Where Are the Girls? Exploring Influences on Female Eighth Grade Public School Students’ Choices of Technology Classes in Texas: A Mixed Method Action Research Study

Shasta Colon

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WHERE ARE THE GIRLS? EXPLORING INFLUENCES ON FEMALE EIGHTH GRADE PUBLIC SCHOOL STUDENTS’ CHOICES OF TECHNOLOGY CLASSES IN TEXAS: A MIXED METHOD ACTION RESEARCH STUDY

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Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Education in

Curriculum and Instruction

College of Education

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DEDICATION

This body of work is dedicated to my family and friends who encouraged me along my dissertation journey. Some of you were with me the entire time and others have joined me in this process along the way. I appreciate your support more than words can express. Your consistent encouragement and reassurance were essential to my success.

To my writing partner, thank you for everything. All of the hard work and late nights, all of the encouragement, and even all of the tears. It’s been an amazing journey.

To my parents, who raised me to never give up and to never stop succeeding – Thank you for your never-ending support.

To my two sons, your patience and understanding thought all of this has been nothing short of astonishing. You were understanding through long nights of writing and encouraging in my moments of frustration. I love you both!
ACKNOWLEDGEMENTS

I would like to acknowledge several people who have been vital to the success of this researched study. I would like to acknowledge the faculty and staff of the University of South Carolina department of Educational Technology. Thank you for your guidance through this process.

Thank you to my committee members Dr. William Morris and Dr. Hengtao Tang. Your feedback was always helpful and challenged me to produce a stronger study.

Thank you to my cohort Slytherin members. This would have been an impossible task without you. Thank you for being a part of my experience and for allowing me to be a part of yours.

I would like to offer so much thanks and gratitude to my dissertation chair, Dr. Ismahan Arslan-Ari. Thank you for your patience and knowledge. Thank you for keeping me on the right path and aiding in my success.
ABSTRACT

There is a continuing trend of unrepresented female students in STEM classrooms, particularly in technology courses. There is a focus on the K-12 learning environment to increase the number of female STEM students, which will encourage a growth in participation for females in the STEM field (Sassler, Glass, Levitte, & Michelmore, 2017). The purpose of this study was to increase the number of females students who enroll in technology courses in a public school in Kether Independent School District (KISD). The participants were 66 eighth–grade female students who were enrolled in the College and Career Readiness (CCR) and Technology Applications classes and two eighth grade CTE teachers. An action research study was conducted to answer the research questions investigating; eighth–grade female students’ perceptions about technology courses at KISD, the factors that influence the eighth-grade female students’ choice of technology courses at KISD, and how eighth grade CTE teachers perceive factors influencing eighth-grade female students’ choices of technology courses at KISD.

The data collection instruments included a student survey with open-ended questions, to collect both quantitative and qualitative data as well as semi-structured instructor interview protocols, to explore the educators’ perspectives. Quantitative data was collected in the form of a student surveys and analyzed using JASP software. Descriptive statistics was used to describe quantitative findings. The findings showed that the female participants generally had a positive perception of technology classes. The
factor with the greatest influence was peers ($M = 3.28$, $SD = 0.70$). Qualitative data was collected in the form of student open-ended survey questions and teachers’ interviews. Inductive analysis was used to locate themes from the open-ended survey questions and teacher interviews. Qualitative findings showed that parental involvement has a large influence on the female participants' choice to enroll in a technology course. The study discussed recommendations were made for classroom teachers, students, and district administration to assist in increasing the number of female students who enroll in technology courses.
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CHAPTER 1
INTRODUCTION

National Context

Historically, there has been a continuous shortage of women in STEM careers (Milgrim, 2011). There is national movement to elevate the numbers of females in Science, Technology, Engineering, and Mathematics (STEM) courses and careers. Across the United States, school districts experience a significantly lower number of females in STEM programs than their male counterparts. Meadows (2016) explains that gender gaps in some STEM careers have decreased while others have remained the same or increased. Calculus classes are seeing equal enrollments of both boys and girls, yet boys are statistically more likely to participate in physics and engineering in high school (Meadows, 2016).

As found by Gomell, Hmelo-Silver, Sabanovic, and Francisco (2016) middle school–aged girls lose their self-confidence and interest in STEM-related courses. In middle school, students begin to select their own elective courses and females are less likely than boys to select a course in the STEM field. Since the majority of the STEM fields and classes experience a deficit of females, leaders in schools and organizations are implementing innovative policies and practices to create a more inviting environment for girls and women. The intention of the policies is to produce a gender balance (Hart, 2016; van Langen, 2015; Wang & Degol, 2016).
In November of 2009, former U.S. President Barack Obama began the Educate to Innovate initiative. The intention was to increase the United States’ world ranking in STEM education over a ten-year period (Educate to Innovate, n.d.). An extension of the initiative is to expand exposure for girls in relation to STEM education and activities. Educate to Innovate partnered with agencies and organizations such as NASA, the Girl Scouts of America, and the Department of Energy’s women in STEM mentoring program as a method of focusing on capturing the attention of female students (Educate to Innovate, n.d). The Obama Administration’s Educate to Innovate movement, sought to fill positions with STEM qualified females. Employers have difficulty finding qualified female applicants because girls are dropping out of the STEM tract early in their educational career (Chesky & Goldstein, 2018). President Obama’s initiative helped bring to light the necessity of encouraging girls to be more proactive in STEM education. Furthermore, utilizing the Department of Energy’s mentoring program emphasizes the need to add additional female role models for young girls.

One of the difficulties with reducing the gender gap in the STEM field is the concept that women feel undervalued, and they decide to make other career choices. In a case study of 25 university STEM professors, the female professors explain that they feel as if they have to try harder to be viewed as equal to the male professors. For instance, the female professors felt compelled to participate in university functions as a way of being viewed as a member of the full-time faculty (Hart, 2016). In tenure decisions, the women expressed the idea they were overlooked for promotion because they did not represent the majority population in STEM careers (Hart, 2016). The case study continues to illustrate how the female faculty experience a lack of support and comradery
with the male faculty (Hart, 2016). It will continue to be a struggle for girls to find female role models in the STEM field if women continue to experience hardships in bridging the gender gap.

A second difficulty with encouraging women to enter the STEM industry is the number of women who leave the STEM degree plans for non-STEM areas of study. Dresden, Dresden, Ridge, and Yamawaki (2018) conducted a study that concluded female enrollment in male dominated college courses has increased. However, the study revealed that retention of female students is a challenge because the females switch to non-STEM courses. The problem continues with females who complete engineering degrees but never pursue engineering career opportunities (Dresden et al., 2018). The study claims that 60% of female college students experience sexual harassment in any male dominated degree plan (Dresden et al., 2018) and the potential for sexual harassment could be a deterrent for women who are interested in entering the STEM arena.

Women are not choosing STEM classes or careers for a variety of reasons. Those reasons affect not just the current generation in the work force but the up-and-coming generation as well. STEM industries are missing the female perspective on innovative products. Women perceive functionality of objects differently than men and a missed opportunity for a woman’s opinion reduces the opportunity for a more innovative product (Chesky & Goldstein, 2018). Furthermore, there is a deficit of female role models in the STEM industry and that phenomenon funnels down to the younger generations (Milgram, 2011). Females need role models who they can relate to in age, education, social status, and career interest (Stoerger, Hopp, & Ziegler, 2017). There is a need to increase the
number of females in STEM classes and careers, and successful female role models in
STEM jobs would help achieve that increase.

**Local Context**

Nationally the topic of STEM includes all aspects of science, technology,
engineering, and mathematics. This action research study will focus of the technology
component of STEM education. Specifically, the technology courses that are available at
Kether Independent School District (KISD) for high school students. To outline this
problem in the local content, this action research study will include information on the
surrounding area and technology classes offered at KISD.

Kether ISD (KISD) is located in Kether, Texas, which is in the central part of the
state. Kether is approximately 60 miles north of Austin and approximately 50 miles south
of Waco. As of July 2018, Kether has a population of 149,102 with a median household
income of $48,848 in 2017 and 13.9% living in poverty (U.S. Census Bureau, 2018). The
U.S. Census Bureau (2018) reported 91.4% of households have a computer and 80.9 %
have broadband internet service. The population is 44.4 % Caucasian, 37.1% African
American, 25.6% Hispanic, and 4% Asian (U.S. Census Bureau, 2018).

There is a U.S. Army base that is connected to the City of Kether and reported a
population of 29,598 in 2010 (United States Census Bureau, 2018). The military children
who reside within the geographical boundaries of the military installation attend KISD
schools. The student population is considered a migrant population due to the military’s
permanent change of station (PCS). Kether Independent School District is comprised of
32 elementary schools, 12 middle schools, 4 high schools, and 5 specialty campuses (i.e.,
Kether Career Center and College Prep High School). The district supports approximately 45,000 students from pre-k to twelfth grade (KISD, 2021).

KISD has a specialty Career and Technology Education (CTE) campus, Kether Career Center (KCC), where students learn marketable skills in a variety of industries. Students are challenged to meet the College Career Military Readiness (CCMR) index, in addition to graduation requirements upon course completion at KCC. Students meet the CCMR index by successful completion of the industry certification that corresponds with the students’ selected endorsement. The KCC has a unique structure because students spend half the day at their home campus and half the day (morning or afternoon) at KCC’s campus. The four traditional KISD high schools, also referred to as home campuses, all share students with KCC. Students can select to enroll in KCC classes in the tenth grade. All ninth-grade classes are attended at the home campuses.

KISD experiences the same deficit of females in technology classes as identified nationally with STEM courses. For example, in the 2018-2019 school year, two out of 25 students enrolled in Robotics I at Solomon High School were female. Additionally, one of the female students did not choose to be enrolled in the course but instead was added to the class by the school counselors. The other female student had intentions of being a computer science major but chose the path of cyber security. She plans to continue to explore a career in the technology sector after completing her four-year college degree. Additionally, she was the president of the Robotics competition team for the 2018–2019 school year.

Table 1.1 explains the enrollment numbers based on gender for Robotics II and Information Technology for the 2020-2021 school year at KCC. Table 1.1 is broken
down by each of the four traditional high schools and combines the morning and
afternoon classes.

Table 1.1 Male and Female Students Enrolled in Technology Courses by High School for
2020-2021 school year.

<table>
<thead>
<tr>
<th>High School</th>
<th>Course</th>
<th>Number of Enrolled Students by Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS 1</td>
<td>Robotics II</td>
<td>11 Male students 0 Female students</td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td>13 Male students 1 Female student</td>
</tr>
<tr>
<td>HS 2</td>
<td>Robotics II</td>
<td>10 Male students 2 Female students</td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td>12 Male students 2 Female students</td>
</tr>
<tr>
<td>HS 3</td>
<td>Robotics II</td>
<td>7 Male students 1 Female student</td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td>4 Male students 0 Female students</td>
</tr>
<tr>
<td>HS 4</td>
<td>Robotics II</td>
<td>2 Male students 1 Female student</td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td>5 Male students 1 Female student</td>
</tr>
</tbody>
</table>

The Career Center offers a professional Fuji Automatic Numerical Controls
(FANUC) Robotics certification for Robotic practicum students (KISD, 2018). For the
2018-2019 school year, the certification class had four students, two boys and two girls.
The Robotics II course also had four students, three boys and one girl. All students were
seniors and the future intention for the specialty high school and school district is to
increase the number of enrolled students, especially females, in the following years
(KISD, 2018). In the 2019–2020 school year, KCC experienced an increase in enrollment
for the Robotics II course. The course population was ten students, nine boys and one
girl. As a transition of this program, Robotics II students were now eligible for the FAA Part 107 UAS Drone Pilot’s license. In the 2019-2020 school year there were no students enrolled in the Practicum course.

The 2020-2021 school year began during a global pandemic. The SARS-CoV-2 coronavirus changed the educational environment by forcing school districts to create a virtual learning platform. Due to the learning activities in the Robotics classes, KISD made the decision that in order to participate in these classes students would be required to attend face-to-face instruction. The decision for face-to-face instruction caused a decrease in the planned enrollment for Robotics because parents choose to remove their child from the class for a virtual option. Currently, for the 2020–2021 student year, the Robotic II class consists of 34 students enrolled, 30 males and 4 females. The Practicum course had a total of seven students enrolled, six males and one female. The 2020-2021 Robotic Practicum students were the 2019-2020 school year’s Robotic II students.

The 2021-2022 school year was a return to educational normalcy. Virtual learning was no longer offered, and all students were back in the classroom. Overall, there was a decrease in the number of upper-level Robotics students due to a lower enrollment in Robotics I because of virtual learning the previous school year. Table 1.2 outlines the enrollment of male and female students for the advanced level of Robotics at KCC.

Table 1.2 Male and Female Students Enrolled in Technology Courses by High School for the 2021-2022 school year.

<table>
<thead>
<tr>
<th>High School</th>
<th>Course</th>
<th>Number of Enrolled Students by Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS 1</td>
<td>Robotics II</td>
<td>9 Male students</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Female students</td>
</tr>
<tr>
<td></td>
<td>Robotics Practicum</td>
<td>5 Male students</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 Female student</td>
</tr>
<tr>
<td>HS 2</td>
<td>Robotics II</td>
<td>4 Male students</td>
</tr>
</tbody>
</table>
Presently, I teach Robotics II and Robotics Practicum. Being a female technology instructor, most of my colleagues and superiors are male. As the Robotics instructor, I am the only female in the district to teach this course. The previous Robotic Practicum instructors were male. When I attended the AP Computer Science training offered by AP College Board in 2017, I was the only female teacher among the Computer Science teachers. Sharing this experience is beneficial for my female students because I understand what it is like to be the minority gender in the classroom. Personally, I have experienced how intimidating it can be to be the only female in the room, but I also understand it is important to overcome that feeling. Furthermore, my male students experience a female technology instructor and get to see a different approach to teaching technology courses since the other instructors are male.

In addition to teaching technology classes, each school year I am required to participate in recruitment activities for classes I teach at KCC. As a campus, we speak to middle school students about the programs we offer so students know their course options when selecting their high school endorsement. KCC conducts tours for middle
school students to observe students working in each program of study. There are parent
information nights, where parents can ask questions and learn about the collection of
programs offered at the Career Center. Specifically, during these events, I represent the
Robotics program. I answer student and parent questions about available certifications as
well as display student-built robotics equipment.

**Statement of the Problem**

The number of eighth–grade female students selecting to enroll in technology
courses in KISD is causing a gender imbalance in the technology classes, which is
limiting future opportunities.

**Purpose Statement**

The purpose of this action research was to explore the factors influencing eighth
grade female students’ choices regarding technology classes in KISD. The intended
outcome of this study was to identify recommendations for recruitment practices to
increase the number of female students in technology classes.

**Research Questions**

This study will be guided by three research questions:

1. What are the eighth-grade female students’ perceptions about technology courses
   at KISD?

2. What are the factors that influence eighth-grade female students’ choices of
teaching courses at KISD?

3. How do the eighth grade CTE teachers perceive the factors influencing eighth–
grade female students’ choices of technology courses at KISD?
Researcher Subjectivity and Positionality

I made the decision to pursue a doctoral degree in educational technology to advance my career and to gain a new perspective of technology use within the education system. I am a certified teacher for classes in the technology component of STEM education. In the last eight years, I have taught courses such as Video Game Design, Fundamentals of Technology, Principles of Technology, Technology Applications, Robotics, Computer Maintenance, Computer Programming, and Computer Science. Most of these courses do not come with curriculum and it falls on me as the instructor to create innovative lessons. Gaining knowledge on proper integration of technology in the classroom and curriculum has been beneficial to my students and my professional development.

