of how person was selected to participate

____ 8. description of what participant is to do

____ 9. length of time participation will take

____ 10. how anonymity of participant will be protected

____ 11. how data collected will be kept confidential

____ 12. benefits to the participant, including any rewards

____ 13. risks to the participant, including protections from those risks

____ 14. assurance of voluntary participation

____ 15. assurance that withdrawing from the research has no consequences

____ 16. provide the name of the researcher and contact information for questions or concerns

____ 17. provide the name of the supervisor and contact information for questions or concerns

____ 18. provide the name of Capella University as a contact for questions or concerns

____ 19. provide the name of Capella University as a contact for questions or concerns using the designated IRB reviewer's contact information

____ 20. print the form on letterhead of the organization authorizing the research, or use the header of Capella University, 225 South 6th Street, 9th Floor, Minneapolis, MN 55402

____ 21. refer to the person as "participant" rather than "subject

CITI Course in The Protection of Human Research Subjects

Wednesday, January 26, 2005

CITI Course Completion Record
for Julianne Amoth

To whom it may concern:

On *1/26/2005*, *Julianne Amoth* (username=jamoth; Employee Number=) completed all *CITI Program* requirements for the *Basic CITI* Course in The Protection of Human Research Subjects.

Learner Institution: *Capella University*

Learner Group: *Group 4.*

Learner Group Description: *Learners from the School of Education*

Contact Information:

Department: Education IDOL
Which course do you plan to take?: Social & Behavioral Investigator Course Only
Role in human subjects research: Student Researcher
Mailing Address:
Email: jamoth@spm.richland2.org
Office Phone: 803-699-3580 ext.3131
Home Phone:

The Required Modules for *Group 4.* are:	**Date completed**
Introduction	01/26/05
History and Ethical Principles - SBR	01/26/05
Defining Research with Human Subjects - SBR	01/26/05
The Regulations and The Social and Behavioral Sciences - SBR	01/26/05
Assessing Risk in Social and Behavioral Sciences - SBR	01/26/05
Informed Consent - SBR	01/26/05
Privacy and Confidentiality - SBR	01/26/05
CAPELLA UNIVERSITY	01/26/05