COMPUTING! SHIFTING THE PARADIGM BY DESCRIBING FEMALE'S ATTITUDES TOWARDS COMPUTING

BY

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Abstract: The careers of the 21st Century influence every aspect of society's workforce and contribute to occupations found within the Science, Technology, Engineering, and Mathematics (STEM) pathways. While the growth of the number of technical occupations is increasing; the number of females studying or starting careers in computer science is decreasing. The decline of females in computer science career fields has serious consequences for their education and careers in technology fields. The ability to provide material that has deep meaning for females is the key to creating a curriculum that appeals to female students. One key to increasing enrollment into computer science careers and majors at college is by making the introductory courses more enjoyable for students. The students' perception of themselves and computer science education or career choice are often that it is not an attainable degree for them as females. The representation of females into computer science careers is relatively low and decreasing at an alarming rate. Career exploration is necessary for both the student and the parent to provide career benefits along with positive work outcomes for the student involved. The findings showed that adult and high school females had a higher confidence level with computing, which indicated they are probably more confident using computers even though the scores indicated uncertainty about favoring computers. The final conclusion was female students were uncertain or not sure about their attitudes toward computing.

KEYWORDS: STEM, MNTC, IT, career exploration, helicopter parent, mentor, gender specific, Likert-type scale

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

CHAPTER I

COMPUTING! SHIFTING THE PARADIGM BY DESCRIBING FEMALE'S ATTITUDES TOWARDS COMPUTING

The careers of the 21st Century influence every aspect of society's workforce and contribute to occupations found within the Science, Technology, Engineering, and Mathematics (STEM) pathways (Lukesh, 2014). While the growth of the number of technical occupations is increasing; the number of females studying or starting careers in computer science is decreasing. "Women and girls are not well represented in the computer science and information technology domains, even as these fields are becoming increasingly relevant to the nation - and few STEM programs are designed to educate high school females about those domains" Office of Naval Research, 2013, p. 2). Although Blair, et al, (2011) indicated the importance of models for our students in terms of the use and producers of digital technology, Amoth (2006) reported the percentage of females in the field with at least a bachelor's degree continues to decrease. This leaves students without adequate role models in the information technology field. Educational systems must create interest in computer science courses for females and alternative ways to increase awareness to educators on how to develop computing courses in order to significantly impact student perceptions towards computing.

According to the statistics given by the National Science Foundation (NSF, 2012); in 2000, 28% of computer scientists were females and in 2009, the numbers were a staggering 17.7%. While females continue to decline in the computer science career fields, the pipeline to those careers via the computer science departments at American universities is also declining.

According to Hardy (2008), "Although they are at or exceed the gender parity in mathematics, biology and other science fields, there is one area in which their presence relative to men is static or even shrinking: computer science" (p. 59) With females comprising over 47% of the labor force (U.S. Department of Labor Women's Bureau, 2014) and as thousands of Baby Boomers retire from their jobs the demand in IT career fields are increasing. Hardy (2008) further suggested that females receiving bachelor's degrees has decreased by 10% from 1985 to 2003 and that females may not be suitably represented in technology career fields.

Numerous ideas exist as to why there is a lack of interest in the computer science field. Jennifer Light (1999) believes some of the lack of interest in the computer field could be contributed to "misconceptions of women from the history of computer science as uninterested or incapable in the field." Another newer study from Girl Scout Re-search Institute (GSRI), states that females "prefer a hands-on approach in STEM fields" and they do not "understand how STEM careers will further their goals of helping people" (Modi, Schoenberg, & Salmond, 2012, p. 18).

Females have been pioneers in this field but rarely receive credit. In fact history credits the first computer program to a woman. This woman was a 19th century mathematician named Ada Lovelace. She was the daughter of the English poet Lord Byron and the associate of Charles Babbage and is often considered with Babbage as the inventor of the modern digital computer. There are other significant females in computing, such as Grace Hopper. She "was a navy officer and mathematician who worked as a programmer in 1944 on the Mark 1, the first large-scale US computer" (Ordidge, 1997, p. 30). There are other notable females in computer science such as Frances Elizabeth Allen who was a pioneer in the field of optimizing compilers and was the first female IBM Fellow and in 2006 became the first woman to win the coveted "Turing Award". (Steele, 2011, p. 39) America's first electronic computer was the Electronic Numerical Integrator and Computer (ENIAC) and was used to automate ballistic computations during World War II (Walton, 2012). Over 200 females worked on this project and six of them were selected to program a machine that would replace them (November, 2011). These first programmers had job titles of

computers during World War II and somehow the significant part they played in the history of computing is seen as just clerical work. “In the 1940’s, the skill of transferring this information – what we now call programming—fit easily with notions about female’s work” (Light, 1999, p. 462). These females were pioneers in their field and rarely received credit for their participation and discoveries in computing.

There is a decline of females in computer science career fields despite the efforts of educational institutions and the workforce. There is also evidence that STEM is making progress in some areas, but not in the computer science arena. History also demonstrates that there were many female pioneers in computing, but where will these future pioneers come from? Are we continuing to build these modern day pioneers in computing?

Statement of the Problem

The demand for employees in the computer science career field is on the rise, according to the U.S. Department of Labor (2012) with the frightening prediction of 1.4 million new jobs in this field by 2018, only four short years. The data already cited indicated those employees do not exist at such a high level in American universities. Ashcraft and Blythe (2010) emphasized the growth of computing occupations due to technical innovation. These occupations consistently rank among the top 10 fastest-growing occupations.

Females compose 47% of the workforce. (U.S. Department of Labor Women's Bureau, 2014) The demand for employees cannot be met with only men who are 53% of the workforce. The situation is exacerbated by the lower perseverance of the females who begin career preparation in this field. The freshmen or sophomore years show females leaving this career choice. These attrition rates are higher than men. (Cohoon, McGrath, & Aspray, 2006) Ultimately the last 20 years have seen a 12% decrease in the percentage of females earning bachelor’s degrees; dropping to 25% in 2004 from 37% in 1984. (Singh, Allen, Scheckler, & Darlington, 2007). Females are grossly underrepresented in the information technology career field and retention of females in the industry is rapidly declining.

> Unlike science disciplines such as engineering and chemistry, computing initially was much more welcoming to women and women responded in large numbers, particularly from the 1960s to the 1980s. By the mid-to-late-1980s, women earned 37% of all computing bachelor degrees and comprised fully 38% of the computing white-collar workforce. By 2005, these percentages had declined to 15% and 27% respectively (Walton, 2012, p. 250).