From my perspective, technology is a very direct way of completing a task, which overlaps with my personality. I frequently describe myself as having a “point A to point B” personality, meaning I speak in a very direct manner, and I tackle tasks with a tunnel vision-like focus. Educational technology is a means of streamlining any educational process for efficiency and even innovation.

A challenge for me in becoming an educational technology professional is the generational difference with technology. The current generation of students has been raised on several forms of technology and social media. Contemporary students are accustomed to all-in-one computers, laptops, smart phones, and mobile tablets being readily available in a classroom setting. These are the technological components that increase efficiency and are relatable to the contemporary student. When I attended high school the only Internet available was dial-up and social media did not exist.
Additionally, there was only one computer lab available in the school with approximately 20 computers. This change of social norm creates a challenge because my generation plays technology catch-up with today’s youth.

An ideal educational technology professional has the ability to evaluate learning needs and manipulate technological tools for appropriate educational purposes. Educational technology is utilized to create curriculum and an educational environment that incorporate technology in a meaningful way. This includes managing the inventory of technology resources and implementing technology procedures in the classroom. Being a technology teacher, I have several methods of technology (i.e., iPads, desktop computers, and laptop computers) available to my students every time they enter my classroom. Incorporating technology appropriately into instruction increases the quality of education students receive because it enhances the active learning environment.

In my professional experience of teaching in a technology driven content area, I forget that not all content areas have technology at their disposal. A professional in educational technology needs to be cognizant of the technology resources available and how to manage those resources based on the learning environment. My professional experience allows my perspective to be skewed in relation to the concept of what technology looks like in different classroom settings.

Through my research I am interested in learning more about the course choices of teenage girls in STEM. Being a female professional in the technology sector, my belief is that it is important to find a way to increase the number of females in the field. However, I am uncertain why it appears that girls lose their interest in technology courses as they get older. By researching and gaining an understanding of the opinions and decisions of
middle school girls, it will help me as a teacher to design more effective recruitment strategies, thereby attracting more females into this course of study—and ideally the STEM career field.

My research paradigm is the pragmatic paradigm. The pragmatic perspective is the idea that world views are based on situations, actions, and consequences (Creswell & Creswell, 2018). This paradigm correlates with my research topic because it is based on real-world situations and 21st century skills. A deficiency of females in technology courses is a real-world problem for leaders in secondary schools, colleges, and the technology industry.

The pragmatic perspective is the idea that world views are based on situations, actions, and consequences (Creswell & Creswell, 2018). Creswell and Creswell (2018) use four categories to describe the pragmatic view: consequences of actions, problem-centered, pluralistic, and real-world practice oriented. Personally, I focus more on the real-world approach to problems. As a teacher whose content focuses on 21st century skills, it becomes natural to relate almost everything to a real-life situation. The world’s problems are always evolving and by extension research related to world problems is continuously evolving.

My positionality within my research is an insider where I am researching my own professional setting. The intention of my research is to understand what attracts and repels young girls from taking technology classes. The research will immediately impact my program and possibly increase the number of students enrolled in the classes I teach. Kerr and Andersen (2005) recommend not ignoring the commitment to success of the research for self-study. The focus of my research directly overlaps with my professional
arena. The success of my research does not directly impact the learning in the educational environment it simply enhances the environment by increasing diversity. This distinction generates a barrier to assist in separating my bias and success of research; each year we are required to recruit for our individual programs. The knowledge I gain from middle school girls will inform my recruiting practices to attract more girls to technology classes.

I will negotiate my positionality with my research, participants, and stakeholders by having an insider’s perspective of the topic but not an insider’s influence over the researched data. The stakeholders also have an insider interest in the research topic because the results relate to specialty programs where there is a vested interest to increase enrollment. I will also utilize outsiders (i.e., doctoral peers, instructors, and committee members) to review the information and data in order to have checks and balances built into the process.

Educational technology is designed around actions, which creates alignment with a pragmatic paradigm. Integrating and managing technology requires critical thinking and problem solving. Educational technology remedies real-world problems, whether they are in the classroom, training room, or workplace setting.

My research will be strengthened by my world views and experiences because I can relate to the population that I am observing. My own experiences as a female in the technology industry and female technology teacher provides additional insight into the situation. Additionally, it creates an opportunity for me as the researcher to build a relationship with the human subjects. Since I am aware of what it is like to be the minority gender, I will be able to create relevant survey questions in order to construct a comprehensive research tool.
My research could be limited by my experience by assuming that all girls in technology classes or industry have the same experience. The reality is there are girls who actively pursue technology careers and remain on that career path. It is necessary to be cognizant of the fact that my experiences are just that—my experiences. Not every girl will know what it is like to be the minority gender in a technology classroom.

I am a female doctoral student at the University of South Carolina. I grew up in a small town in Pennsylvania and attended college in Albany, New York. I hold a master’s degree in Business Administration and obtained my teaching certification through an alternative teaching program. I maintain teaching certifications in the states of Washington and Texas. Professionally, I teach Technology Education at KISD in Kether, Texas. I am a high school teacher and will be researching the factors that influence the choices eighth-grade female students make when enrolling in technology classes.

As female technology instructor, most of my colleagues are male and this fact allows for insight and bias into my research topic of recruiting practices for females in technology classes. My personal and professional experiences as a female in the technology sector makes it easier to relate to the girls who are apprehensive about entering the field. I can be a role model to the girls who want to pursue a technology-based career.

Conversely, being a female in the technology sector enables the potential for bias in assuming the girls will be the minority gender in the class. When formulating research questions, I will need to construct questions that are not leading or request different responses for males and females. Without carefully worded questions, my biases could be reflected in the survey and could cause inaccurate results. Furthermore, it is necessary to
acknowledge that not all girls will experience the same apprehension about technology courses. My personal and professional experience will not be their individual experiences.

As a high school technology teacher, I utilize multiple platforms of technology every class period. I have preconceived notions about educational technology, such as assuming all teachers in all content areas have technology readily available. As a researcher in educational technology, I will need to obtain background information regarding what technology is available and how it is utilized on a day-to-day basis. It will be essential to have the knowledge of what type of technology is most interesting in young females to include into recruiting practices.
**Definition of Terms**

21st Century skills are employability skills that correlate with a workforce setting such as, communication, collaboration, creativity, critical thinking, and problem-solving (Van Laar, Van Deursen, Van Dijk, & De Hann, 2019).

CTE education is Career and Technology Education. It is vocational training that is vital in the workforce and labor market (Stevens, Kurlaender, & Grosz, 2019).

Equity in STEM is when the STEM learning and working environment is diverse in gender and ethnicity (Barber et al., 2020).

Social Cognitive Theory is a learning theory that concentrates on the interaction and relationship between personal characteristics, behaviors, and environment (Rubenstein et al., 2018).

Social Cognitive Career Theory is influenced by social cognitive theory and reviews an individual’s career choice as being the result of self-efficacy, outcome expectations, and personal goals (Burga, Leblanc, & Rezania, 2020).

STEM education is the engagement in the classes of Science, Technology, Engineering, and Mathematics. STEM education goes behind core classes, and it involves course selection and career aspirations (Murphy, MacDonald, Wang, & Danaia, 2019).

Students’ perception is a demonstration of their choices and gives students’ a voice in learning programs (Wu, Pease, & Maker, 2019).
CHAPTER 2
LITERATURE REVIEW

Introduction

The purpose of this action research was to explore the factors influencing eighth grade female students’ choices regarding technology classes in Kether Independent School District (KISD) in order to make recommendations to increase the number of female students in technology classes. Students who are enrolled in the eighth grade in KISD are required to take the CCR and Technology Application courses. In the CCR class, students explore several different future career options and select their high school endorsement. The Technology Applications explores different avenues in technology education. One endorsement option is a technology track, which is seldom pursued by female students. The literature review focused on three research questions: (1) What are the eighth-grade female students’ perceptions about technology courses at KISD? (2) What are the factors that influence the eighth-grade female students’ choice of technology courses at KISD? (3) How do the eighth grade CTE teachers perceive the factors influencing the eighth-grade female students’ choices of technology courses at KISD?

The literature review includes researched studies that helped determine the reasons why eighth grade girls are not selecting to enroll in technology courses in KISD. The literature review began with literature that explained the broad term of STEM education and then further explored the importance and challenges associated with STEM
education. The next section involved literature on equity in STEM and includes the gender gap in STEM education, girls in STEM education, and girls in technology education. The largest section of researched material highlights the factors influencing girls’ enrollment in technology courses. Several factors were discovered during the research process. The three groupings of factors are comprised of the societal, organizational, and personal factors that influence girls’ decisions to participate in STEM courses. The third section incorporated research into students’ attitude about STEM courses and fields. The next to last portion researched students’ perceptions of STEM classes and industries. Finally, the literature review includes the theoretical framework of social cognitive theory (SCT) and social cognitive career theory (SCCT).

**Method for Literature Review**

The method for the literature review was conducted utilizing an online collegiate library available through the University of South Carolina. There were four separate databases used for research, including Educational Resource Information Center (ERIC), Business Source Complete, Academic Search Complete, and Science Citation Index. The databases were used to search for peer-reviewed, academic journals with a focus on empirical research between the years 2010–2020. The online searches were conducted periodically between January 2019 and December 2020. Initial searches covered a ten-year period and included broad topics and used key words such as *women in STEM careers, less girls in STEM, females in STEM* and *gender gap in STEM*. These searches returned articles that focused on the science and mathematics components of STEM. While the research includes the overarching umbrella of STEM, mathematics and science were not the main focus of the action research. Also, many articles were from
international journals. Subsequent searches used more specific key words to narrow down topics, specifically, exploring STEM courses for girls, girls in technology classes, and female enrollment in STEM courses. This cycle of research returned articles involving engineering and computer science classes. In order to obtain contemporary articles, the parameters were reduced to the five-year span from 2015–2020 and was geographically limited to the United States.

The next literature search was for social cognitive theory (SCT) and social cognitive career theory (SCCT). Using EBSCOhost Business Source Complete and the search words Bandura Social Cognitive Theory returned an article written by Albert Bandura on the foundation of SCT. To obtain the original document by Bandura, search parameters were adjusted beyond the ten-year requirement to incorporate the year 2001. The research parameters for years were reset to 2015–2020, to retrieve current and relevant studies for SCCT. The search was then expanded to incorporate SCT in STEM and the search results gave articles that included SCCT. The next step in the research process was to conduct searches specifically using the key words social cognitive career theory. Then it was necessary to find peer-reviewed journals relating SCCT to STEM education and careers. These searches were conducted implementing the keywords SCCT in STEM.

The last search for the literature review was focused on alignment with research questions one and two. All of the previous parameters were used such as the year range of 2015-2020, academic peer reviewed journals, and online availability. In this grouping of research, the first search was conducted for students’ attitudes towards STEM. Key words used were students’ attitudes in STEM classes and students’ attitudes toward
STEM. The key words for students’ perceptions where similar because the searches were slightly altered to use the words student’s perceptions of STEM classes.

**STEM Education**

Science, Technology, Engineering and Mathematics (STEM) education is an interdisciplinary approach to incorporate all four areas of study to increase innovation (Sheffield, Koul, Blackley, & Maynard, 2017). Students who participate in STEM education experience a hands-on learning environment that is intended to advance technology and provide future career opportunities. Currently, there is a goal in the United States’ education system to increase competency in the STEM disciplines, which will increase the number of qualified applicants for STEM positions (English, 2016). Additionally, there is a focus in the United States to increase enrollment in STEM courses in both secondary and post-secondary education.

**Significance of STEM Education**

STEM education is important in the current learning environment because it will help fill the employment gap in the United States (Peters-Burton, House, Peters, & Remold, 2018). Businesses are lacking in innovative and competitive ideas due to a shortage of knowledgeable, qualified candidates in technology positions (Abbas & Natta, 2018; Feller, 2011). Making STEM education available to students at a lower grade level would increase the number of STEM professionals in United States (Lazaros & Bormann, 2013; Rigler, 2018; Solberg, 2018). STEM education is used to incorporate 21st century skills into the classroom, which teach students how to be productive and successful in the workplace (McConnell & Dickerson, 2014; Littlejohn & Hood, 2017; Reeve, 2015). STEM education steps outside of a traditional classroom environment through project-
based learning, self-directed activities, and student-centered lessons (Mesas-Carrascosa, Porras, Trivino-Tarradas, Merono de Larriva, & Garcia-Ferrer, 2019; Sheffield, Koul, Blackley, & Maynard, 2017; Ryoo & Barton, 2018). This allows students to learn problem solving and creativity and gain the ability to troubleshoot issues. Additional skills needed to encourage success in a STEM classroom is critical thinking and higher-order thinking (Barlow-Jones & van der Westhuizun, 2011). Students also acquire digital and computing skills (Wong, 2017). The skills students obtain in a STEM classroom are beneficial for future careers and even everyday life.

Many of the skills students learn in a STEM classroom are beneficial for all students. However, the success of STEM education is challenged by the lack of female participation. Leaders of businesses and educational institutions are faced with implementing policies and programs to eliminate this challenge (Milgram, 2011; Mone, 2016). Enrollment in STEM courses is in a deficit because not enough students are selecting these courses. Furthermore, fewer girls than boys select STEM courses which increases the need for female enrollment in STEM (Bozick, Srinivasan, & Gottfried, 2017; Burrows, Lockwood, Borowczar, & Janak, 2018). A challenge to STEM education is inequity within the field. More specifically, correcting the inequity is a challenge.

**Equity in STEM Education**

Equity in STEM means a fair and equal environment for Science, Technology, Engineering, and Mathematics for genders and ethnicities (Young, Young, & Ford, 2017). Minorities such a Black Americans and Hispanics are underrepresented in the STEM arena and traditionally not included in STEM education, which limits diversity (Barber et al., 2020; Ong, Smith, & Ko, 2016; Young, Young, & Ford, 2017). The focus
of this research is on equity in STEM from the gender perspective. Females in the STEM courses and careers should experience the same treatment and environment as their male counterparts. In many instances boys are encouraged to pursue a STEM course or career and girls are discouraged by hearing how difficult it is for women in the field or by being told boys are better at math and technology (Bartow, 2016; Khan & Rodrigues, 2017). Encouragement of participation for both genders and different ethnicities will go a long way for equity in STEM.

Equity in STEM education is significant because business leaders need qualified employees to fill positions and create ideas that help generate revenue. Women are underrepresented in innovative STEM fields and having an increase of women in STEM education also increases innovation because females possess a different perspective than males (Kuschele, Ettl, Diaz-Garcia, & Alsos, 2020). STEM education goes beyond just learning fun things in the classroom. STEM education and knowledge translates to job and information required for a successful workplace. It opens the learning and employment environment for ideas that would not have been generated otherwise (Bogdan-Martin, 2018; Elbers & Grigore, 2018; Liao, Motter, & Patten, 2016). Businesses with innovative ideas experience an increase in revenue and financial stability (Holmberg-Wright & Wright, 2018). Creating an equitable environment and obtaining both male and female perspectives in STEM increases the probability of success for businesses.

The gender gap in STEM education is the numerical difference of the boys represented in STEM versus that of girls (Milgram, 2017). This gap is acknowledged in secondary education, post-secondary education, and industry. Moreover, the gender gap
in STEM is not simply an issue in the United States but an international problem (Elbers & Grigore, 2018; Engstrom, 2018; Holmes, Gore, Smith, & Lloyd, 2018; Ismail, Zulkifi, & Hamzah, 2017). Countries such as Switzerland and the United Kingdom both encounter a stable shortage of women in the field of STEM (Makarova, Aeschlimann, & Hezog, 2016). One study contributed the gender gap in STEM education to the gender expectations that relate to post-secondary education and career preparation (Han, 2016).

Higher institutions implement unconventional methods to reduce the gender gap and increase females’ confidence in STEM (Bystydienski, Eisenhart, & Bruning, 2015; D’Inverno, Kearns, & Reidy, 2016). Schools and organizations are actively attempting to increase the number of girls in STEM education by putting policies and actions into place to attract more females to the STEM field. Some post-secondary institutions establish non-research-intensive programs of study for STEM, and they are experiencing an increase in female enrollment and degree completion (Miller & Hurlock, 2017). Policies are put into place for a more gender balanced environment (Hart, 2016; van Langen, 2015; Wang & Degol, 2016). Inclusive policies and practices are needed to create an environment where girls do not feel like outsiders.

**Gender gap in technology classes**

In a more focused search, the number of girls selecting technology courses also reflected a deficit. The lack of technology course selection for females continues through high school to postsecondary education. Colleges are witnessing fewer girls in a technology course of study and in other degree plans. Girls are less likely than boys to choose a technology course of study in college (Outlay, Platt, & Conroy, 2017; Sassler, Glass, Levitte, & Michelmore, 2016). One researched study provided statistics illustrating
only 32% of college-bound females viewed Information Technology as a viable college major, opposed to 74% of boys (Outlay, Platt, & Conroy, 2017). If girls are not selecting to pursue a college degree in the technology field, then they are also selecting to not be employable in the technology sector.

**Female Students’ Attitudes Towards STEM**

A student’s attitudes can have a negative or positive effect on motivation to pursue STEM fields or careers and those attitudes are shaped by an individual’s experiences (Kurt & Benzer, 2020; Mavridis, Katmada, & Tsiatsos, 2017; Vennix, den Brok, & Taconis, 2018). A student’s positive or negative attitude corresponds with whether or not she likes a particular topic, in this case, STEM courses and fields. (Mavridis, Katmada, & Tsiatsos, 2017). The research determined that positive attitudes are an integral part to one’s ability to achieve success in a STEM field (Davadas & Lay, 2020). Furthermore, research also concluded that a negative attitude towards STEM resulted in low performance in STEM courses or fields (Katmada, & Tsiatsos, 2017).

Mavridis, Katmada, & Tsiatsos (2017) noted the female students are more likely to have a negative attitude towards STEM when compared to male students. An intriguing fact that was presented in the research was that both male and female students were found to have positive attitudes toward the social implications of STEM careers because both genders related it to a successful life as an adult (Vennix, den Brok, & Taconis, 2018).

**Female Students’ Perceptions of STEM**

A student’s perception is associated with engagement and initiative in an active learning environment as a means to foster higher order of thinking (Kressler & Kressler, 2020; Wu, Pease, & Maker, 2019). The research clarifies that positive perceptions of
STEM prevail when hands-on activities are incorporated into lessons. Interactive hands-on classroom activities promote positive perceptions of STEM which, can potentially influence learning outcomes, positively affect student’s achievement, and influence student identities, endeavors, and retention (Kressler & Kressler, 2020; Nealy & Orgill, 2019). Another avenue of research about perceptions explain that other peoples’ beliefs can influence females’ self-perceptions of STEM courses. Research found that parents’, especially mothers, beliefs about science and math correlated with their children’s self-perception and achievement (Piatek-Jimenez, Cribbs, & Gill, 2018). Self-perception was determined to be related to what a female student knew about STEM careers and if she was able to relate herself to the career field. It is based on the idea that a female student will gain a STEM identity if she can see herself doing something STEM related (Kang et al., 2018) Additionally, students’ perception of their instructors’ beliefs can make a student question the possibility of success in STEM courses. If the students’ perception is that the instructor does not believe that she can be successful than her level of engagement and performance in STEM decreases (Muenks et al., 2020).

Factors Influencing Girls’ Enrollment in Technology Courses

The next section of the literature review contains an overview of the factors that influence the females’ choice on whether to choose a STEM career. Students in middle school, especially in the eighth grade, are easily influenced by outside factors because students in this age group are trying to fit in with those around them. When eighth grade girls are selecting high school courses, their decisions are influenced by more than their own future goals. The girls are not making decisions as independent thinkers and with considerations to their futures. This is resulting in lower numbers of girls selecting to
enroll in technology courses. Research was conducted to determine the factors that positively and negatively influence eighth grade girls’ choice to select STEM courses. These influences are related to the girls’ lives such as their family or school environment.

Societal factors are viewed as factors that are a part of the girls’ social environment. Typically, elements of an eighth-grade girls’ social situation are other students of both genders that are of the same relative age. Their peers are viewed as girls in the same class, female friends, male friends, and members on the same sports team. Family members, like siblings and parents, are the societal influences in the girls’ home environment. The last part of societal factors are cultural stereotypes that imply that technology courses are for boys and further deter girls from enrolling.

Organizational factors are the factors that come directly from the school environment. For instance, the lack of female teachers or role models and the implementation of technology activities create the atmosphere in a technology course. Through research it was determined that the type of curriculum and classroom materials that are used in the classroom are also a reason for a girl to not enroll in technology classes. Additionally, placement of non-gender items in the learning environment effects the educational opinion of female students. Leadership positions in the field are difficult for women to achieve and when they do, they are faced with resistance from subordinates.

Personal factors are the issues in the STEM or technology sector that the girls and women experience on an individual level. Women in the technology field and girls actively enrolled in technology classes must overcome being in a male-dominated environment. These factors affect the girls’ choice because they could potentially be
viewed as an outsider and feel like they do not belong. Secondly, women are more likely to debate over a family-work balance when pursuing a career. Lastly, women question whether they will be successful in a STEM career.

**Societal Factors**

Peer influences can affect a girl’s choice to enroll in a STEM class because in eighth grade, girls feel the need to socially fit in. Girls face pressure from peers to select careers that fit the social norm and identity (Katz & Halpen, 2014). Technology classes are typically considered a ‘boy’s’ class and technology careers are considered a ‘man’s’ job. Girls and women in the technology sector have commented on the absence of feeling like they belonged there. They articulate the fact of mostly feeling like an outsider because they do not meet the gender expectation (Koch & Gorges, 2016). van der Vleu, Steinmetz, & van der Werfhorst (2018) did a study that research peers and traditional gender roles. This research study concluded that adolescents are likely to conform to traditional gender roles to avoid being different than their peers. Men and women have a different perspective of technology courses, and that perspective can be altered by friends and those in a similar age group or career path. Peers influence decisions through peer pressure to make a certain choice and peer pressure is related to adhering to stereotypes (Starr & Leaper, 2019). Peers also positively impact a female’s choice for STEM through peer tutoring from other females in STEM (Katz & Halpen, 2014). Research shows that the STEM career choice can be influenced by the career choices that other students make. When a female makes the decision to pursue a STEM career path through STEM education then other females will join her in choosing STEM (Schone, von Simson, Strom, 2020).
Family members influence a young female’s choice through support or lack of support of the decision being made. Females can be influenced against choosing a technology career by factors such as their families’ economic status, language spoken at home, and geography (Adams, Barber, & Odean, 2018). Parental influence and encouragement have a profound effect on a girl’s course option. Students without a family connection to STEM are less likely to enroll in a STEM class. Both male and female students are more likely to enroll in a STEM track if they have a STEM connection through a parent or sibling (Holmes, Gore, Smith, & Lloyd, 2018). In a study that was conducted to research gender differences in Computer Science, parental perception of their child’s ability to be successful was determined to be a significant factor. In many instances, parents expected their sons to grasp the material easily while other parents anticipated their daughters to struggle to understand (Vrieler, Nylen, Cajander, 2021).

Women in STEM careers are affected by family influence due to work-family balance. STEM careers are typically classified as high demand careers, which makes it difficult to balance a family at home and responsibilities in the workplace. However, marital status does not appear to have an influence on the aspirations for a STEM career (Fouad & Santan, 2017; Myers & Major, 2017; Sassler, Glass, Levitte, & Michelmore, 2016).

Cultural stereotypes are another societal factor that impacts the girls’ enrollment in STEM courses. Young girls are faced with the stereotype that STEM is for boys because it is hands-on and that girls do not like technology classes. Additionally, it is assumed that males will be more successful in a STEM course than females. Materials
that are used to attract girls to STEM are widely different than those intended for a male audience (Brkich, Allen, Huffling, & Matthews, 2017; Chesky & Goldstein, 2018; Hand, Rice, & Greenlee, 2017). Starr (2018) researched STEM identities and stereotypes within the science field and how they effected women’s choice of STEM courses and careers. The study provided stereotypical descriptors of people who are interested in STEM and those descriptors such as unattractive and socially awkward, were reasons that women were not choosing a STEM course or career. Cultural stereotypes reduce the number of young females wanting to enroll in STEM courses because they will be forced to face adversity to be successful.

**Organizational Factors**

Teachers and role models are those who teach STEM courses or work in the STEM field. These individuals are knowledgeable and can share their knowledge with other who are interested in the STEM field. Typically, role models are individuals who the girls look up to or follow the same path. Female role models in STEM find it easier to recruit girls than their male counterparts (Milgram, 2011; Stearns et al., 2016).

Teachers and role models can be influential in the selection of STEM courses because of the environment they create. Girls can be deterred from technology-based classes due to the setup on the classroom and materials. The structure of the classroom and placement of non-gender items encourage girls to select technology classes (Boscia, n.d; Master, Cheryan, & Meltzoff, 2016). The type of course work in a high school setting can also pose challenges when attempting to increase the number of females in a STEM class. Advance level mathematics is viewed as a predictor to those who chose to
pursue a STEM career and females are less likely than males to enroll in such a course (Huber et al., 2017).

Challenges associated with role models are the lack of female role models in STEM classes or careers. There is a lack of female mentors for girls who are interested in technology classes or careers. The availability of female mentors to girls in technology increases success (Stoerger, Hopp, & Ziegler, 2017). It is difficult for girls to see themselves in a technology career when they do not have a role model for comparison.

Technology activities can attract middle school girls to choose STEM courses. STEM projects are designed specifically for females to increase their interest through hands-on activities. Several programs are girls-only as a means to increase confidence and the comfort level of the girls participating. The more exposure to positive experiences young girls has with technology will increase the likelihood of future selection of technology courses (Burrows, Lockwood, Borowczar, & Janak, 2018; Gomoll, Hmelo-Silver, Sabanovic, & Francisco, 2016; Koch & Gorges, 2016; Mesas-Carrascosa et al., 2019). A challenge associated with implementing technology activities in the classroom is that female students question their ability to complete operational computer tasks. In a researched study, women scored lower than the male participants on the computer task which was remastering a PowerPoint (Sobieraj & Kramer, 2020).

Women are faced with organizational factors related to leadership roles when they enter the STEM career field. When a woman progresses to management in the technology field, frequently she is met with a lot of resistance from subordinates. Furthermore, it is assumed that women will be ‘mothering’ and males feel the pressure to be in management (Amon, 2017; Hughes, Schilt, Gorman, & Bratter, 2017; Ismail, Zulkifli,
Hamzah, 2017). Women do not experience an easy transition from entry-level to management because they are treated differently from male and female subordinates.

Women who complete a STEM degree are less likely than men to continue on to a STEM career. This is outlined in a study by Xu (2017) who stated that women question whether or not to be employed in the STEM sector due to pay and treatment. Xu (2017) expressed the fact that women are aware that they could possibly receive a lower salary than their male colleagues. Additionally, as part of the study, Xu (2017) explained that women are met with an unsupportive male working environment when in a STEM job.

**Personal Factors**

Technology careers are viewed as being a component of a male-dominated field, and women struggle to overcome being the minority gender in the workplace. While universities and colleges are attempting to increase the number of female enrollments, there have been studies conducted that show there are subtle elements included in STEM programs that contain masculine features (McCarty et al., 2020). Women are often viewed as the weaker employee (Dresden, Dresden, Ridge, & Niwako, 2018; Makarova, Aeschlimann, & Herzog, 2016; Mone, 2016). It is common for women in a male-dominated situation whether it is in the classroom or workplace to face harassment and discrimination. Women of STEM have experienced sexual harassment from instructors, classmates, and peers and this type of harassment can hinder a woman’s motivation to pursue a STEM career (Leaper & Starr, 2019). This makes for a difficult working environment and causes women to shy away from taking the steps necessary to enter the field. There are instances where women choose to exit the STEM field due to sexual harassment (Roper, 2019).
A second personal factor for females’ choice of a STEM career is the work-life balance. Women are more likely than males to make career choices and career sacrifices based on the needs of their family responsibilities (Wang & Degol, 2017). While this factor is mentioned as a societal factor, it is also a personal factor because women are individually affected when being forced to choose between family and career. STEM careers are viewed as demanding careers and women select a less demanding career in order to meet family obligations or request a part-time and more flexible position (Wang & Degol, 2017).

The research determined that a contributing factor to the gender gap, and another personal factor, is the lack of confidence girls experience early on in STEM courses and their self-perception of their inability to be successful (Gomoll, Hmelo-Silver, Sabanovic, & Franciso, 2016; Makarova, Aeschlimann, & Herzog, 2016). Women who lack self-confidence in their knowledge of STEM disciplines do not select a STEM path because they believe they will not be successful and will fail (van Aalderen-Smeets & Walma van der Molen, 2016).

Theoretical Foundation

Social Cognitive Theory (SCT) is a theory of psychology that includes the social environment as a factor to one’s behavior (Bandura, 2001). The theory also acknowledges that behaviors change through social evolution. The collective power component of SCT incorporates people’s shared beliefs. SCT is used as a predictor of future behavior to determine if an individual will engage in a task and measure self-efficacy (Kaminsky & Behrend, 2015). SCT has an impact on STEM because it plays a role in academic and career decisions through self-efficacy. SCT is used to predict
behavioral intentions to enrolling in STEM courses (Bandura, 2001; Cheng & Chu, 2012; Steward et al., 2020). A study by Wang and Lin (2021) suggests that SCT incorporates the effects of personal and environmental factors for the participants.

Mozahem (2020) conducted a study that viewed SCT as a triad of person, environment, and behavior. The study described the relationship between the person, and the environment as bidirectional. An individual’s options can be limited by environment however, the individual has the opportunity to select which aspect of the environment to experience (Mozahem, 2020). Schunk & DiBenedetto (2020) explain, using SCT, that people strive to achieve a sense of influence over the events that occur in their lives. They further explain that people try to exercise this influence by setting goals and determining the best way to accomplish those goals. The proposed research focuses on an extension of SCT, which is social cognitive career theory.

Social Cognitive Career Theory (SCCT) is derived from SCT and relates to students’ choice of college majors and future career paths (Atadero, Rambo-Hernandez, & Balgopal, 2015). SCCT is used to evaluate the social environment for perceived barriers of entry and areas of support for women who pursue careers in the STEM industry. SCCT focuses on career choice and whether that choice is affected by the social environment and the role self-efficacy plays in that decision (Foud & Santon, 2017). Women of minority backgrounds and lower income levels are even less likely to enroll in STEM classes or pursue STEM careers (Byars-Winston, & Rogers, 2018; Fouad & Santan, 2017; Hall, 2017; Myers & Major, 2017). Women can be deterred from exploring a career in STEM due to the social influences, such as direct peers and family situation. Foud and Santon (2017) explain parental influence on outcome expectations and goal
intentions for middle school students. Positive social support is required from the individuals who make up the social environment of the females in the STEM field. These individuals are essential to the success of females in the STEM field and serve as a protective factor when choosing to enter such a challenging field of study (Chaschashvili-Bolotin et al., 2016). Burga, Leblanc, & Rezania (2020) completed a study that implemented of SCCT models of career interest, choice, and performance. Their study explained that SCCT is an extension of SCT because it considered a person’s career choice and the complex interactions of self-efficacy beliefs, outcome expectations, and personal goals.