Initially females were considered 'favorably' as candidates for computing positions, however over time the status changed to "computing positions were masculine; clerical positions were feminine" (Walton, 2012, p. 251). As capable females leave the technology industry it becomes clear there are fewer females in the pipeline to move into open positions (Catherine Ashcraft & Blythe, 2010).

The perceptions of females toward computing along with a lack of confidence cause low enrollment and low retention in computing (Walton, 2012). "Ask a group of students for an image associated with the term 'computer geek,' and they'll describe the typical male student with glasses, alone with his machine" (Blair, et al., 2011, p. 43). Many studies have been comprised about gender and attitudes toward computing (Johnson, 2009) and females with positive experiences in computing are more likely to have a positive attitude toward computers. These positive experiences in computer science courses equate to current and future enrollment and placement in computer science career fields. John Falcioni (2012) wrote "that 74 percent of teen girls are interested in the field of STEM and in STEM subjects;" (p. 6) yet how do we change the stereotypes that females and females do not flourish in areas of science, technology and math?

> Given such stereotypes, it's no surprise that according to the American Association of University Women's (AAUW) 2000 publication *Tech-Savvy*, girls begin to lose interest in technology around the middle school years—and not only because of the perception of social isolation associated with computers (Blair, et al., 2011, p. 43).

By diminishing female student's stereotypes about computer science, teachers are able to foster a positive culture and atmosphere for learning. Students respond to assignments that are engaging and research shows that females respond to more collaborative and empowering relationships when learning and using technology (Blair, et al., 2011). Educators must pay attention to the roles that school, class, parental attitudes and student learning style play in the girl attitudes and use of technology while

challenging continued research of the matter (Anonymous, 2001). Therefore there is a need to know the perceptions of female students toward computing and computing careers.

Purpose of the Study

The purpose of this study was to determine the perceptions of female adult and high school students of Moore Norman Technology Center (MNTC) toward computing and the computing career fields. The current female students at MNTC make decisions on a variety of career majors from technical, health and business and information technology pathways. A growing concern within the community is that females are losing interest in computers and computer science very early in the educational process. The rigid design of entry-level programming courses cause some female students to lose interest almost before they begin. (Anderson, Crombie, & Abarbanel, 2001). Education must reconsider their approach to teaching computer science courses and allow the females to develop positive attitudes towards computing within a safe environment. There are outsiders, such as Lenovo, that are partnering with educators to provide the much needed resources "STEM practices at the secondary level" (2012, p. 10). Even the Office of Naval Research is getting on board by 'helping to meet the challenge of encouraging young women to become scientists through the Technovation Challenge…"(ONR, 2013, p.2) which provides opportunities for females to develop skills in computers and business areas with female mentors. Blair, et al, (2011) attributes these mentors as "technological agents" that allow females to have equal footing for developing computer skills that reinforce STEM-based abilities.

Research Questions

The following research questions will be used to provide analysis of the female population of the Business and Information Technology Department (BIT) at MNTC's perceptions:

1. What are the overall attitudes of females toward computing?
2. Is there a significant difference between high school females and adult females in regards to attitudes towards computing?

In order to increase enrollment in computer science courses and create positive experiences for female students a variety of questions were asked about likes and dislikes of computers and perceptions of computers and people with careers in computing.

Significance of the Study

"In the late 1990's, researchers have been focusing on how girls interact with the computer in different ways than boys do; these studies often seek to arrive at strategies for making the world of computers more friendly for girls" (Butler, 2000, p. 227)**.** People make career choices at increasingly young ages and there is a need to target females to encourage them to enter into the Information Technology industry. This research study provides insight to what types of careers females choose and what may be a cause for low enrollment into computer science coursework. The IT industry must seek ways to make themselves relevant to the growing number of young females making choices for careers in the industry.

Assumptions

There are several assumptions considered for this study:

1. The female students enrolled at MNTC have been enrolled in an introductory computing course during their educational careers.
2. The students understand and honestly document their answers when participating in the study.
3. The students have access to a computer at home or school and computer activity was similar for each participant.

Limitations

There are several limitations to consider for this study:

1. These female students are limited to the students from Moore Norman Technology Center and no other schools were involved.

2. There is no controlled way of determining if the answers from the students have been answered honestly and without bias from other's perceptions.

Definitions

For the purposes of this manuscript careers in computing are limited to computer programmers, computer systems analysts, and computer scientists with at least a bachelors' degree.

Conceptual

The 21st century's career and technology education is a comprehensive system that attributes to the state's economic workforce. CareerTech provides nationally recognized competency-based curriculum, education, and training for both adult and high school students with a wide-variety of courses available. The curriculum meets both academic standards and requirements to fulfill specific job skills that are needed within industry. "Career and technical education does not use a one-size-fits-all approach, and it can take various forms according to the needs of school districts, communities, and employers and businesses in those communities" (Vail, 2007, p. 4). Using competency-based education, career techs provide students with skills that are needed in the workplace.

Operational

Oklahoma CareerTech is leading the nation in the development of Career Clusters, which group occupations together based on commonalities. Schools will use these clusters as an organizational tool to help students identify pathways from secondary school to career and technology education, colleges, graduate schools and the workplace. The Career Clusters show students how what they are learning in school links to the knowledge and skills needed for their success in postsecondary education/training and future careers.

Career Majors

There are career majors within the framework of these technology centers that are group occupations together in clusters. The career majors are linked to industry through a specific job or career

that students can choose for study. The students learn skills through their studies that link them to careers within the workplace.

Conceptual Framework

The perceptions of females toward computing along with a lack of confidence cause low enrollment and low retention in computing courses. According to some research female students may have need for a different type of instruction. According to Ordidge (1997) "female students are more goal oriented and this may be the key to getting them involved in information technology" (Ordidge, 1997, p. 34). Kaiser (2000) believed the current computer classes are boring for females even though computer science jobs are exciting, and the message conveyed to females turns them to other career choices, instead of computing.

Figure 1: Theoretical Framework

Creating technology courses that appeal to females are not as easy as one would think (Amoth, 2006). The ability to provide material that has deep meaning for females is the key to creating a curriculum that appeals students. Females approach computer technology differently than their male counterparts. They like the social aspect of computers and view them from an emotional and aesthetic design approach rather than simply using computers for action and adventure gaming. By using Prensky's theory of Digital Immigrants and Digital Natives (2012), these students are one of the first generations to

d experience technology like no other generation in the past. Digital Natives are students who have grown up with technology experiences and Digital Immigrants are those without who may have adapted to it. Instructors of the digital natives are often digital immigrants causing communication differences that may hinder the classroom instruction (Duncan, 2012). Theoretically the classroom should be a springboard for the student to reach their educational and career goals.