Summary

There are several factors that affect a female students’ choice of whether to enroll in a technology class. Researching those factors and understanding what affects the females’ choice is intended to increase the number of female students in a technology class. Furthermore, female students’ perceptions of technology are linked to perceived success and achievement in a STEM class or field. Ultimately, researching and understanding what influences female students’ choice to enroll in a technology class will allow a researcher to make suggestions on the best practices to include when recruiting girls for a technology class.
CHAPTER 3

METHOD

Introduction

There is a national movement within the STEM culture to attract more females to the STEM platform. This action research focused on the technology sector of STEM. Societal perception stated that technology industries were missing out on the female mind (Bogdan-Martin, 2018). Women brought a different element to collaboration than that of their male counterparts. When women were present for collaboration on innovative projects, industries are missing out on potential ideas that would not otherwise be present (Bogdan-Martin, 2018). One way to address this problem was to get girls interested in technology courses while they are still in middle school. The purpose of this action research was to explore the factors influencing eighth grade female’s choices regarding technology classes in KISD in order to make recommendations to increase the number of female students in technology classes. The study was guided by the following research questions:

1. What are the eighth-grade female students’ perceptions about technology courses at KISD?
2. What are the factors that influence the eighth-grade female students’ choice of technology courses at KISD?
3. How do the eighth grade CTE teachers perceive the factors influencing the eighth-grade female students’ choices of technology courses at KISD?
Research Design

Mertler (2017) describes action research as a cyclical process that incorporated four steps. Those steps include planning, acting, developing, and reflecting. The planning step also consists of four components, identify the topic, gather information, review literature, and development of a research plan (Mertler, 2017). In the acting stage, the researcher starts by implementing the plan and collecting and analyzing the data. The next part in action research is to create the action plan and finally sharing, communicating, and reflecting on the process (Mertler, 2017). Once the researcher concludes the initial four steps, the reflecting element allows the researcher to return to the planning stage and make the necessary corrections for an accurate and comprehensive study. The four-step approach makes the research process less daunting and increases the accuracy of material. Action research is viewed as different from other types of research. Action research uses the role of the researcher and participants combined with the researched data to solve a real-world problem (Collatto, Dresch, Lacerda, & Bentz, 2017). Action research is appropriate for the purpose of my research because it directly affects my job. I will be able to use the research recommendations to increase the number of female students in the classes I teach.

A second constituent to action research was the direct impact on the researcher’s working environment. When the researcher was an educator, the information obtained from action research was used to improve the learning process (Lari et al., 2019). It was essential that the researcher selected a topic that aligned with her scope of influence. In order for the action portion of action research to be successful the researcher needed to be able to implement the findings from the research into the learning environment. In my
research study, I used the recommendations from the researched data to implement new recruiting practices to increase the number of female students selecting technology courses at KISD.

This action research followed the convergent parallel mixed method design. Convergent parallel mixed method design utilized both qualitative and quantitative data. In this method, the same variables were examined from two different approaches (Creswell, 2014). Quantitative data was collected in the form of a student survey, which was a Likert-scale item and asked specific questions. Within the same survey, the other data set was a qualitative survey with open-ended questions for eighth–grade female participants to create their own responses. Additionally, qualitative data was collected in the form of semi-structured interviews from the CCR and Technology Application instructors.

The purpose of my action research study was to explore the factors that influence the choices of eighth grade female students regarding technology classes in KISD. The parallel variables to be studied are the factors influencing the female eighth grade students’ choices of technology courses. The quantitative elements of data collection asked definitive questions to the eighth–grade female students in the CCR and Technology Applications classes, which are required classes for all eighth-grade students. Quantitative questions are necessary for definitive data because qualitative questions are subjective data. The qualitative elements of data collection asked the female students open ended questions to allow them the freedom to answer in their own words. These questions asked the female students to list any other technology classes or after school
technology clubs they have previously participated in, what they liked about a technology class, and what they did not like about a technology class.

Convergent parallel mixed method research design was an ideal choice for my research because it provided the opportunity to fully evaluate female students’ perceptions of technology classes and the factors that influenced their choices. The purpose of the research was to use the findings to make suggestions to increase the number of females in technology classes at KISD. Implementing a research design with a dual approach will illustrate a clear picture of the situational factors, which will then be used to make informed suggestions. At the conclusion of my action research, I made recommendations to administrators in KISD regarding recruiting practices for female students into technology classes. The recommendations are a direct reflection of the responses to the female students’ survey questions and teachers’ interviews. An evaluation of the results is intended to be used to initiate changes in recruiting practices that are tailored to attract more female students and encourage them to select technology courses (Orme & Kehoe, 2019).

**Setting and Participants**

The setting and participants section provides details about the place where the research was conducted and the individuals participating in the research. The participants were 66 eighth–grade female students enrolled in the CCR class and Technology Applications class, which are required middle school courses. Additional participants were two middle school teachers who participated in one-on-one interviews. One teacher was a CCR teacher, and one was the Technology Applications teacher. Students and teachers who participated were from Correy Peterburg Middle School (CPMS).
Setting

The setting for this action research was CPMS in the KISD. Kether Independent School District is a large school district located in central Texas and includes a U.S. Army base. The district educates approximately 45,500 K-12 students. There are 11 middle schools in the district that feed into four high schools. Each middle school has approximately 300 eighth–grade students whose ages range from 13–14 years old and approximately half of the eighth-grade students are female.

As a high school teacher, one of my job requirements is to recruit eighth grade students for the technology program. I chose the CCR and Technology Applications classes as the focus of the study not just because they are required courses but also because of their course content. CCR class explored various careers and the academic steps needed to pursue those careers. Prior to completing this course, students selected their high school endorsement. In KISD, students must graduate with an endorsement, which is similar to a college major. The options for endorsements were STEM, Business and Industry, Arts and Humanities, and Multidisciplinary (Killeen Independent School District, 2019). In the CCR course, students explored all the endorsement paths that KISD had to offer. They learned information about available high school courses and career paths associated with those courses. Furthermore, the CCR curriculum aligned high school endorsement with college or technical training and future careers. The CCR classrooms have a one-to-one student to computer ratio.

Technology Applications was an introduction into the technology element of STEM. The curriculum was an overview of the technology industry. Students were introduced to coding, proprietary laws, animation, digital citizenship, digital arts, and
engineering. In one semester, eighth-grade students, both male and female, experienced material for the STEM elective classes that are available to them in high school. The Technology Applications course exposed all eighth-grade students to a technology class. It provided the opportunity for all eighth-grade female students to form a preliminary opinion of technology courses. Additionally, some of the middle schools offered an after-school Robotics club, which is a technology based extracurricular activity. The students competed in robotic competitions, but the challenges are not curriculum driven until the high school level (Killeen Independent School, 2019).

Participants

The participants were 66 female eighth-grade middle school students from CPMS. The female students were between the ages of 13 -14 and were predominately White, Black American, and Hispanic. Table 3.1 represents the demographics of the female student participants.

Table 3.1 Demographics of the Female Student Participants

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>White or Caucasian</td>
<td>18</td>
</tr>
<tr>
<td>Black or African American</td>
<td>29</td>
</tr>
<tr>
<td>Hispanic or Latina</td>
<td>28</td>
</tr>
<tr>
<td>Asian or Asian American</td>
<td>5</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>0</td>
</tr>
<tr>
<td>Native Hawaiian or other Pacific Islander</td>
<td>2</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
</tr>
</tbody>
</table>

This group was selected because, within their program of study, this was the year that they chose their endorsement for high school graduation. Middle school participants were ideal because of the need to increase the number of high school girls in the STEM endorsement, with a focus on the technology courses. The eighth–grade students from CPMS will attend ninth through twelfth grade at Emerson High School. As tenth graders
they will be eligible to attend KCC and currently Emerson High School and the fewest number of girls who chose to enroll in the Robotics program at KCC. Table 3.2 shows the available endorsements and the intended endorsement choices of the eighth–grade female student participants.

Table 3.2 Intended Endorsements and Student Participants Choices

<table>
<thead>
<tr>
<th>Intended Endorsements</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art and Humanities</td>
<td>23</td>
</tr>
<tr>
<td>Business and Industry</td>
<td>27</td>
</tr>
<tr>
<td>Multidisciplinary</td>
<td>5</td>
</tr>
<tr>
<td>Public Service</td>
<td>4</td>
</tr>
<tr>
<td>STEM</td>
<td>7</td>
</tr>
</tbody>
</table>

Regarding the female eighth-grade students, the sample set was a purposeful sample because they were not selected at random. Instead, they were invited to participate for a specific purpose (Griffith, 2013). The specific purpose was because the female students chose their high school courses at the conclusion of their eighth-grade year. As participants, they provided insight into their own influences for choosing to enroll in a technology course. The participants were students who were enrolled in the CCR and Technology Applications courses.

The two teachers were invited to participate in the study and were a purposeful sample. Since the STEM courses were listed as a category of CTE in KISD, both teachers were classified as middle school CTE teachers. The CCR and Technology Applications courses were only available to eighth–grade students, which narrowed down the instructors’ classification to eighth grade CTE teachers. The CCR and Technology Applications instructors that taught the courses possibly had an impact on the choices the eighth–grade female students made for technology courses. Both teachers were experienced secondary education teachers. The teachers interacted with the eighth-grade
female students and provided insight into their perceptions of technology materials and had knowledge of the technology activities and curriculum.

**Data Collection**

There are two types of data collection methods that were implemented in order to successfully conduct the study of female students and their choices of technology classes at KISD. The data collection methods that were relevant to this study were students’ survey and teachers’ interviews. Multiple forms of data collection enhanced the validity and in-depth understanding of the study (Bloomberg & Volpe, 2015). During data collection, pseudonyms were assigned to all participants as a means of protecting confidentiality. Table 3.3 illustrates the alignment of research questions and data sources.

Table 3.3 Research Questions and Data Sources

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: What are the eighth-grade female students’ perceptions about technology courses at KISD?</td>
<td>1. Student Survey</td>
</tr>
<tr>
<td>RQ2: What are the factors that influence eighth-grade female students’ choice of technology courses at KISD?</td>
<td>1. Student Survey</td>
</tr>
<tr>
<td>RQ3: How do eighth grade CTE teachers perceive the factors influencing the eighth-grade female students’ choices of technology courses at KISD?</td>
<td>1. Instructor Interviews</td>
</tr>
</tbody>
</table>

**Quantitative Data Collection**

**Student Survey.** A survey of 25 questions was used to conduct the research. (Appendix A) The survey consisted of three main sections that will investigate: demographics, students’ perceptions of technology courses, and factors that influence course selection. Sections 2, 3, and 4 contain quantitative survey questions that will be on a 5-point Likert scale. The survey was a combination of questions from the STEM-
Specific Cost Perceptions Scale (Ko & Marx, 2019), and the Domain Identification Measure (DIM) – Computer Technology Version (Smith, Morgan, & White, 2005).

The portion of the Girls in Technology survey that asked questions about factors that influence the female students’ choice of technology classes was broken down into six subscales. The subscales include questions about Success in Class, General Interest, Career Goals, Peers, Family, and Organizational Factors. Table 3.4 is the number of survey items aligned with subscales. Reliability analysis internal consistency is Success in Class 0.76 and General Interest 0.74, which verifies internal consistency. Due to the limited number of items reliability analysis was not conducted on Career Goals, Peers, Family, and Organizational Factors.

Table 3.4 Alignment Between Subscales and Number of Items

<table>
<thead>
<tr>
<th>Subscales</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success in Class</td>
<td>4</td>
</tr>
<tr>
<td>General Interest</td>
<td>3</td>
</tr>
<tr>
<td>Career Goals</td>
<td>2</td>
</tr>
<tr>
<td>Peers</td>
<td>2</td>
</tr>
<tr>
<td>Family</td>
<td>2</td>
</tr>
<tr>
<td>Organizational factors</td>
<td>2</td>
</tr>
</tbody>
</table>

For the section of the Girls in Technology survey that focuses on students’ perceptions of technology courses, the STEM Specific Cost Perceptions Scale was used. The STEM-Specific Cost Perceptions Scale was created by Sei Jin Ko and David M. Marx in 2019. The instrument was intended to measure high school students’ cost perceptions of pursuing a STEM course path in college (Ko & Marx, 2019). The items are on a 7-point Likert scale, with 1 = strongly disagree and 7 = strongly agree. The authors reported internal consistency of effort cost = .73, loss of valued alternative = .86, and emotional cost = .74. The original survey questions were modified to focus on a
technology class. This research study used 5 out of 17 survey questions. (Appendix B). Upon review of the students’ survey, the teachers expressed concern over accuracy and consistency in using two different Likert scales. At the recommendation of the eighth-grade technology teachers, the survey ranking scales were modified to reflect a 5-point Likert scale for consistency as to not confuse the study participants. Using more than six rating options can make the survey confusing for participants who struggle to differentiate between slightly worded response options (Simms, Zelanzny, Williams, & Bernstrein, 2019).

For the section of the Girls in Technology survey that focused on factors that influence students’ course selection, the DIM was used. The DIM was originally created by Jessie L. Smith, Carolyn L. Morgan, and Paul H. White in 2005. The purpose of the DIM was to examine gender differences in career planning for college students. The survey consisted of nine Likert items on three separate 5-point Likert scales. Four questions were scored using 1 = Strongly Disagree and 5 = Strongly Agree and a second set of four questions with 1 = Not at all and 5 = Very Much. The original survey did not specify a career track or discipline; instead, the survey form presents a blank field to fill in with a course name. This research study used all nine DIM question. The last question in original survey was modified to address the factor of female students’ perception of technology courses based on gender stereotypes. Morgan, Paul, and White (2005) scored this question on a separate 5-point Likert scale, with 1 = Very Poor and 5 = Excellent. An internal consistency was reported to be .78. Additionally, in a survey of 221 college students, relationships between male and female CT domain identification and perceptions were examined. Furthermore, the CT domain identification affirmed that
computer science is considered masculine and creative (Smith, Morgan, & White, 2005). All survey questions were aligned with research question 1 and research question 2. At the recommendation of the middle school teachers, all survey questions were on a 5-point Likert-like scale with $1 = \text{Strongly Disagree}$ and $5 = \text{Strongly Agree}$. Table 3.5 shows alignment between survey questions and research questions.

<table>
<thead>
<tr>
<th><strong>Research Questions</strong></th>
<th><strong>Student Survey Questions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: What are the eighth-grade female students’ perceptions about technology courses at KISD?</td>
<td>A technology class would be fun and enjoyable?</td>
</tr>
<tr>
<td></td>
<td>A technology class would be too stressful and tiring</td>
</tr>
<tr>
<td></td>
<td>Considering what I want to do with my life having a technology class would be worth the effort.</td>
</tr>
<tr>
<td></td>
<td>Considering what I want to do with my life having a technology class would not be worth the effort.</td>
</tr>
<tr>
<td></td>
<td>A technology class would be a good use of my time.</td>
</tr>
<tr>
<td></td>
<td>A technology class would demand too much of my time and effort.</td>
</tr>
<tr>
<td></td>
<td>A technology class would require projects that I like working on.</td>
</tr>
<tr>
<td></td>
<td>A technology class would require too much work.</td>
</tr>
<tr>
<td></td>
<td>A technology class would include activities that I enjoy doing.</td>
</tr>
<tr>
<td></td>
<td>A technology class would require me to give up too many other activities that I value.</td>
</tr>
<tr>
<td>RQ2: What are the factors that influence eighth-grade female students’ perceptions about technology courses at KISD?</td>
<td>Technology is one of my best subjects.</td>
</tr>
</tbody>
</table>
students’ choices of technology courses at KISD?