There are definitely other factors to consider when analyzing the research especially the educational setting the study was conducted under. Using Strauss and Howe's Millennial Generation Theory, there is support for using collaboration and team projects in education for both instruction and the workplace. There are facts that show some females have disconnects between their interests and their plans to achieve these (Strauss & Howe, 2012).

Creating an engaging environment for learning is always challenging and increasing atmospheres where females see themselves as computer programmers or analysts is the key. (Prensky, 2012) Through projects and self-reflective activities, females are able to cultivate attitudes and skills that help them to see themselves more clearly as programmers in the workplace. Instructors should provide opportunities for students to choose mentors within the program which permit these females to interact with females who are currently in the workplace setting.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to determine the perceptions of female adult and high school students of Moore Norman Technology Center (MNTC) toward computing and the computing career fields. Therefore the literature guiding this study looks at That Appeals to Females, Enrollment in Computer Science Courses, Family Status Influences Career Guidance, Impact of Instruction and Presentation, Question Stereotypes about Technology and Challenge Perceptions, and Mentoring to Build the Computer Leaders of Tomorrow.

Technology That Appeals to Females

"If girls are ever to catch up with boys in information technology, the 'culture of computers' has to change, according to a panel of school teachers, academics and others formed by the American Association of University Women Educational Foundation" (Kaiser, 2000, p. 395). They like the social aspect of computers and view them from an emotional and aesthetic design approach rather than simply using computers for action and adventure gaming.

> 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 (Amoth, 2006, p. 16).

There are definitely other factors to consider when analyzing the research especially the educational setting under which the study was conducted. "A new study from Girl Scout Research Institute (GSRI), Generation STEM: What Girls Say about Science, Technology, Engineering and Math

(STEM), shows that most females have an interest in STEM, but when thinking about future careers, they do not prioritize STEM fields" (Modi, Schoenberg, & Salmond, 2012, p. 18). The fact that some females have disconnects between their interests and their plans to achieve these goals. They may not see themselves as computer programmers or analysts but they are not opposed to the idea of career within these fields. One study by Nourbakhash (2009) into robotics shows that females are more apt to be excited about the engineering technology when material is presented in creative ways and when females' interests are considered during the development of the curriculum.

Enrollment in Computer Science Courses

"If you ask most children to draw a picture of a computer scientist, you will probably get a picture of a man in a lab coat working in a cubicle. The images in these drawings reflect a problem with the way today's youth perceive technical careers" (Kekelis, Ancheta, & Heber, 2005, p. 99). Increasing enrollment into computer science courses are challenges that educators cannot continue to ignore.

> The public and policymakers often mistakenly assume that attracting females, and retaining them, across all areas of math and science is a problem, said Jacquelynne S. Eccles, a professor of psychology, women's studies, and education at the University of Michigan in Ann Arbor, when in fact, that shortage is most pronounced in certain subjects, such as engineering and physics (Cavanagh, 2008, p. 9).

However, Congresswoman Carolyn Maloney (2014) (D-NY) lent her support to Million Women Mentors, a group that helps females prepare for careers in STEM. The Million Women Mentors program brings corporations together with females to help grow the economy and "reduce inequality between men and women" (2014, p. 2). According to Cheryan, et al, (2011), "Interacting with one member of a field, even briefly, can shape students' beliefs about their potential for success in that field" (p. 661).

The underrepresentation of women into computer science careers is relatively low and decreasing at an alarming rate (Robinson, 2007).

> Aspirations in Computing is a talent-development pipeline initiative of the National Center for Women & Information Technology (NCWIT). Currently, not enough high-achieving young women in math and science are entering the fields of engineering and computer science. In 2011, just 18% of undergraduate Computing and Information Sciences degrees

> were awarded to women; in 1985, women earned 37% of these degrees (Sabin, et al., 2013, p. 61).

The National Center for Science and Engineering Statistics (NSF) (2012) statistics show that bachelor degrees for undergrad females are surprisingly low. Out of the 84,600 computer science degrees awarded in 2009, only 15,900 of them were given to females. These statistics show less than19% of all computer science degrees being awarded to females (NSF, 2012). While these careers are among the fastest growing in the job market; females are not a part of that career opportunity.

At Harvey Mudd College in Claremont California a computer scientist turned college president has turned the enrollment into computer science courses around (Klawe, Whitney, & Simard, 2009). Dr. Klawe and the computer science department at Harvey Mudd College awarded degrees to females at the high rate of nearly 40% in 2012 (Klawe, Whitney, & Simard, 2009). These numbers are astounding when compared to university numbers from competing colleges. "In 2010, just 18.2 percent of undergraduates in the field were women, according to the National Center for Education Statistics—in spite of gains in chemistry, biomechanical engineering and other so-called STEM Fields (the acronym stands for science, technology, engineering and mathematics)" (Hafner, 2012, p. 1). By re-inventing the program the administrators of Harvey Mudd College were able to see significant increases in enrollment and retention and graduation of females in computer science majors (Klawe, Whitney, & Simard, 2009).

One key to increasing enrollment into computer science careers and majors at college are by making the introductory courses more enjoyable for students. The students' perception of themselves and the computer science often are that it is not an attainable degree for them as females (Butler, 2000). Female's confidence to complete careers in these majors needs to be restored by closing the gender gap (Robinson, 2007). Often the females' perceptions are what limits their confidence in computer science. "Cultural arguments for equity focus on increasing females' opportunities to use technology to explore and express their identities, create, communicate, and maintain relationships" (Raphael, 2002, p. 3). Females value communication in relationships and working together toward a common purpose and

understanding others (Kekelis, Ancheta, & Heber, 2005). Raphael (2002) expresses that females "need to develop critical thinking and ethical reasoning skills both with computers and about them" (p. 5).

Family Status Influences Career Guidance

Family status is too often a major influence in the career choices for females. The families according to Kekelis, et al, (2005) "maintain 'open' attitudes to different areas of study and do not encourage their daughters to focus on one career in middle school and high school" (p. 103). Many of these parents have limited education or may not understand the English language and rely on others for interpretation (Selwyn, 1999). All too often no career counseling is encouraged by parents with their daughters especially when they are representatives from educated or upper middle-class. Parents' reluctance to support specific career choices may unknowingly hinder their daughters' ability to stay on a technical or scientific educational and career path (Kekelis, Ancheta, & Heber, 2005).

The impact of the home has greatest influence toward developing positive attitudes toward technology. When children are introduced to technology toys such as LEGOS, Tinker toys and Erector Sets their aptitude for technology careers increases (Amoth, 2006). Many times the career choices are made for females by their parents and translate into support and direction for development of that career. "Parental social support appears to be especially important for beginning, traditional college students, whose parents seem to be more involved in the students' lives than parents in the past" (Schneider, 2009, p. 12). The parents of the 21st century are considered to be helicopter parents who are defined as parents who are extremely involved in their children's activities and decision-making processes. These parents continue with involvement in their children's lives into their college years. "A helicopter parent is visualized as hovering over their college student and not allowing him or her to explore and experience college in an autonomy enhancing way" (Schneider, 2009, p. 13).

It is important that career counselors and educators not only encourage and guide females into technology careers, but also find ways to help parents to guide their daughters into technical career opportunities (Lease & Dahlbeck, 2009). Career exploration is necessary for both the student and the

parent to provide career benefits along with positive work outcomes for the student involved. "One of the foundations for many social support relationships, especially the parent-child relationship is attachment" (Schneider, 2009, p. 36). Parental attachment and fear of disappointment plays important roles in the children's career exploration and career choices. "These relationships and parental expectations, or perceived expectations, could impact the type and amount of exploration that a college student participates in, thus impacting the career decision making process as a whole" (Schneider, 2009, p. 36). Helping parents to influence their children positively toward career choices should begin during early adolescents. According to Keller, et al, (2008), "parents could be provided with information regarding available career resources and informed of the importance of expressing interest, trust, confidence, and pride in their children" (p. 212). "Another possibility would be to offer psycho-educational programs for students and their parents that would facilitate open discussion of the career decision-making process and how students and their parents could work together in this developmental process" (Lease & Dahlbeck, 2009, p. 108).

Impact of Instruction Methods and Presentation

Traditional instructional methodology does not always provide the necessary motivation for students to develop skills and concepts needed for computing. Students may need exposure to other methods and presentation of materials to engage them into computer science careers (Stoeger, Duan, Schirner, Greindl, & Ziegler, 2013, p. 409). One such program that provides an alternative to mainline education is found at Lamar University and is called INSPIRED (Increasing Student Participation in Research Development Program) (Doerschuk, Liu, & Mann, 2011). "It is designed to attract, retain and transition underrepresented students to advanced study or careers in computing" (Doerschuk, Liu, & Mann, 2011, p. 7:1).

> As part of its mission to increase participation of women and underrepresented minorities in computing, INSPIRED conducts computing academies for high school students. These academies engage not only high school participants but also the female and minority undergraduates in the INSPIRED program, who help organize, conduct, and assess the

academies (Doerschuk, Liu, & Mann, 2011, p. 7:1).

An interesting element of the INSPIRED academy involves the simplicity of replicating it in five afternoon sessions where students with little or no computer science background are introduced to instructional materials during the summer. Another important element of these academies involves exposing the students to computer languages and concepts using a series of hands on labs. The last important element of the school is to provide and promote participation in computing (Doerschuk, Liu, & Mann, 2011).

Question Stereotypes about Technology and Challenge Perceptions

"In addition to a lack of good examples, girls face numerous other well-documented obstacles to ultimately choosing a career in the STEM fields" (Paz, 2012, p. 9). The typical stereotype of a computer scientist includes a male, wearing glasses, high-water pants or wrinkled and unkempt that does not have proper social skills and therefore interacts well with only the computer. By conjuring the image of a geeky or nerdy male, most young females would not aspire by design to achieve a computer science degree, let alone a career in computing. (Stoeger, Duan, Schirner, Greindl, & Ziegler, 2013) A study on gender differences and computing showed that students viewed computing as a "male domain" (Kwan, Trauth, & Driehaus, 1985, p. 187). Shapiro, et al, (2012) shows there is ongoing research that parents and teachers are behind the "negative stereotypes about women's math abilities" (p.175) and they determine in early childhood the interest into STEM fields.

> Young women who want to pursue nontraditional training and employment must often overcome obstacles such as sex discrimination in course enrollment and recruiting procedures, biased career and academic counseling, and sexual harassment. These obstacles not only reinforce negative gender stereotypes but also deny girls equal opportunity to be hired for and succeed in jobs that offer opportunities for good wages and benefits (Eardley & Manvell, 2006, p. 397).

Females need to question the typical stereotypical ideals about computers and computer scientist and learn to overcome the challenges of peer pressure and low self-esteem (Tan, Barton, Kang, & O'Neill, 2013).

> Thousands of young women in the US remain clustered in CTE courses directed at traditionally female occupations, with very small numbers pursuing nontraditional fields (occupations in which one gender represents less than 25 percent of workers). Sex segregation in career and technical education courses has critical implications for girls' economic security as adults. In contrast to traditionally male occupations, traditionally female occupations generally do not pay well, often do not include benefits, and hold the possibility for only limited advancement. Therefore, female students' low enrollment in traditionally male CTE courses can negatively impact their future earnings (Eardley & Manvell, 2006, p. 397).

Educational systems must provide more teaching on the subject for females to find their pathway to success.

Mentoring to Build the Computer Leaders of Tomorrow

The research posits that females in computer science have excellent communication and collaboration skills which when combined with computer courses expand their scope of satisfying careers (Kekelis, Ancheta, & Heber, 2005). The research also indicates if females that are given positive mentoring experiences from either a parent or guardian or role model, will have more encouraging experiences with computing. "Even from an early age, a mentor can help guide you and be your champion. Today, more than ever, females need to be able to envision themselves in a range of professions; without woman mentors, imagining the future becomes much harder to do" (Healey, 2008, p. 6). There are occasions for females to attend workshops and conferences like Expanding Your Horizons Conference, (West Oakland girls attend STEM conference, 2014) where females attend classes that are led by female presenters who encourage them to pursue course in STEM. The value of mentoring "…provides females with appropriate role models who are experts in STEM fields" (Stoeger, Duan, Schirner, Greindl, & Ziegler, 2013, p. 409). Mentors can encourage females to feel proud and to have high self-esteem and encourage them to set goals and not to shy away from subjects like science and math (Stoeger, Duan, Schirner, Greindl, & Ziegler, 2013). "Making sure that there are women mentors and role models who can help today's young women achieve their maximum potential is more important than ever before" (Healey, 2008, p. 6). Female mentors are influencers to young girls and the value of the nurturing provided by these females cannot be underestimated (Colwill & Townsend, 1999). These mentor

challenges these females and while they believe they can be good leaders they lack the qualities and necessary skills needed to become a leader. "Girls today don't necessarily aspire to the traditional 'command and control' style of leadership they often see modeled by men. Girls want leadership focused on personal principles, ethical behavior and the ability to affect social change" (Healey, 2008, p. 6).

CHAPTER III

METHODOLOGY

Purpose

The purpose of this study was to examine the perceptions of the adult and high school female students at Moore Norman Technology Center (MNTC) toward computing and computing careers. The careers chosen at MNTC are called career majors. They consist of a wide variety of career fields that students can choose to study. Each of the career majors align to a particular industry career and often have national certifications associated with them.