I have always done well in technology classes.
I get good grades in technology classes.
I do badly on tests in technology classes.
I enjoy technology related subjects
I enjoy technology related subjects more than others.
I am not interested in technology related subjects.
I would take a job in a technology related field.
Jobs in the technology field do not interest me.
Compared to male students I excel in a technology class.
Compared to female students I excel in a technology class.
My father encourages me to take a technology class.
My mother encourages me to take a technology class.
Technology is promoted in my classes.
My teachers do no mention technology in my classes.

Qualitative Data Collection

The qualitative data instruments were reviewed by my colleagues. The open-ended survey questions and interview questions were read by two Career and Technology Education (CTE) teachers and one administrator for alignment with research questions, wording, and grammar of the study. There was also discussion of alignment of district
goals to increase the number of female students in technology classes. Cypress (2017) described validity for qualitative research as a means to question and investigate rigor.

**Student Survey.** The student open-ended survey entailed five questions intended to gain unprompted views from the students (Creswell & Creswell, 2018). These questions were created as part of peer debriefing with the teacher participants. They both made suggestions for generically worded open-ended questions. This was intended to allow the students to answer the questions without asking too many questions. It was decided to ask the female participants five open-ended questions to help ensure quality answers. There was space provided for students to type in their thoughts on what influences their decisions to enroll in technology classes for high school. There was a final item for students to include any additional comments about technology classes. Questions formatted in this manner helped the students express their viewpoint, which provided me with insight to female students’ perceptions and influencing factors when choosing technology classes for high school. Open-ended questions are included in Appendix A.

**Instructor Interviews.** Instructor interviews were used to provide the teachers’ professional perspective regarding female students and their choices related to technology classes. The interviews were semi-structured, with predetermined questions (Whiting, 2008) and lasted between 30–50 minutes, and was completed on a day of the teachers’ choosing outside of the teachers’ contract hours. The interviews were performed at a location convenient to the interviewees Two total interviews were conducted, one with the CCR teacher, and one with the Technology Applications teacher. Interviews were beneficial to my research because it created the opportunity for the instructors to supply
information that I may have overlooked. Interview questions began with demographic questions (Pudelko & Tenzer, 2019) and then moved to questions that were intended to directly address the research questions.

Interview questions were open-ended to permit the instructors to contribute their unique perspective. The interview protocol was designed from materials used in a study that also investigated perceptions, and career aspirations (Heacock, 2016). The interview was originally asked to students and questions were modified for a teacher. For instance, the modified questions incorporated wording such as “in your professional opinion”

Interview questions were semi-structured and aligned with the research questions. The CCR and Technology Application instructors were asked questions related to their perceptions of the factors that influence the eighth-grade females’ choices in technology classes. Appendix C provides a full copy of the CCR and Technology Application Teachers Interview Protocol. Table 3.6 shows the alignment of teacher interview questions and research questions.

Table 3.6 Alignment Between Research Questions and Teacher Interviews

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>CCR Teacher Interview Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ2: What are the factors that influence eighth-grade female students’ choices of technology courses at KISD?</td>
<td>As the female students are learning about each endorsement, in your opinion, what is their perception of the technology courses offered?</td>
</tr>
<tr>
<td>RQ3: How do the eighth grade CTE teachers perceive the factors influencing the eighth-grade female students’ choices of technology courses at KISD?</td>
<td>In your professional opinion what is the eighth-grade female students’ thoughts about enrolling in a technology class.</td>
</tr>
<tr>
<td></td>
<td>In your professional opinion what factors influence eighth-grade female students’ choice of technology course?</td>
</tr>
<tr>
<td></td>
<td>Do you think one factor has a greater influence over the other?</td>
</tr>
</tbody>
</table>
For the eighth-grade female students that chose a technology course what drives their choice?

Data Analysis

Data analysis procedures are the methods of analyzing the data collected during the researched study. Data analysis was conducted for both qualitative and quantitative data. Table 3.7 illustrates the alignment of the research questions, data sources, and data analysis methods.

Table 3.7 Alignment Between Research Questions, Data Source, and Data Analysis Methods

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data Source</th>
<th>Data Analysis Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: What are the eighth-grade female students’ perceptions about technology courses at KISD?</td>
<td>Student Survey</td>
<td>1. Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Inductive analysis</td>
</tr>
<tr>
<td>RQ2: What are the factors that influence eighth-grade female students’ choices of technology course at KISD?</td>
<td>1. Student Survey</td>
<td>1. Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td>2. Instructor interviews</td>
<td>2. Inductive analysis</td>
</tr>
<tr>
<td>RQ3: How do eighth grade CTE teachers perceive the factors influencing the eighth-grade female students’ choices of technology courses at KISD?</td>
<td>Instructor Interviews</td>
<td>1. Inductive analysis</td>
</tr>
</tbody>
</table>

Quantitative data analysis

The student survey yielded quantitative data, and the analysis of the quantitative data involved descriptive statistics. Descriptive statistics represent data relevant to frequencies, means, and standard deviations (Creswell & Creswell, 2018). The student survey was rated on a Likert scale and assigned a numeric value of 1 through 5. Measure
of central tendency is frequently used to evaluate performances, attitudes, and opinions of the whole group (Mertler, 2017). Demographic questions were included such as gender, ethnicity, and intended high school endorsement as a way to evaluate unique factors that might impact the choices of the researched population. Then quantitative analyses were conducted using the JASP statistical software to verify internal consistency of the survey. The JASP results show an internal consistency of Perceptions 0.70, Success in Class 0.76, and General Interest 0.74.

**Qualitative data analysis**

The qualitative data analysis consisted of inductive analysis with theme development. Inductive analysis is the process of reducing the amount of data by grouping the data into similar themes without taking away for the importance of the data collected (Mertler, 2017). Female middle school students in the eighth grade were given a survey with five open-ended questions, and the students explained the factors related to what their perceptions of a technology class and their choices of technology classes. A second source for qualitative data was the two instructor interviews. All qualitative data required inductive analysis as a means to reduce the amount of data and located reoccurring themes (Mertler, 2017).

Both sources of qualitative data were analyzed using the online qualitative data analysis software, Delve. Computer software programs are used to assist the researcher in coding qualitative data to reduce the time associated with manual coding (Creswell & Creswell, 2018). Responses from the open-ended survey questions were downloaded into a Microsoft Word document. Responses from instructor interviews were recorded using the mobile application, VoiceRecord and then transcribed using a Google document.
Following the two interviews, the first step was transcribing the interview recordings using the intelligent verbatim approach, which looked at the responses as a whole. In the second step the documents were uploaded into Delve and coded to identify categories and themes that were relevant to the research questions. Saldana (2011) describes the coding of interviews as, “a method of discovery” (p. 96). Initial coding, In Vivo coding and two rounds of Pattern coding were used to identify the female students’ and teachers’ perspectives (Saldana, 2011). The third step in the process was to present the findings. The findings were presented through descriptive narrative.

**Procedures and Timeline**

There were four phases of this study: Phase One: planning, Phase Two: data collection, Phase Three: data analysis, and Phase Four: sharing information. Table 3.8 provides an overview of the procedures and timeline. A Girls in Technology survey was conducted to collect both qualitative and quantitative data. The survey was distributed to the female students in the eighth grade CCR and Technology Applications classes, at KISD. A paper copy with the survey’s QR code was prepared for the CCR and Technology Applications teachers to distribute to the female eighth grade students who volunteered to participate. Students were able to complete the survey on any mobile device, tablet, or computer. Survey responses were sent to the researcher electronically and anonymously to protect their identity.

Table 3.8 Procedures and Timeline

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activity</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase One: Planning</td>
<td>1. Send home parental consent forms</td>
<td>3 weeks</td>
</tr>
<tr>
<td></td>
<td>2. Receive parental consent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Schedule instructor interviews</td>
<td></td>
</tr>
</tbody>
</table>
Phase One: Planning. The first phase of the process was planning. In this planning stage the researcher created a QR code that incorporated parental consent form and student survey. Researcher prepared informative material for parents to be informed of the survey and material was made available to students to send home to their parents. A copy of the parental consent form is available in Appendix E.

Phase Two: Data collection. Phase two involved the data collection process and was divided into two steps. During the fall of 2021, the first step was to interview the CCR and Technology Application instructors. Instructors were emailed interview questions a week prior to the interview along with the survey questions. Student survey questions were shared in order for the instructors to verify for accuracy. The interviews took approximately 30 minutes with the final ten minutes being allotted to discussing the student survey questions.

The second step in the data collection process was the students’ survey. The researcher distributed the paper copy of a QR code that linked to the survey. The parental consent form was available in the QR code for the parents to click agreement and then the female students could begin the survey.

Phase Three: Data analysis. Quantitative survey data was loaded into JASP for analysis. Student open-ended survey questions and teachers’ interview responses were
transcribed and coded to identify codes, categories, and themes that are relevant to research questions. This phase took approximately eight weeks.

Phase Four: Sharing information. The final phase was sharing research information. A report was written explaining the research and the research findings. The report was sent as an attachment through email to all necessary parties.

**Rigor and Trustworthiness**

Trustworthiness is often questioned in respect to qualitative research due in part to a lack of understanding that validity and reliability can be achieved through careful constructs that ensure credibility (Shenton, 2004). Credibility is considered an important component of trustworthiness (Lincoln & Guba, 1985). Creswell and Creswell (2018) explain that, in action research rigor demonstrates accuracy and validity. For the qualitative methods of my research, I used the following methods: a) triangulation, b) rich, thick descriptions, c) member checking, and d) peer debriefing.

**Triangulation**

Triangulation is the use of various instruments, methods, and sources to collect data that enhance the validity of findings (Mertler, 2017). This was valuable to my research because themes were established through the convergence of data sources or perspectives that can add to the trustworthiness of the study (Creswell & Creswell, 2018). My study used qualitative methods such as, surveys with open ended questions and interviews. The semi-structured interviews consisted of open-ended questions to eighth grade teachers based on their experiences and perceptions of female student in their technology classes. In addition to the interviews, a student survey with open-ended questions asking the female students their perceptions of technology classes and the
factors influencing their choice to enroll in technology classes. I accomplished triangulation through methodological triangulation; analyzing and comparing the data sources to look for corroboration to ensure trustworthiness.

Rich, Thick Description

Rich, thick descriptions allow the reader to understand the setting and provide an element of shared experiences through written discussion and exact details (Creswell, 2013). Shenton (2004) stated that detailed descriptions of the phenomenon promote credibility by conveying a depiction of an exact situation being observed. This insight allowed for the reader to make determinations into the findings and conclusions of the researcher (Shenton, 2004). In this study, I supplied the reader with a vivid description of the events that occurred during the interview and survey process. For instance, I provided a clear explanation of the interview environment. Furthermore, I thoroughly described the data collection and analysis process to give the reader a mental illustration of the entire research study.

Member Checking

Member checking was used to serve as a means for the interviewee to examine the data being presented in the study. Varpio, Ajjawi, Monrouxe, O’Brien, and Rees (2017) explain that member checking is conducted in separate intervals during the analysis process. In my research study, at first interval, I requested that the interviewees proofread the transcribed interview to make sure their words are represented correctly. They were provided a copy via their district email address. Both teachers agreed to the accuracy of the transcribed interviews. Next, at the conclusion of data analysis, I solicited the viewpoints of the interviewees to make certain their responses are interpreted.
precisely as they intended. The teacher participants stated that their responses were accurately represented in the study.

**Peer Debriefing**

Peer debriefing was implemented to include the opinions of other educational professionals. Peer debriefing improved my research because it forced me to think outside my own data analysis and consider all angles of the research results. By requesting that my colleagues review the research and findings it assisted me in evaluating the data on a deeper level (Nowell, Norris, White, & Moules, 2017). I collaborated with other high school technology teachers, both male and female, to obtain a third-party perspective of my research study. All parties agreed the study was important to the future of education and would help to increase the number of female students in the technology courses they taught. As technology teachers in the same district, they experience the same deficit in female students as I do, and they will be able to use that experience to evaluate the data and offer constructive criticism and professional insight. Additionally, I conferred with my dissertation chair to avoid missing any major components in the qualitative methods of research. I used peer debriefing as a way to expand my own thinking to verify accuracy of data analysis.

**Plan for Sharing and Communicating**

Effectively communicating research findings is necessary for transparency and ethical research. As the researcher, I shared all research findings, even those that might be viewed as negative. At the conclusion of the researched study, I shared all findings through email communication.
My research findings were shared to inform the necessary stakeholders. Prior to conducting research, I met with the Career Technology Education (CTE) district curriculum specialist, principal of the Kether Career Center, and the principal and teachers at the selected middle school to inform them of the intention of my research. After compiling the survey results and the teachers’ statements, I composed a report to be emailed to the executive director of special education, building principals and curriculum instructional specialists. The report to administrators incorporated recommendations based on the findings. The recommendations outlined ways to increase the number of females in the technology classes. Additionally, I shared the information with the CCR and Technology Application teachers who participated in the interviews. Research findings will be shared with the middle school participants and their parents.

It was necessary to protect the anonymity and confidentiality of all participants. When presenting the research findings in a report, I did not disclose any information that would identify the eighth-grade female students. Furthermore, even though there will be only two teachers invited to participate, I made every attempt to protect the teachers’ confidentiality by being mindful of word choice to not reveal their identities. In the report, teachers were referred to as Ms. Jackson and Ms. Wilson.
CHAPTER 4

FINDINGS

Introduction

The purpose of this action research is to explore the factors influencing eighth grade female students’ choices regarding technology classes in KISD. This chapter presents the findings of the action research study. It describes the quantitative findings related to the 25-question survey completed by the eighth-grade female students. Qualitative findings are derived from two teacher interviews and five open-ended student survey questions. All analysis of the findings is used to address the study’s research questions:

1. What are the eighth-grade female students’ perceptions about technology courses at KISD?
2. What are the factors that influence the eighth-grade female students’ choice of technology courses at KISD?
3. How do the eighth grade CTE teachers perceive the factors influencing the eighth-grade female students’ choices of technology courses at KISD?

Quantitative Findings

The quantitative findings are based on the results of a survey completed by 66 eighth-grade female students from CPMS. Survey questions were presented to students on a 5-point Likert-type scale ranging from 1 *Strongly Disagree*, to 5 *Strongly Agree*. The
quantitative segment of the survey includes four sections: (1) demographics, (2) intended endorsement (3) students’ perceptions of technology courses, and (4) factors that influence course selection. Descriptive statistics was used to analyze quantitative data. Adams and Lawrence (2019) define descriptive statistics as an analysis used to determine the characteristics of a sample. In this study, descriptive statistics summarizes the perceptions and the factors influencing the choice of technology courses for the eighth-grade female students at KISD.

In this section the methods of analysis and findings for the perceptions about technology courses and factors that influence the choice of technology courses are presented.

**Reliability Analysis**

Reliability of the survey was conducted to verify internal consistency. Internal consistency determines if there is a consistency between the participants responses and items in a scale (Adams & Lawrence, 2019). Cronbach’s alpha analysis was used to test for internal consistency. It is recommended to obtain an alpha of 0.70 or higher (Adams & Lawrence, 2019). For this researched study, JASP software was used to calculate the reliability of the instrument using Cronbach’s alpha. Data from all survey questions ($n = 25$) were divided based on type of question, Perceptions 0.70, Success 0.76, and General Interest 0.74, verifying internal consistency ($\alpha \geq .70$). The factors of Career goals, Peer Pressure, Family, and Organizational factors were not evaluated for reliability due to the limited number of questions. This is discussed further in the limitations section.
Perceptions about Technology Courses

This section includes a total of 10 items asking the students to rate their perceptions about the technology courses. The software program JASP was utilized to calculate descriptive statistics for mean and standard deviation. These survey responses revealed that the eighth-grade female students at KISD have a neither positive nor negative perception of technology courses ($M=3.02$, $SD = 0.34$). Table 4.1 contains the mean and standard deviation for each item in the Perceptions of technology courses section.