The approach for these females to choose career majors may be based on sheer love of the career major; however this study will pursue the possibility of peer influences and parental or mentor influences on the choices made by these females. The study describes how females are introduced to computing and what their peers believe to be true and how this heavily influences their perceptions towards computing. A sampling of the adult and high school population at MNTC will be used to provide analysis with the research questions below:

1. What are the overall attitudes of females toward computing?
2. Is there a significant difference between high school females and adult females in regards to attitudes towards computing?

The girls will have closed response questions and in addition there will be a focus group to share their opinions about the use and importance of computers.

Instrumentation

The researcher designed a self-administered questionnaire for the data gathering process to get quantitative data. In Appendix B, a copy of the questionnaire can be found. This was distributed to 100 females and girls at MNTC and aimed to show the perceptions of females about computing careers and education. The validity of the questionnaire was based on criterion compared with measures of a questionnaire found in previous research (Amoth, 2006). The difference between the previous research and this is the population sample were different ages. The questions were adapted make them age appropriate for adult and high school students. The study by Amoth dealt primarily with elementary age children, and this study is high school and adult females. The questions were changed specifically to be more independent and did not allow for biases. The questions that were used from Amoth's study were questions 1-2, 4, 13, 26, 28. The rest of the questions were developed from the literature review and focus of the paper.

There was consistency among the questions which ensured reliability of the measurement. The primary aim of the questionnaire was to determine the attitudes females have toward computing and provide insight to why females choose career majors outside of STEM. This research used a mixture of closed questions without any open comments in the questionnaire. The questionnaire was designed to be answered easily and used a Likert five-point response scale.

For the purposes of the study, an online questionnaire was created and distributed electronically to the female population at MNTC. A closed question is one that has pre-coded answers. Through closed questions, the researcher was able to limit responses that are within the scope of this study. The questionnaire elicited descriptive statistics for the determined variables. The variables had answer responses of 'definitely', 'probably', 'not sure', 'maybe', 'not at all'. These options served as the quantification of the participants' agreement or disagreement on each question item.

Population and Sample

The data used for the study was drawn from the adult and high school female population of roughly 100 at MNTC in the BIT department. The classes involved were Graphic Design, Digital Video and Production, Web Design, Legal Offices, Pre-Engineering, Accounting, Computer Programming and Database Applications. These courses were selected partly out of convenience to the researcher and in order to get a larger population of female participants. Apart from the Health Careers the Business and Information Technology department has the largest population of females at the MNTC campus. The students may or may not have a background in computer science or computing. The research was conducted in spring of 2014. There was a census study that sampled the entire population using a survey from a wide range of career majors available in the Business and Technology division of the school. These participants were provided with a list of questions about computer science classes that student may be currently enrolled into or may have completed in the past. The population sample is from both high school and adult females, ranging in ages 16 – 65 and was determined by the female respondents who consented to take the survey. This type of sampling is voluntary sampling because the population is self-selected or they choose to become a part of the study. The limitations on this sampling can be that the population may have a strong interest in the topic being presented to them.

Data Collection Strategies

After obtaining approval to conduct the study through the Oklahoma State University Institutional Review Board, an email was sent to the instructors of the Business and Information Technology programs at MNTC asking for adult and high school females to participate in the study. These specific careers were targeted due to the large population of female participants within them. The permission forms were distributed and collected during class time. A copy of the introductory page was attached to the permission forms that was used to present all the essential information needed to make an informed decision as whether or not to participate in the study. An informational cover letter was also attached to the parent/guardian permission forms.

The data were collected quantitatively by using an online survey called Survey Monkey and provided sensitivity and validity to the study. The questionnaire was a means of measuring the attitudes of female students toward computers and computer careers. These questions were reasonable and the content in the questions were relatable to the students who chose to respond to the survey. In other words the questions made sense to the female participants.

The Survey Monkey Privacy Policy can be found at this link: https://www.surveymonkey.com/mp/policy/privacy-policy/. Each student's responses are completely confidential and the student's identity was protected. The individual responses were only seen by the researcher and there were no names or email addresses associated with the information. The data is secure on the Survey Monkey website and is stored on servers throughout the United States. Each consent form included a note of the standard Survey Monkey disclaimer in the confidentiality section of the information form. The process of collecting data involves determining the adult and high school female population at MNTC and the career majors in which they are currently enrolled. The instructors of these career majors have agreed to allow the individual participants to complete the online survey and the data was collected and analyzed from the results. Participants were asked to read the consent form and check the box agreeing to participate in the study. Participants were asked to carefully read and respond honestly to each question.

Summary

The quantitative survey allowed the students to communicate their thoughts concerning computers, careers in computing, and people who use computers or have careers in computing. The study allowed the students to answer questions honestly and completely without fear of reprisal from peers or instructors. The study adds to the knowledge of the attitudes that high school and adult females have toward computing and may enable educators to design future curriculum and courses that are appealing to these females and could possibly impact the computing career fields of the 21st century.

CHAPTER IV

FINDINGS

Data Collection Methods

There was a population of 100 high school and adult female students in the Business and Technology Department at MNTC. From the population of 100 individuals that were asked to take the survey, 38 consented forming the voluntary sample for the study. Quantitative data were collected from 22 adult females and 16 high school students at MNTC using Survey Monkey. One high school student survey was incomplete with only six questions answered. The survey included Likert-type responses, where students were given statements and need to indicate how closely they agree or disagree with the statements. The survey was delivered to each student electronically and they were given 2 weeks to complete the questions. The data collected used descriptive analysis and a t-test to determine the significant differences between these three categories: computer partiality, confidence using a computer, and overall attitudes toward computers and computing careers. The research questions examined the attitudes of females toward computing and defined the data collected and benefit the researcher in responding to the proposed question:

1. What are the overall attitudes of females toward computing?
2. Is there a significant difference between high school females and adult females in regards to attitudes towards computing

Purpose of the Research

The purpose of the research was to examine the perceptions of female adult and high school students of Moore Norman Technology Center (MNTC) toward computing and the computing career fields in the categories of computer partiality, confidence using computers and attitudes toward computers and computer careers. The females in the study came from a variety of classes where computer experience may or may have not been significant. The study asked questions from all three categories were used for data analysis (See Table 1).

Table 1: Data Analysis of Survey Questions

CATEGORIES	QUESTIONS ON SURVEY
Computer Partiality	1,3,4,6,7,8,11,13,14,17,18,27,30,32,34,38,40,44
Computer Confidence	2,5,15,23,25,31,35,41,42,43
Computer Attitudes	9,10,12,16,19,20,21,22,24,26,28,29,33,36,37,39

Summary of the Analysis of the Data Collected

Descriptive analysis and the t-test were used to compare the answers of the adult female students with the answers of the high school female students with the percent of females who answered definitely, probably, maybe and not at all in each of the three categories: computer partiality, confidence using computers and attitudes towards computers. A Likert-type scale with data that is ranked. The students selected answers from a scale ranked 1 through 5 where 1to 1.49=not at all, 1.5 to 2.49=maybe, 2.5 to 3.49=not sure, 3.5 to 4.49=probably and 4.5 to 5=definitely. sing the Statistical Package for Social Sciences (SPSS) 22 for Windows data analysis was used to complete descriptive statistics; mean, median, and std. deviation for research question one, and an independent t-test to determine if there is a significant relationship between the independent variable; the answers of the adult female students with the answers of the high school female students, and the dependent variable of computer partiality, confidence using computers and attitudes towards computers.

Variables	Student_pop	N	Mean	Std. Deviation	t	p
Overall	High School Females	15	2.9826	.80255	-.397	.346
	Adult Females	22	2.9624	.80050		
CP Mean	High School Females	15	2.7993	.19821	-.454	.652
	Adult Females	22	2.8370	.27606		

Table 2 - Means and standard deviations of frequency in the categories of Overall Attitudes, Computer Partiality, Computer Confidence and Computer Attitudes

CC Mean	High School Females	15	3.7800	.31668	-.338	.610
	Adult Females	22	3.8182	.35002		
CA Mean	High School Females	15	2.1750	.16570	-.804	.427
	Adult Females	22	2.2320	.23746		

M=mean; SD=standard deviation

In Tables 2 the Mean, Std. Deviation, t and p were calculated on categories of questions that were referenced in Table 1. Of the 38 respondents completing the survey, one high school student survey was incomplete leaving 35 questions unanswered. In the analysis N=37, the number of respondents completing the survey, with 15 high school females and 22 adult females. An independent samples t-test was conducted to compare the overall attitudes of females toward computing in both high school and adult female students.

The results indicate that there is not a statistically significant difference in the scores for computer partiality in high school female students (M=2.7993, SD=.19821) and adult female students (M=2.8370, SD=.27606) conditions; t (37) = -.454, p=.652. These results suggest that both high school and adult

females are not sure if they have partiality towards computers. Specifically, the results suggest that when adult and high school females use computers, their preferences for using computers is uncertain. On the category of computer confidence the high school female students had a mean score of 3.7800 (SD = .31668) where the adult female students had a mean score of 3.8182 (SD = .35002) with equal variances assumed. There was not a significant difference in the scores for computer confidence in high school female students (M=3.7800, SD=.31668) and adult female students (M=3.8182, SD=.35002) conditions; t (37) = -.338, p=.264. The outcomes show that adult and high school females have a higher confidence level with computing, with results that indicate they are probably more confident using computers even though the scores indicated uncertainty about favoring computers. There was a no significant difference in the scores for computer attitudes in high school female students (M=2.1750, SD=.16570) and adult female students (M=2.2320, SD=.23746) conditions; t (37) = -.804, p=.54. The attitudes of female students whether they are adult or high school students show the results of not sure demonstrating uncertainty about their attitudes toward computing.

At MNTC the students are classified as either an adult or high school student. These categories are not separated by age, but by the enrollment of the individual student. The second proposed research question states "Is there a significant difference between high school females and adult females in regards to attitudes towards computing?" An independent samples t-test was conducted on each question of the survey sample to determine if there is significance in the scores for adult female students and high school female students. Using Levene's test for equality of variances, there were four questions (Q29, Q33, Q36, and Q38) with the result of unequal variances assumed because the standard deviations for the two groups adult female students and high school female students were less than 0.05. These questions indicate there are differences between high school females and adult female's attitudes and there are statistically significant differences between the mean computer attitudes of adult and high school female students. These questions are marked with an asterisk on Table 3. The t-test for questions (Q25 and Q33) answers show evidence to reject the null hypothesis with a statistically significant result and are highlighted in

yellow. However, the questions indicate that there are no statistically significant difference between the two groups and differences between Means are likely due to chance and not to these differences.

Table 3: Means and standard deviations of frequency on all 44 survey questions

Independent Samples t-test

Questions	Student_pop	N	Mean	Std. Deviation	t	p
Q1	High School Females	15	4.73	.458	-.602	.551
	Adult Females	22	4.82	.395		
Q2	High School Females	15	4.73	.458	-.980	.334
	Adult Females	22	4.86	.351		
Q3	High School Females	15	3.53	1.552	.072	.943
	Adult Females	22	3.50	1.263		
Q4	High School Females	15	4.60	.507	.248	.805
	Adult Females	22	4.55	.739		
Q5	High School Females	15	4.87	.352	-.947	.350
	Adult Females	22	4.95	.213		
Q6	High School Females	15	4.60	.828	-.124	.902
	Adult Females	22	4.64	.902		
Q7	High School Females	15	2.07	.884	-.415	.681
	Adult Females	22	2.23	1.307		
Q8	High School Females	15	4.27	1.280	-.193	.848
	Adult Females	21	4.33	.796		
Q9	High School Females	15	1.87	.990	.422	.676
	Adult Females	22	1.73	.985		
Q10	High School Females	15	4.27	1.163	-.397	.694
	Adult Females	22	4.41	1.008		
Q11	High School Females	14	1.64	.929	-.709	.483
	Adult Females	22	1.91	1.192		
Q12	High School Females	14	4.79	.426	.063	.950
	Adult Females	22	4.77	.685		
Q13	High School Females	14	1.14	.535	-.790	.435
	Adult Females	22	1.41	1.182		
Q14	High School Females	14	1.43	1.158	-.260	.797
	Adult Females	22	1.55	1.405		
Q15	High School Females	14	4.64	.842	.187	.853