Table 4.1 Descriptive Statistics for Perceptions of Technology Courses

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A technology class would be fun and enjoyable.</td>
<td>3.35</td>
<td>0.81</td>
</tr>
<tr>
<td>A technology class would be too stressful and tiring.</td>
<td>2.83</td>
<td>0.85</td>
</tr>
<tr>
<td>Considering what I want to do with my life, having a technology class would be worth the effort.</td>
<td>3.33</td>
<td>0.93</td>
</tr>
<tr>
<td>Considering what I want to do with my life, having a technology class is just not worth the effort.</td>
<td>2.61</td>
<td>1.08</td>
</tr>
<tr>
<td>A technology class would be a good use of my time.</td>
<td>3.35</td>
<td>0.81</td>
</tr>
<tr>
<td>A technology class would demand too much of my time and effort.</td>
<td>2.68</td>
<td>0.77</td>
</tr>
<tr>
<td>A technology class would require projects that I like working on.</td>
<td>3.29</td>
<td>0.86</td>
</tr>
<tr>
<td>A technology class would require too much work.</td>
<td>2.74</td>
<td>0.85</td>
</tr>
<tr>
<td>A technology class would include activities that I enjoy doing.</td>
<td>3.55</td>
<td>0.77</td>
</tr>
<tr>
<td>A technology class would require me to give up too many other activities that I value.</td>
<td>2.50</td>
<td>0.86</td>
</tr>
</tbody>
</table>

Several of the question responses have a mean average of 3.00- Neither disagree nor agree, however further review of the individual survey responses indicated several of the responses were 4-Moderately agree. The question, “A technology class would include activities that I enjoy doing” had the highest mean score ($M = 3.55$, $SD = 0.77$) and a frequency of 47.76% of the female students replied Moderately agree (Table 4.2).
Table 4.2 Frequencies for A Technology Class Would Include Activities that I Enjoy Doing

<table>
<thead>
<tr>
<th>Responses for A technology class would include activities that I enjoy doing.</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>6</td>
<td>8.96</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>23</td>
<td>34.33</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>32</td>
<td>47.76</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

When asked if a technology course would be fun and enjoyable, ($M = 3.35, SD = 0.81$) the female students’ responses were slightly over Neither disagree nor agree and 43.28% of the female student participants selected Moderately agree (Table 4.3).

Table 4.3 Frequencies for A Technology Class Would be Fun and Enjoyable

<table>
<thead>
<tr>
<th>Responses to A technology class would be fun and enjoyable.</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>6</td>
<td>8.96</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>27</td>
<td>40.30</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>29</td>
<td>43.28</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>2</td>
<td>2.96</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Other survey questions asked if the female students thought that a technology course would be a good use of their time ($M = 3.35, SD = 0.81$) and 41.79% of the female students chose Moderately agree (Table 4.4).

Table 4.4 Frequencies for A Technology Class Would be a Good Use of My Time

<table>
<thead>
<tr>
<th>Responses to A technology class would be a good use of my time.</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>11</td>
<td>8.96</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>24</td>
<td>40.30</td>
</tr>
</tbody>
</table>
Lastly, the female participants did not believe that a technology course would require them to give up too many other activities that they value \((M = 2.50, SD = 0.86)\). Although, a review of the individual responses shows a frequency of 41.80% of the eighth–grade female students responding with Neither disagree nor agree, indicating a more neutral opinion.

Table 4.5 Frequencies for A Technology Class Would Require Me to Give Up Too Many Other Activities that I Value

<table>
<thead>
<tr>
<th>Responses to A technology class would require me to give up too many other activities that I value</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>5</td>
<td>7.63</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>28</td>
<td>41.80</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>24</td>
<td>35.82</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>8</td>
<td>11.94</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Based on the overall survey responses it can be determined that the eighth-grade female students’ view leans towards a neutral response towards a technology course. Conversely, the individual responses highlight a positive perceptive of a technology class.

**Factors**

The mean and standard deviation for all the survey responses is illustrated in Table 4.6. It provides an overview of the entire study. For the six factors that influences the choice of the eighth-grade female student’s technology courses, Peer pressure \((M = \)
3.28, $SD = 0.59$) has the highest mean of the factors that influence the choices of the eighth-grade participants.

Table 4.6 Descriptive Statistics for Factors of Influence

<table>
<thead>
<tr>
<th>Topic</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success in class</td>
<td>2.93</td>
<td>0.59</td>
</tr>
<tr>
<td>General interest</td>
<td>2.88</td>
<td>0.49</td>
</tr>
<tr>
<td>Career goals</td>
<td>2.80</td>
<td>0.51</td>
</tr>
<tr>
<td>Peers</td>
<td>3.28</td>
<td>0.70</td>
</tr>
<tr>
<td>Family</td>
<td>2.52</td>
<td>0.94</td>
</tr>
<tr>
<td>Organizational</td>
<td>2.61</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Success in a Technology Class. The next section of the survey focuses on four questions involving the factor of success in a technology classroom ($M = 2.93, SD = 0.59$). Table 4.11 shows the mean and standard deviation for Success in class.

Table 4.7 Descriptive Statistics for Success in a Technology Class

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology is one of my best subjects.</td>
<td>2.64</td>
<td>0.99</td>
</tr>
<tr>
<td>I have always done well in technology classes.</td>
<td>3.35</td>
<td>0.97</td>
</tr>
<tr>
<td>I get good grades in technology classes.</td>
<td>3.64</td>
<td>1.10</td>
</tr>
<tr>
<td>I do badly on tests in technology classes.</td>
<td>2.09</td>
<td>0.96</td>
</tr>
</tbody>
</table>

The survey question, “I get good grades in technology classes” ($M = 3.64, SD = 1.10$) with a frequency of 32.83% of the female participants responding with Moderately agree (Table 4.8) and the question “I have always done well in technology classes” ($M =3.35, SD = 0.97$) had a frequency of 34.33% selecting Moderately agree (Table 4.9) suggests the eighth-grade female students view themselves as successful in a technology class.

Table 4.8 Frequencies for I Get Good Grades in Technology Classes

<table>
<thead>
<tr>
<th>Responses to I get good grades in technology classes</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>4</td>
<td>5.97</td>
</tr>
</tbody>
</table>
Table 4.9 Frequencies for I Have Always Done Well in Technology Classes

<table>
<thead>
<tr>
<th>Responses to I have always done well in technology classes</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>10</td>
<td>14.25</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>24</td>
<td>35.85</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>23</td>
<td>34.33</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>7</td>
<td>10.45</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

There is a slight contradiction in responses, while the eighth-grade female participants consider themselves successful in a technology class they do not consider technology to be one of their best subjects ($M = 2.64$, $SD = 0.99$). The majority of the female participants selected Neither disagree nor agree and has a frequency of 44.78 % (Table 4.10). The individual responses show neutrality when considering a technology class to be one of their best subjects.

Table 4.10 Frequencies for Technology is One of My Best Subjects

<table>
<thead>
<tr>
<th>Responses to Technology is one of my best subjects</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>10</td>
<td>14.93</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>16</td>
<td>23.88</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>30</td>
<td>44.78</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>8</td>
<td>11.94</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Furthermore, the female participants responded with Moderately disagree when asked if they did badly on tests in a technology class ($M = 2.09$, $SD = 0.96$). Individually, 32.84% of the eighth–grade female Strongly disagreed with this question (Table 4.11). This grouping of responses denotes that they female participants view themselves as successful in a technology class.

Table 4.11 Frequencies for I Do Badly on Tests in Technology Classes

<table>
<thead>
<tr>
<th>Responses to I do badly on Tests in Technology Classes</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>21</td>
<td>31.34</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>20</td>
<td>29.85</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>22</td>
<td>32.84</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

**General Interest.** The survey results showed similarities with the General interest responses ($M = 2.88$, $SD = 0.49$). This section was comprised of three questions that asked the female students if they enjoyed technology related subjects compared to other subjects. Table 4.12 is the collective descriptive statistics for general interest.

Table 4.12 Descriptive Statistics for General interest

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoy technology related subjects more than others.</td>
<td>2.65</td>
<td>1.09</td>
</tr>
<tr>
<td>I enjoy technology related subjects.</td>
<td>3.36</td>
<td>0.91</td>
</tr>
<tr>
<td>I am not interested in technology related subjects.</td>
<td>2.64</td>
<td>1.00</td>
</tr>
</tbody>
</table>

When asked the question, “I enjoy technology related subjects” ($M = 3.36$, $SD = 0.91$) the eighth-grade female students stated that they did in fact enjoy technology
related subjects because 40.29% of the eighth-grade female students stated that they
Moderately agree (Table 4.13).

Table 4.13 Frequencies for I Enjoy Technology Related Subjects

<table>
<thead>
<tr>
<th>Responses to I Enjoy Technology Related Subjects</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>11</td>
<td>16.42</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>22</td>
<td>32.84</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>27</td>
<td>40.30</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Conversely, when asked if they enjoyed technology related classes more than
other classes ($M=2.65$, $SD=1.09$) the female students answered with a less neutral
response of Moderately disagree, which could be interpreted that the female student do
not enjoy technology classes when compared to other classes. Individual response
explained a more neutral response with a frequency of 34.33% of the female students
answering with Neither disagree nor agree (Table 4.14).

Table 4.14 Frequencies for I Enjoy Technology Related Classes More Than Other
Classes

<table>
<thead>
<tr>
<th>Responses to I Enjoy Technology Related Classes More Than Other Classes</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>12</td>
<td>17.91</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>16</td>
<td>23.88</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>23</td>
<td>34.33</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>13</td>
<td>19.40</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

The question “I am not interested in technology related subjects” ($M=2.64$, $SD=
1.00$) showed a frequency of 35.82% of the female participant chose Moderately disagree
(Table 4.15). This demonstrates that the female students have a slight interest in technology classes.

Table 4.15 Frequencies for I am Not Interested in Technology Related Subjects

<table>
<thead>
<tr>
<th>Responses to I am not interested in technology related subjects</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>14</td>
<td>20.90</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>19</td>
<td>28.36</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>24</td>
<td>35.82</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>8</td>
<td>11.94</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

**Career Goals.** The section on Career Goals ($M = 2.80$, $SD = 0.51$) asked two conflicting questions, “I would take a job in a technology related field” and “Jobs in the technology field do not interest me”. These survey responses divulge that overall, the eighth-grade female students are not interested in pursuing a career in the technology field. Table 4.16 is the descriptive statistics for the career goals survey questions.

Table 4.16 Descriptive Statistics for Career goals

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would take a job in a technology related field.</td>
<td>2.35</td>
<td>1.01</td>
</tr>
<tr>
<td>Jobs in the technology field do not interest me.</td>
<td>3.26</td>
<td>1.11</td>
</tr>
</tbody>
</table>

The question asking if the female students would take a job in the technology field ($M = 2.35$, $SD = 1.01$) followed up with Moderately disagree and a frequency of 35.82% Moderately disagree (Table 4.17).

Table 4.17 Frequencies for I Would Take a Job in a Technology Related Field

<table>
<thead>
<tr>
<th>Responses to I would take a job in a technology related field</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>15</td>
<td>22.39</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>24</td>
<td>35.82</td>
</tr>
</tbody>
</table>
Neither disagree nor agree & 16 & 23.88 \\
Moderately agree & 11 & 16.41 \\
Strongly agree & 0 & 0 \\
Missing & 1 & 1.50 \\
Total & 67 & 100.00 \\

There is a more neutral response to “Jobs in the technology field do not interest me” $(M = 3.26, SD = 1.11)$ selecting Neither disagree nor agree. The individual responses also revealed 34.33% responded Neither disagree nor agree (Table 4.18).

Table 4.18 Frequencies for Jobs in a Technology Field Do Not Interest Me

<table>
<thead>
<tr>
<th>Responses to Jobs in a technology field do not interest me</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>9</td>
<td>13.43</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>19</td>
<td>28.36</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>23</td>
<td>34.33</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>10</td>
<td>14.93</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

This grouping of survey responses suggests that the eighth-grade female students are unsure if they would take a job in the technology field and leans toward not choosing a technology career.

Peers. This portion on peers $(M = 3.28, SD = 0.70)$ includes two questions that asked the female participants to be self-reflective of their ability to excel in a technology classroom as compared to their male and female counterparts (Table 4.19).

Table 4.19 Descriptive Statistics for Peers

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compared to male students I excel in a technology class.</td>
<td>3.28</td>
<td>0.74</td>
</tr>
<tr>
<td>Compared to female students I excel in a technology class.</td>
<td>3.28</td>
<td>0.70</td>
</tr>
</tbody>
</table>
One of the findings discovered in the survey implies that the eighth-grade female students consider themselves equal to other students academically in a technology class. The female students were asked, “Compared to male students I excel in a technology class” \((M = 3.28, \ SD = 0.74)\) states Neither disagree nor agree and this response is verified with 64.18% of the individual responses being Neither disagree nor agree (Table 4.20). Similarly, “Compared to female students I excel in a technology class” \((M = 3.28, \ SD = 0.70)\) had a frequency of 70.15% of female student participants responded Neither disagree not agree (Table 4.21). This confirms that the female eighth-grade students do not view themselves as inferior to their peers in a technology class.

Table 4.20 Frequencies for Compared to Male Students I Excel in a Technology Class

<table>
<thead>
<tr>
<th>Responses to Compared to male students I excel in a technology class</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>3</td>
<td>4.48</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>43</td>
<td>64.18</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>13</td>
<td>19.40</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Table 4.21 Frequencies for Compared to Female Students I Excel in a Technology Class

<table>
<thead>
<tr>
<th>Responses to Compared to female students I excel in a technology class</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>47</td>
<td>70.15</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>11</td>
<td>16.42</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>
Family. The next section of the survey incorporated two questions that evaluated family ($M = 2.52, SD = 0.94$) as a factor influencing the choices of the eighth-grade female students. The female students were asked to reflect on the support they receive from their fathers and mothers when choosing a technology class for high school (Table 4.22).

Table 4.22 Descriptive Statistics for Family

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>My father encourages me to take a technology class.</td>
<td>2.40</td>
<td>1.08</td>
</tr>
<tr>
<td>My mother encourages me to take a technology class.</td>
<td>2.66</td>
<td>1.12</td>
</tr>
</tbody>
</table>

The female students’ survey responses concludes that they do not feel encouraged by their father or mother to select a technology course. The eighth-grade female students answered Moderately disagree that they were encouraged by their fathers to select a technology course ($M = 2.40, SD = 1.08$). The individual responses showed a more neutral response and had a frequency of 40.30 Neither disagree not agree (Table 4.23).

Table 4.23 Frequencies for My father Encourages Me to Take a Technology Class

<table>
<thead>
<tr>
<th>Responses to My father encourages me to take a technology class</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>18</td>
<td>26.87</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>12</td>
<td>19.40</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>27</td>
<td>40.30</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>6</td>
<td>8.96</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>2</td>
<td>2.99</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

The eighth–grade female students answered relatively the same about their mothers ($M = 2.66, SD = 1.08$) and agreed they Moderately disagreed with receiving
support from their mother to enroll in a technology class. A greater number of the female participants chose Neither disagree nor agree individually and had a frequency of 46.27% for not feeling encouraged by their mothers (Table 4.24). It is noteworthy to mention the female participants felt slightly less encouraged by their fathers as compared to their mothers.