	Adult Females	22	4.59	.796		
Q16	High School Females	14	1.43	.646	.161	.873
	Adult Females	21	1.38	.973		
Q17	High School Females	14	1.43	1.158	-.077	.939
	Adult Females	22	1.45	.858		
Q18	High School Females	14	4.64	1.082	.671	.506
	Adult Females	22	4.36	1.293		
Q19	High School Females	14	1.21	.802	-.736	.467
	Adult Females	22	1.50	1.300		
Q20	High School Females	14	1.50	1.160	-.111	.912
	Adult Females	22	1.55	1.224		
Q21	High School Females	14	1.50	1.092	-.437	.665
	Adult Females	22	1.68	1.287		
Q22	High School Females	14	4.50	1.092	.594	.557
	Adult Females	22	4.23	1.478		
Q23	High School Females	14	2.29	1.541	.126	.901
	Adult Females	22	2.23	1.232		
Q24	High School Females	14	1.93	1.592	.940	.354
	Adult Females	22	1.50	1.144		
Q25	High School Females	14	4.14	.864	-2.264	.030
	Adult Females	22	4.68	.568		
Q26	High School Females	14	1.86	1.027	-.018	.985
	Adult Females	22	1.86	1.037		
Q27	High School Females	14	1.43	.756	.545	.589
	Adult Females	22	1.27	.883		
Q28	High School Females	14	1.36	.745	.461	.648
	Adult Females	22	1.23	.869		
Q29	High School Females	14	1.29	.611	-1.131	.266
	Adult Females	22	1.59	1.008		
Q30	High School Females	14	1.64	1.277	.364	.718
	Adult Females	22	1.50	1.058		
Q31	High School Females	14	3.50	1.506	-.375	.710
	Adult Females	22	3.68	1.359		
Q32	High School Females	14	1.21	.579	-.049	.961
	Adult Females	22	1.23	.869		
Q33	High School Females	14	1.21	.579	-2.455	.020
	Adult Females	22	1.95	1.214		

Q34	High School Females	14	1.71	1.326	.205	.839
	Adult Females	22	1.64	.953		
Q35	High School Females	14	4.21	1.311	.052	.959
	Adult Females	21	4.19	1.327		
Q36	High School Females	14	1.07	.267	-1.460	.157
	Adult Females	22	1.45	1.184		
Q37	High School Females	14	3.29	1.590	.106	.916
	Adult Females	22	3.23	1.631		
Q38	High School Females	14	1.21	.579	-1.381	.177
	Adult Females	22	1.59	1.054		
Q39	High School Females	14	1.79	1.424	.488	.629
	Adult Females	21	1.57	1.165		
Q40	High School Females	14	4.43	.938	-2.12	.833
	Adult Females	22	4.50	1.012		
Q41	High School Females	14	2.14	1.351	-.605	.549
	Adult Females	22	2.45	1.595		
Q42	High School Females	14	1.86	1.406	.384	.703
	Adult Females	22	1.68	1.287		
Q43	High School Females	14	4.86	.363	-.053	.958
	Adult Females	22	4.86	.351		
Q44	High School Females	12	4.67	.888	-.047	.963
	Adult Females	22	4.68	.894		

M= mean; SD = standard deviation

CHAPTER V

CONCLUSIONS & RECOMMENDATIONS

Computer science is a vital part of today's modern society. Research studies into the career choices made by females will be a critical component in our future workforce. Analyzing why and how careers choices are made will give us more insight to developing curriculum and learning styles that allow educators to link the computer science coursework to the female student.

The females who participated in this study indicate by research question one there are significant differences in the overall attitudes of female students within the three categories of computer partiality, computer confidence and computer attitudes. These outcomes propose female students are not sure if they have partiality towards computers. The results show uncertainty in both adult and high school students and demonstrate little or no differences in preference for using computers. However, this seems odd when compared to confidence in using computers. The findings display that adult and high school females have a higher confidence level with computing, with results that indicate they are probably more confident using computers even though the scores indicated uncertainty about favoring computers. So while these females are no sure about partiality to computers, they are confident in computer usage and knowledge. The final category results in the attitudes of female students being not sure or uncertain about their attitudes toward computing. So female students whether adult or female seem to be unsure about their preferences or attitudes towards computing while they show higher confidence in computers.

In research question two, there are also no significant differences between adult and high school females in regards to attitudes towards computing overall. However on questions (Q29, Q33, Q36 and Q38) research indicates there are differences between high school females and adult female's attitudes and that there are statistically significant difference between the mean computer attitudes of adult and high school female students. However the majority of these questions are not significantly different and result in the overall attitudes of female students whether they are adult or high school as positive. They indicate they probably have a good attitudes toward computers and computer careers.

Researcher Perspective

This research grew from my own personal curiosity about females in information technology careers and education. I was the only female in most of my computer science courses while in college and the only female programmer in the office. I always found this to be challenging in both the educational and workplace setting and wanted to see if there were any associations between previous training in computing and attitudes of females toward computing. However the result of the study only make me have more questions. Why do adult and high school females have confidence in computing yet they indicated in the survey their partiality and attitudes were unsure? What can educators and industry partners ensure that females who are 47% (U.S. Department of Labor Women's Bureau, 2014) of the workforce are prepared for careers in computing?

Practical and Conceptual Implications

The research into why females are declining to take coursework and careers in computer science is imperative to education and industry. The female students' perception of computing is significantly different from males and statistically fewer females are attempting computer science courses. "Nationwide, women earned only 18 percent of the bachelor's degrees awarded in computer science in 2010, according to the National Science Foundation. That's less than half the proportion in 1985, when 37 percent of those degrees went to women" (Gose, 2012, p. 1). Research indicates females need reassurance in computing concepts and that self-efficacy can be increased by mastering skills in computer tasks

(Baker, 2013). It also points to females need for early educational experiences with computing and they respond well to student-centered teaching (Baker, 2013). These positive experiences could allow them to make better decisions regarding educational and career choices in the future.

Recommendations for Future Research

The students perception toward computing will play a huge part in their career choice for both educational pursuits and ultimately in the workplace. There needs to be research into implementing computing into early elementary (kindergarten) and relevant curricula that address females' interests and provide opportunities for genuine inquiry and tinkering experiences. There should also be activities that build self-efficacy, appropriate role models, messages that computer science is for everyone, and student-centered teaching. Future studies should be able to draw upon this research to determine if an all-female class is the best place for learning about computers and should we as educators teach females differently and approach curriculum differently for female students verses male students.

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APPENDICES

APPENDIX A

ADULT CONSENT FORM

OKLAHOMA STATE UNIVERSITY

Computing! Shifting the Paradigm by Changing Girls Attitudes towards Computing

Sandy Kelso, Moore Norman Technology Center, Instructor, B.S. Computer Science East Central University

This study is designed to gather information about the perceptions of the adult and high school female student population at Moore Norman Technology Center towards computers or computing courses taken by these women. You will be asked to respond to a set of questions that assess this type of information. Results from the study will help to inform our understanding of how perception of computers or computer courses may influence enrollment and career choices.

You will be asked to complete a series of questions about your perceptions of computers and computer courses and how past experience with computing may have influenced your current career major choices. This study is designed to last approximately 30minutes.

There are no known risks associated with this project that are greater than those ordinarily encountered in daily life.