Table 4.24 Frequencies for My mother encourages me to take a technology class

<table>
<thead>
<tr>
<th>Responses to My mother encourages me to take a technology class</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>13</td>
<td>19.40</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>11</td>
<td>16.42</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>31</td>
<td>46.27</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

**Organizational.** The final factor also had two questions and considered organizational factors ($M = 2.61$, $SD = 0.61$) such as technology use in other classrooms.

This section of the survey asked the female students to address whether or not their teachers encouraged the use of technology in the classroom (Table 4.25)

Table 4.25 Descriptive Statistics for Organizational

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology is promoted in my classes.</td>
<td>3.27</td>
<td>0.92</td>
</tr>
<tr>
<td>My teachers do not mention technology in my classes.</td>
<td>1.95</td>
<td>1.02</td>
</tr>
</tbody>
</table>

The question “Technology is promoted in my classes” ($M = 3.27$, $SD = 0.92$) had a neutral response of Neither disagree nor agree and the individual responses had a frequency of 49.25% Neither disagree nor agree (Table 4.26).
Table 4.26 Frequencies for Technology is promoted in my classes

<table>
<thead>
<tr>
<th>Responses to Technology is promoted in my class</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>3</td>
<td>4.48</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>6</td>
<td>8.96</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>33</td>
<td>49.25</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>18</td>
<td>26.87</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>6</td>
<td>8.96</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

The question “My teachers do not mention technology in my classes” ($M = 1.95, SD = 1.02$) had a response of Strongly disagree, which matches the individual responses with 40.03% of the female participants answering Strongly disagree. This represents the fact that the female students do have teachers who mention technology is their classes (Table 4.27).

Table 4.27 Frequencies for My Teachers Do Not Mention Technology in My Classes

<table>
<thead>
<tr>
<th>Responses to My Teachers Do Not Mention Technology in My Classes</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Moderately agree</td>
<td>5</td>
<td>7.46</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>11</td>
<td>16.41</td>
</tr>
<tr>
<td>Moderately disagree</td>
<td>21</td>
<td>31.34</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>27</td>
<td>40.30</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1.50</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Qualitative Analysis and Findings

The qualitative data sources for this action research study were two teacher interviews and five open ended survey response that were answered by 66 eighth–grade female students. Teacher interviews and student open-ended responses were analyzed and reported separately to accurately represent the thoughts and feelings of both sets of
participants. The interviews were conducted to gain insight from two eighth-grade middle school technology teachers about the factors influencing the choice of technology courses for the eighth-grade female students. The interviews were semi-structured and completed in the individual teacher’s classrooms, at their request. Interviews were audio recorded using the mobile application Voice Record. Then they were transcribed verbatim using Google docs and lastly reviewed for accuracy.

The eighth-grade female students were asked to complete five open-ended questions at the end of the student survey to help identify their perceptions of technology courses available in KISD and the factors influencing their choice to enroll in a technology course. The open-ended survey responses that were completed by the female students were made available to them as part of the same survey as the quantitative data. The open-ended survey responses were recorded in Survey Monkey and exported to an Excel spreadsheet. Then each question was transferred to a Word document as individual questions with 66 responses each. This section describes the methods of qualitative data analysis for this study and the qualitative findings. To verify the richness of the study, the teacher interviews had six codes and 62 subcodes and the student responses had six codes and 280 subcodes (Table 4.28).

Table 4.28 Qualitative Data Sources

<table>
<thead>
<tr>
<th>Qualitative Data Sources</th>
<th>Total number of participants</th>
<th>Total Number of Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Interviews</td>
<td>2</td>
<td>68</td>
</tr>
<tr>
<td>Student Open-ended responses</td>
<td>66</td>
<td>280</td>
</tr>
</tbody>
</table>
Qualitative Data Analysis

Teachers’ Interviews

This research study was analyzed using inductive analysis. The inductive process started with gathering data from participants and then compiling the data into categories and themes. The categories and themes are compared to personal experiences and the literature discussed in Chapter 2 (Creswell & Creswell, 2018). After accurately transcribing both teachers’ interviews, I divided the interviews by teacher, Ms. Jackson and Ms. Wilson. Then I read each interview separately prior to the coding process because this provided me the opportunity to contemplate the appropriate type of coding.

I began writing analytic memos as I read through the transcribed teachers’ interviews. Analytic memos allowed me to take notes and write down important thoughts that came to mind when reading through the interviews and coding process (Saldana, 2021). This portion of my analysis was important to my researched study because it helped me identify and recognize my own bias. During the times I would recognize bias, I would write down my thoughts to be discussed during peer debriefing and addressed later in the study. Additionally, I would write down ideas that could be applied to the discussion section of Chapter 5. Figure 4.1 is an example of an analytic memo written during the data analysis stage.
Then the transcribed Google document was converted into a Microsoft Word document that was uploaded to the online qualitative data analysis software, Delve. Multiple rounds of coding were implemented to help organize the codes, group codes together into categories and then ultimately identify themes in the qualitative data collected.

**First Cycle of Coding of Teachers’ Interviews**

The first round of coding in Delve for the teachers’ interviews was conducted utilizing initial coding and In Vivo coding.

**Initial coding.** I read the interviews a second time to begin initial coding through a manual process. I printed out the transcribed interview and used a pencil to make note of phrases that I believed to be relevant to the study. Initial coding is a starting point for
the researcher and some codes from this cycle are viewed as provisional (Saldana, 2021). Figure 4.2 is an image of initial coding for the teachers’ interviews.

**Figure 4.2. Initial Coding for Teachers’ Interviews**

**In Vivo Coding.** For the second round of the initial coding process, I decided to implement sentence-by-sentence coding to allow for a complete thought. In Vivo coding uses the participants exact words (Saldana, 2021). I chose this type of coding in order to maintain the integrity of the participant’s thoughts and experiences. In Delve, I read each sentence of the teachers’ responses and used the program to highlight a particular section and then created a corresponding code based on the teachers’ exact words. An example of In Vivo coding from the teachers’ responses was the phrase, “I think social media influence”, that was assigned the code Social Media Influence. Figure 4.3 shows a sample screenshot of the first cycle of coding in Delve.
In preparation for the first peer debriefing, I began to create a list of emerging categories that grouped together the In Vivo codes. Table 4.29 represents the emerging categories and In Vivo codes. The emerging categories and In Vivo codes were discussed during peer debriefing.

**Table 4.29 Emerging categories for Teacher Interviews and In Vivo codes**

<table>
<thead>
<tr>
<th>Emerging categories for Teachers Interviews</th>
<th>In Vivo Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to technology courses</td>
<td>• More exposure to technology courses needed</td>
</tr>
<tr>
<td></td>
<td>• Lack of exposure to technology courses</td>
</tr>
<tr>
<td></td>
<td>• Lack of exposure to the technology field</td>
</tr>
<tr>
<td>Teacher views social media as an influence</td>
<td>• Social media influence</td>
</tr>
<tr>
<td></td>
<td>• Social media influences decision for a technology class</td>
</tr>
<tr>
<td></td>
<td>• Lack of females on social media in the technology field</td>
</tr>
<tr>
<td></td>
<td>• Social media is the greatest influence</td>
</tr>
<tr>
<td>Video about technology courses</td>
<td>• Video presentations</td>
</tr>
<tr>
<td></td>
<td>• Video lessons</td>
</tr>
<tr>
<td></td>
<td>• Technology informational videos</td>
</tr>
<tr>
<td>Technology activities</td>
<td>• Technology things in action</td>
</tr>
<tr>
<td>Future opportunities for scholarships</td>
<td>Math Courses</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>We need to capture them in their world</td>
<td>Different math courses needed</td>
</tr>
<tr>
<td>Virtual reality glasses for class</td>
<td>Type of math is another factor</td>
</tr>
<tr>
<td>Need to visually connect with technology</td>
<td>Capable of doing the match course</td>
</tr>
<tr>
<td>Don’t understand the opportunities available for technology and non-traditional courses</td>
<td>Can start looking at scholarships in the eighth grade</td>
</tr>
<tr>
<td>Can’t start looking at scholarships in the eighth grade</td>
<td>Don’t know the scholarships available to them</td>
</tr>
<tr>
<td>Don’t understand how to win scholarship money for college</td>
<td>Don’t know the scholarships available to them</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The first peer debriefing was conducted with my dissertation chair to validate the proper use of terms after the first cycle of coding. We discussed the specificity of the codes to make sure that codes were descriptive for In Vivo coding and not too generalized. My dissertation chair recommended implementing different codes for the teachers’ interviews and the students’ survey responses. The suggestion was made to print out the codes and then determine if the codes could be placed into a specific category. My dissertation chair also advised me to continue with the emerging categories that I created and to consider modifying the list of categories in the next cycle and to begin thinking about themes. Next was to begin the second cycle of coding.

**Second Cycle of Coding of Teachers’ Interviews**

Pattern coding was used in the second cycle of coding, it groups the initial codes together into smaller categories or themes (Saldana, 2021). Prior to second cycle of coding, I added the list of emerging codes from Table 4.10 to be reflected in Delve then printed out the codes and the list of emerging categories to be placed on a table for manual coding. First, I placed all of the codes on the table. This allowed me to see all the codes at once. After being placed on the table in the same order as they appeared in Delve, I read through each set of codes and took notes in a notebook. This part of the process helped me move codes to different subcodes that they better aligned with and...
identify categories. I completed two rounds of pattern coding. In the first round of pattern coding, patterns began to emerge, and categories were created. The categories were (a) Teachers’ view of factors, (b) Gender related to technology courses, (c) Success, (d) Math Courses, (e) Microsoft programs, (f) Technology activities, (g) Video about technology courses, (h) Exposure to technology courses, (i) Technology careers, (j) Future opportunities and scholarships, and (k) Teachers view social media as a factor. Figure 4.4 is an image of the first round of pattern coding that was completed manually when categories were identified. In Delve, the categories were created to reflect the manual coding.

Figure 4.4 First Round of Pattern Coding for Teachers’ Interviews

After completing the first round of pattern coding another session of peer debriefing was conducted with my dissertation chair. During peer debriefing, my dissertation chair asked questions to guide the coding process, guarantee accuracy, and remove any bias. Several suggestions were made for the second round of codes, categories, and themes. We reviewed the code and categories to make sure they fit
together and then made the appropriate changes. For instance, initially the Additional Teachers’ thoughts had several codes that did not seem to fit into any category. The final suggestion was to consider the presentation of themes.

The second round of pattern coding was also completed using manual coding on a table. I reread each of the categories and their corresponding codes. Then I started to group together similar categories. Categories were combined together to form themes. There were eight themes identified and then all changes that were made during manual coding were reflected in Delve. The themes were (a) Teachers’ perceptions, (b) Gender, (c) Success, (d) Academics, (e) Related to technology field/courses, (f) Careers, (g) Future opportunities, and (h) Social media. At the conclusion of the second round of pattern coding, the codes listed under Additional teacher’s thoughts were able to be placed into various categories and then placed in the corresponding themes. Figure 4.5 is an image of the second round of pattern coding with themes identified. Figure 4.6 is a screenshot of the updated teachers’ themes in Delve.

Figure 4.5 Second Round of Pattern Coding for Teachers’ Interviews
In the third peer debriefing, my dissertation chair and I talked about the themes created. In the discussion, we considered the themes and their alignment with Chapter 2 and the research questions. It was decided to change the name of one of the themes. The theme name for Teachers’ perceptions was altered for accuracy and became Teachers’ personal perspectives of factors. Figure 4.7 is visual representation of the categories and themes for the teachers’ interviews.
Qualitative Themes and Interpretations for Teachers’ Interviews

Throughout two teacher interviews, eight themes emerged from the data: (a) Teachers’ personal perspectives of factors, (b) Gender, (c) Success, (d) Academics, (e) Related to technology field/course, (f) Careers, (g) Future Opportunities, and (h) Social media. The themes for teachers’ interviews are presented in Table 4.30. Pseudonyms were assigned to protect the identity of the teacher participants.

Table 4.30 Themes, Assertions, and Categories for Teachers’ Interviews

<table>
<thead>
<tr>
<th>Themes</th>
<th>Assertions</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers’ personal perspectives</td>
<td>Teachers share various factors that influences the choice of the eighth–grade female students to enroll in a technology course based on their personal perspectives.</td>
<td>Teachers’ view of factors</td>
</tr>
<tr>
<td>Gender</td>
<td>Teachers felt that the eighth-grade female students choose not to enroll in technology courses because of gender stereotypes.</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>The teacher believed that their female students do not enroll in technology courses because they are concerned about not being successful.</td>
<td></td>
</tr>
<tr>
<td>Academics</td>
<td>Teachers explain courses and programs they believed should be required to experience success in a technology course.</td>
<td></td>
</tr>
<tr>
<td>Related to technology</td>
<td>The teacher provided examples of ways they try to inform their eighth-grade female students about available technology courses.</td>
<td></td>
</tr>
<tr>
<td>field/courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Careers</td>
<td>The teachers agree that the female students are not aware of the benefits of enrolling in a technology course.</td>
<td></td>
</tr>
<tr>
<td>Future Opportunities</td>
<td>The teachers believed that the female student participants lack exposure to technology courses and were not aware of all of the future opportunities.</td>
<td></td>
</tr>
<tr>
<td>Social media</td>
<td>The teachers felt it was important to capture the female students’ attention in an arena that they understood such as social media. They also believed that there was a lack of female social media influencers from the technology field.</td>
<td></td>
</tr>
</tbody>
</table>
Teachers’ personal perspectives of factors. The first theme that emerged from the teacher interviews was the teachers’ personal perspectives on the factors influencing the choice of the eighth–grade female students to enroll in a technology course at KISD. Teachers who teach technology courses are considered knowledgeable and can share their knowledge about the course and the technology field (e.g., Milgram, 2011; Stearns et al., 2016). The teachers’ personal perspective of factors provides insight into why the female participants are not enrolling in a technology course.

Teachers’ views of factors. In this section the teachers disclose their professional opinions about the factors that influence the choice of the eighth–grade female students of technology courses. Ms. Jackson believed a factor that would influence their choices to enroll in a technology course is their lack of interest in using a computer. She explains, “they really are not into computer usage” The female students are accustomed to using mobile devices and are not well versed in computer software programs, such as Microsoft Office. Ms. Wilson provided three different factors that in her opinion affected the choice to enroll in a technology course. The factors that she named as important are unique field of study, family support, and role models. As mentioned above, Ms. Wilson considered technology courses to be in a unique field of study making it a deterrent for young eighth–grade female students to select for high school. She claimed, “a lot of family support is a factor”. She speculated that family support played a vital role in the choices of her female students Ms. Wilson concluded her interview by discussing the influence of role models. She suggested the female students can, “talk to students that maybe have taken the courses”. Collectively the teachers, determined four factors that they have
personally witnessed has having an influence of the eighth–grade female students when choosing to enroll in a technology course.

**Gender.** There is a national movement that recognizes the gender gap in the STEM field and technology classes (Milgrim, 2011). Recent research studies (e.g., Outlay, Platt, & Conroy, 2017; Sassler, Glass, Levitte, & Michelmore, 2016) in the STEM field provides evidence of reasons for the gender gap. For example, Bartow (2016) articulated the discouragement that female students experience such as being informed that boys are superior in math and technology. Cultural stereotypes can be obstacle for female who are interested in a technology course (Hand, Rice & Greenlee, 2017).