Your participation in this research is completely voluntary and you may withdraw at any time. You do not have to be in this study if you do not want to be. If you decide to stop after we begin, that's okay too. If you are interested, we will send you a copy of the results of the study when it is finished.
The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify you. Research records will be stored on a password-protected computer in a locked office and only researchers and individuals responsible for research oversight will have access to the records. Data will be destroyed three years after the study has been completed. You will not be identified individually; we will be looking at the group as a whole.
Note that Survey Monkey has specific privacy policies in their own company. You should be aware that this webs service may be able to link your responses to your ID in ways that are not bound by this consent form and the data confidentiality procedures used in this study, and if you have concerns you should consult this service directly.
You may contact any of the researchers at the following addresses and phone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study: Sandy Kelso, Moore Norman Technology Center, Norman, OK 73070, (405) 364-5763, ext.4143, sandy.kelso@mntc.edu or Dr. Belinda Cole, 255 Willard Hall, Stillwater, OK 74078, (405)744-9502, Belinda.cole@okstate.edu. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.

I understand that my participation is voluntary; that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time, without penalty.

I have been fully informed about the procedures listed here. I am aware of what I will be asked to do and of the benefits of my participation. I also understand the following statements:

I affirm that I am 18 years of age or older.

I have read and fully understand this consent form. I sign it freely and voluntarily. A copy of this form will be given to me. I hereby give permission for my participation in this study.

_____ _____

Signature of Participant Date

I certify that I have personally explained this document before requesting that the participant sign it.

_____ _____

Signature of Researcher

PARENT/GUARDIAN PERMISSION FORM

OKLAHOMA STATE UNIVERSITY

Computing! Shifting the Paradigm by Changing Females Attitudes towards Computing

Sandy Kelso, Moore Norman Technology Center, Instructor, B.S. Computer Science East Central University

This study is designed to gather information about the perceptions of the adult and high school female student population at Moore Norman Technology Center towards computers or computing courses taken by these women. Your child will be asked to respond to a set of questions that assess this type of information. Results from the study will help to inform our understanding of how perception of computers or computer courses may influence enrollment and career choices.

Your child will be asked to complete a series of questions about your perceptions of computers and computer courses and how past experience with computing may influence your child's future career major choices. This study is designed to last approximately 30minutes.

There are no known risks associated with this project that are greater than those ordinarily encountered in daily life.

Your child's participation in this research is completely voluntary and they may withdraw at any time. They do not have to be in this study if they do not want to be. If they decide to stop after we begin, that's okay too. If you are interested, we will send you a copy of the results of the study when it is finished.

The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify you or your child. Research records will be stored on a password-protected computer in a locked office and only researchers and individuals responsible for research oversight will have access to the records. Data will be destroyed three years after the study has been completed.

Note that Survey Monkey has specific privacy policies in their own company. You should be aware that this webs service may be able to link your responses to your ID in ways that are not bound by this consent form and the data confidentiality procedures used in this study, and if you have concerns you should consult this service directly.

You may contact any of the researchers at the following addresses and phone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study: Sandy Kelso, Moore Norman Technology Center, Norman, OK 73070, (405) 364-5763, ext.4143, sandy.kelso@mntc.edu or Dr. Belinda Cole, 255

Willard Hall, Stillwater, OK 74078, (405) 744-9502, Belinda.cole@okstate.edu. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.
I understand that my child's participation is voluntary; that there is no penalty for refusal to participate, and that I am free to withdraw my permission at any time. Even if I give permission for my child to participate I understand that he/she has the right to decline.

I have been fully informed about the procedures listed here. I am aware of what my child and I will be asked to do and of the benefits of my participation. I also understand the following statements:

I have read and fully understand this permission form. I sign it freely and voluntarily. A copy of this form will be given to me. I hereby give permission for my child _____(insert child's name here)_____ participation in this study.

_____ _____

Signature of Parent/Legal Guardian Date

I certify that I have personally explained this document before requesting that the participant sign it.

_____ _____

Signature of Researcher Date

APPENDIX B

Read each statement and then select the number which best describes how you feel. **5 – Definitely** **4 - Probably** **3 –Not Sure** **2 – Maybe** **1 – Not at all**	5	4	3	2	1
1. I enjoy doing things on the computer					
2. I will be able to get a good job if I learn how to use a computer.					
3. I enjoy computer games.					
4. I feel comfortable when using a computer					
5. My peers think it is a good idea to know how to use a computer.					
6. I enjoy doing my assignments on the computer.					
7. I get very frustrated when using a computer.					
8. I will be able to do my assignments better when using a computer.					
9. People who like computers are considered unsociable.					
10. Computers are fun and exciting.					
11. Computers are difficult and hard to use.					
12. I think that a home computer would be fun to own.					
13. I do not like computers.					
14. Working with computers is not interesting to me.					
15. I can use a computer without assistance.					
16. People who program computers are not my friends.					
17. Computers make me nervous and uncomfortable.					
18. I have taken an entry level course in computers.					
19. I am not interested in computers.					
20. People who work with computers are strange and unsociable.					
21. I think it takes a long time to complete assignments with a computer.					
22. I have a computer at home that is available to use.					
23. It would be hard for me to learn how to program a computer.					
24. I do not think most women are able to become computer programmers.					
25. Given time and training anyone can learn to program a computer.					
26. I would rather stay at home and work on the computer than go out with friends.					
27. Computers are boring.					
28. Females do not know how to program a computer as well as a male.					
29. There are no women in the history of computing.					
30. Computers are not easy to use.					
31. I could easily be a computer programmer if I wanted to.					

32. I have no interest in computers at all.					
33. There is no way I would ever want to have a career working with computers.					
34. I have very little patience to learn computers or programming.					
35. If I had training I could learn how to program a computer.					
36. I chose my career major at MNTC because my friend was taking this course.					
37. I have always wanted to be in this career major at MNTC.					
38. I have no interest in computers or programming.					
39. Women who are computer programmers are nerdy and weird.					
40. I think that computers are fun.					
41. I am not sure that I know how to use the computer.					
42. There are not many women taking computer classes in technology centers.					
43. It takes me a long time to finish tasks using a computer.					
44. I feel comfortable using computers and technology.					
45. I enjoy learning things on the computer.					

VITA

Sandy Lea Kelso

Candidate for the Degree of

Master of Science

Thesis: COMPUTING! SHIFTING THE PARADIGM BY DESCRIBING FEMALE'S ATTITUDES TOWARDS COMPUTING

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Biographical:

Education:

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2007 – 2011 Prepaid Legal Services, Inc. Ada, Oklahoma
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2011 – Current Moore Norman Technology Center Norman, Oklahoma
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Oklahoma Association for Supervision and Curriculum Development (OASCD)
American Federation of Teacher (AFT)
Computer Science Teachers Association (CTSA)
Information Systems Security Association (ISSA)