**Gender related to technology courses.** Both teachers solidified the concept of the eighth–grade female students feel discouraged to enroll in technology courses because of their gender. Ms. Jackson described what she witnessed when assisting the female students to select a high school endorsement. “I do notice that they kind of stay in endorsements that are gender neutral to their own gender …it’s ok to dabble in other endorsements, it doesn’t have to be what society has boxed your gender in”. Ms. Wilson referred to the struggles of enrolling in non-traditional courses of study for the eighth–grade female students. She emphasized that the female student did not like choosing a course that would separate them from their other female peers.

**Success.** Current research showed that female students are more likely to have a negative attitude towards STEM courses or careers resulting in low performance and decreased success (Katmada, and Tsiatsos, 2017). The teachers confirmed the idea of the eighth–grade female students being skeptical of their own perceived success in a
technology class. Female students who doubt their knowledge of STEM courses also question their own ability to be successful in a STEM course (van Aalderen-Smeets & Walma van der Molen, 2016).

**Concern about not being successful.** The teachers explain their experiences with the eighth–grade female students’ as they learn about the technology courses available to them in high school. Ms. Jackson is quoted as saying, “I think once they hear about the endorsements offered, they are a little more intrigued but kind of nervous because they don’t want to not be successful because they kind of just have self-doubt” Ms. Wilson detailed how the female students were intimidated by technology courses, “they think this class is a little hard for them because it asks them to stretch and think a little bit and to think outside the box”. In her professional opinion, she felt as though the female students viewed the technology class as being a little bit hard for them

**Academics.** When making course selection for high school, the eighth–grade female students can only draw from their current academic knowledge. They rely on their instructors to inform them of their choices and the content associated with those courses. For example, through research, Huber et al (2017) suggested that mandatory enrollment in advance level math courses in high school maybe a solution for increasing female students’ interest in a STEM career. In their interviews, the teachers discussed courses they felt were necessary for success in a technology course.

**Math courses.** When asked to specifically address one factor for selecting a technology course, Ms. Wilson considered the type of math courses as a factor that influenced the eighth–grade females’ choices of technology courses at KISD. Ms. Wilson expressed concern about the method of communicating the required prerequisite courses
to the female students. She vocalized, “I don’t think the math teachers are saying ‘when you take this course’ or ‘you can take a more advanced math course’”. From her experiences she is inferring that the eighth–grade female students are not being properly informed in order to be prepared for technology courses at the high school level. Ms. Jackson felt that if no one is telling the female students they can be successful in math courses then they won’t feel like they can be, “Give them the opportunity to think they are capable of doing it, they have trepidation about not being successful.” She went on to say, “before we got into course selection, they really had no idea what courses were offered”. Both teachers felt it was imperative to inform and encourage the eighth–grade female students to select an advanced level math course as a means to encourage more STEM classes such as a technology course.

Microsoft programs. Through the course of the interviews the teachers disclosed their experiences of working with the eighth–grade female students in a technology class. Ms. Jackson recalled the students dislike of using computers because they are not well versed on using a desktop computer. They are accustomed to using mobile devices as their main form of technology hardware. In her course, Ms. Jackson teaches all eighth–grade students how to use Microsoft Word, Excel, and PowerPoint. When referencing any prior knowledge that the eighth–grade female students might have she remarks, “the kids who were not into computer usage, they had no idea about Excel, Power Point, or Microsoft Word”. Ms. Wilson disclosed in her experience, the female students have limited knowledge on how to use technology, “they don’t know all the things technology includes right now, they see like this much” (indicating a small amount). There is a misconception that all middle schoolers are familiar with all forms of technology
Related to technology field/course. One way to increase the number of females in a technology course, would be to introduce students to STEM education at a lower grade level (Lazaros & Bormann, 2013). The teachers mentioned several components to the eighth–female students’ relationship to technology courses and career field such as (a) technology activities, (b) videos related to technology courses, and (c) exposure to technology courses.

Technology activities. During both interviews the teachers described the material they use to teach the female students about available technology courses in high school and technology careers in the future. Ms. Wilson referred to the technology equipment that she utilized in class. She provided the example of virtual reality goggles and expounded on the benefits of exposing the female students to multiple platforms of technology. “I think if they could visual connect, then you can meet them where they are”. Ms. Jackson has a classroom full of computers that she used to teach them using the Microsoft Office suite, “I think they just need to see some of the things in action”. Both teachers use hands on projects in their class to promote technology education.

Video about technology courses. Ms. Jackson and Ms. Wilson provide their students with informational material about high school endorsements and courses. Ms. Jackson talked about the technology course informational lessons that are conducted in class. In her class, lessons incorporate instructional videos containing information about the STEM endorsement and technology courses available at KISD. “There is a video that we watch that goes over each of the endorsements then we have students come in and we talk about it”. Ms. Wilson expressed the importance of providing interactive lessons to help keep the female students interested, “watch some videos or any type of technology
that they can do interactively”. Instructional videos provided visual representation of the technology courses offered.

**Exposure to technology courses.** Another aspect that both teachers agreed upon was the lack of exposure to technology courses available to the eighth–grade female students in high school. The teacher participants felt that the female students needed more access to available technology classes. Ms. Jackson, “Last year some students that were at the Career Center came over and talked to the students, some of the students had no idea Robotics (course) even existed”. The lack of exposure to the high school technology courses reduced their familiarity with all of the course options available to them. Ms. Wilson also suggested to remedy that problem it would be wise to communicate with high school students. “They can talk to students who have taken the course”. The lack of exposure to high school technology courses hinders the increase of female students enrolling in a technology course because they simply are not aware that it exists.

**Careers.** Females are underrepresented in technology careers (Milgram, 2011; Mone, 2016). That trend originated with the decreased number of females in technology classes in secondary and post-secondary classes. The teacher participants attributed the lack of females pursing a technology career to the lack of knowledge and understanding of what a technology career involves.

**Technology careers.** During their interviews, the teachers shared views about the eighth–grade female students’ lack of knowledge of potential future careers. Ms. Jackson elaborated, “a lot of girls just really don’t have the idea or the understanding to know what a career in technology looks like”. Ms. Wilson was more inclined to believe the female students gave into societal stereotypes when it came to choosing a technology
career. She explained that the female students struggled to feel confident about considering a career in the technology sector. “You know like any unique field of study, something non-traditional”. Similar to the topic of technology courses, the teachers speculated the female students did not have enough information to make an informed decision about pursuing a career in the technology sector

**Future Opportunities.** Future opportunities are available for students who choose to enroll in a technology course. Currently, in the United States there is a deficit of individuals who pursue a technology career, which by extension decreases the number of qualified applicants in the technology sector (English, 2016). In order to consider a career in the technology sector, the female students need to receive education on their options for being successful in the technology field.

**Unaware of STEM-related future opportunities and scholarships.** The teachers’ interview responses segued into future opportunities that would help create success in a technology career. Ms. Jackson blamed the lack of exposure to information about a technology course as a reason the female students are ignorant to future opportunities. She said, “I feel like that because they’re not really exposed to that, they kind of don’t know of technology to a field that is cool, and girls are really into it”. Ms. Wilson spoke candidly about the scholarship opportunities available to the eighth-grade female students. She elaborates on the fact that the female students who are enrolled in technology courses can begin applying for scholarships specifically intended for female students who are interested in the technology field of study. “I don’t know that they understand that you can win a hundred dollars now and let it sit there”. Ms. Wilson
believed that the female students were not aware of the resources available to them if they choose to pursue a technology career.

**Social Media.** Societal factors have a direct impact on whether eighth–grade female students choose to enroll in a technology course (Chaschashvili-Bolotin, Milner-Bolotin, & Lissitsa, 2016). Koch and Gorges (2016) address the fact that females in technology fields have been quoted as stating that they feel like an outsider in the field. In this research study, the teachers determined that social media was a major factor on the eighth–grade female students’ choice to enroll in technology courses.

**Teachers’ views social media as an influence.** During her interview, Ms. Jackson explained that “there is not enough of a female presence on social media from the technology sector”. She continues to explain that very few social media influences from the technology sector are female. For instance, if the eighth–grade female students were able to follow female TikTok influencers from the technology field then the female students would have role models they could relate to. Ms. Jackson clearly stated, “there’s not many females that use social media to show themselves to be in the technology field”. During the interview with Ms. Wilson, she expressed the idea of the female students visually connecting with technology courses. She clarified by saying, “we can capture them in their world of something that would hold their interest, then they can see what the possibilities are.” A larger social media presence of females in the technology sector would help capture the female participants in an environment that they are familiar with.

**Students’ Open-ended Responses**

The students’ open-ended survey responses were analyzed using the same steps as the teacher interviews. Students completed their survey by scanning a QR code that
linked to SurveyMonkey on their mobile devices. The responses were made available to the researcher through SurveyMonkey and then downloaded to a Microsoft Excel spreadsheet. There were five open-ended questions in total and once on the spreadsheet, question responses were individually transferred to a Microsoft Word document. After five Microsoft Word documents were created, they were then uploaded to Delve for coding.

**First Cycle of Coding for Open-ended Survey Questions**

Reflective of the qualitative data analysis done on teachers’ interviews, the students’ open-ended responses were coded using In Vivo coding, and pattern coding. I chose these methods of coding to maintain consistency of analysis across the entire researched study but also to not alter the thoughts of the eighth-grade female students. Due to the amount of survey responses, manual coding was not conducted in the initial round of coding, all coding was completed using Delve. After being uploaded to Delve, I read through each open-ended survey question and its responses. At the conclusion of reading all five open-ended questions and responses I began In Vivo coding.

**In Vivo coding.** Starting with the first open-ended survey responses, I used Delve and highlighted relevant responses from the female student participants. Then I assigned codes for the highlighted responses. An example of In Vivo coding for the open-ended survey responses is the phrase, “I get to learn how to use things at a higher level that I didn’t know how to use before”, was coded Learn Skills Involving Technology. Figure 4.8 shows the first cycle of In Vivo coding in Delve for the open-ended survey responses
Prior to peer debriefing, I reviewed the In Vivo codes and began considering categories. Table 4.31 shows the emerging categories and In Vivo codes that were discussed in peer debriefing.

Table 4.31 Emerging categories for Students’ Open-ended Survey Responses and In Vivo codes

<table>
<thead>
<tr>
<th>Emerging categories for Students’ Open-ended</th>
<th>In Vivo Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoughts on technology lessons</td>
<td>• Learning more things about that will benefit me</td>
</tr>
<tr>
<td></td>
<td>• Learning new things about technology</td>
</tr>
<tr>
<td></td>
<td>• Learn cool and useful features on the computer</td>
</tr>
<tr>
<td></td>
<td>• Explore the web and manufactured programs</td>
</tr>
<tr>
<td></td>
<td>• Like technology activities</td>
</tr>
<tr>
<td></td>
<td>• Increase technology knowledge</td>
</tr>
<tr>
<td></td>
<td>• Teacher helping to improve on technology lessons</td>
</tr>
<tr>
<td>Type of technology activities in a technology class</td>
<td>Feelings about technology courses</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Learn how to do things on the computer</td>
<td>See friends in class</td>
</tr>
<tr>
<td>Learning Word</td>
<td>Group work and fun activities</td>
</tr>
<tr>
<td>Learning Excel</td>
<td>Working on the computer</td>
</tr>
<tr>
<td>Functions of a computer</td>
<td>Explore new things in technology classes</td>
</tr>
<tr>
<td>Learning apps</td>
<td>The technology class is chill</td>
</tr>
<tr>
<td>Learn to type</td>
<td>Learn something new everyday</td>
</tr>
<tr>
<td>Word documents can be confusing</td>
<td>Likes the freedom in technology class</td>
</tr>
<tr>
<td>Word documents can be boring</td>
<td>Cool for people who like technology</td>
</tr>
<tr>
<td>When files don’t submit correctly</td>
<td>Possibly useful in the future</td>
</tr>
<tr>
<td>Technology lessons can be confusing or complicated</td>
<td>A technology class is fun</td>
</tr>
<tr>
<td>Excel can be confusing</td>
<td>It’s easy</td>
</tr>
<tr>
<td>Don’t like technology quizzes</td>
<td>It’s fun having a friend in class</td>
</tr>
<tr>
<td>Technology is just overwhelming</td>
<td>It’s fascinating</td>
</tr>
<tr>
<td>I don’t like to type</td>
<td>It’s fun</td>
</tr>
<tr>
<td>Engineering sparks my interest</td>
<td>Neutral feeling about a technology class</td>
</tr>
<tr>
<td>Everyone can find a way to import technology into their lives</td>
<td>Takes time and effort to work in a technology class</td>
</tr>
<tr>
<td>Technology can make things complicated</td>
<td>Don’t like presentations because they take up too much time</td>
</tr>
</tbody>
</table>

Attends a technology class everyday
A technology class is time consuming
Technology can make things complicated
Perceptions of technology activities

- Technology class can be tedious
- Technology class is boring
- Technology class is boring and a waste of time
- A technology class should not be required
- Can be somewhat difficult work
- Learning new things that couldn’t learn independently
- I find engineering cool and interesting
- Technology does benefit us at school
- Enjoy technology projects
- Technology classes help complete work faster
- Doing assignments on a sucky day
- Computer issues when working on a project
- Headache from screen time
- Staring at a screen for too long
- Don’t like technology terminology
- Making PowerPoints
- Working on PowerPoints
- I don’t know how to type
- Sometimes the computer is too slow
- Not interested in learning about digital footprint
- Typing takes longer than writing
- Don’t understand certain things
- Can listen to music and work
- Teacher is chill
- Free time after lesson
- Nothing negative about Tech Apps
- The technology teacher is nice
- Technology Applications is a good class

Thoughts on Technology Applications

- Good class to take
- I enjoy Technology Applications
- Deadline for projects
- Too much on the computer is boring
- Too much independent learning
- Boring because it is easy
- Too much work
- All big projects
- Don’t like peers in class
After school or summer camps

- The teacher teaches technology lessons too fast
- Technology class is a loud learning environment
- I feel rushed
- Should be taking classes they enjoy
- Too fast paced
- No afterschool or summer camps
- Latins LEADS STEAM program
- After school coding club
- Camp invention STEM Summer Camp
- Assisted technology department after school and in the summer

Influences for choosing a technology course

- Following my own aspirations
- Learning new technology lessons is an influence
- My dad works in technology
- My mom is an influence
- Biggest influence is the stereotype of engineering being for boys
- Learning to type is an influence
- Dream job is an influence
- Future financial gain in an influence

Planning to pursue a technology/STEM career

- Intend to be a marine biologist
- I work to work in the technology field
- Future job as a programmer

Planning to enroll in a technology course

- Planning on enrolling in a programming class
- Choose to enroll in technology in high school
- Really want to do a Robotics class in high school

After the first cycle of coding for the students open-ended survey responses, peer debriefing was completed with my dissertation chair. The initial codes were discussed as possible categories. We decided to continue with the emerging categories as potential categories for the next cycle of coding. A suggestion was made to divide the responses in each of the emerging categories for thoughts, feelings, and perceptions into positive and
negative responses. Additionally, in the category of Thoughts on Technology Applications it was suggested to divide responses into teacher and activities. Figure 4.9 reflects the changes in Delve to include the peer debriefing suggestion of adding negative and positive groupings. The next step was pattern coding to help identify themes.

Figure 4.9. Positive and Negative Grouping Added to Categories in Delve

**Second Cycle of Coding for Student Open-ended Responses.**

In order to keep continuity of the analysis process, the students’ open-ended survey responses were manually coded during the second cycle of coding and used the same process of manual coding as the teachers’ interviews. There were two rounds of pattern coding conducted.

**Pattern Coding.** Pattern coding was chosen in the second cycle of coding. In the first round, pattern coding was initially conducted manually with all codes and the categories that were discussed in peer debriefing being printed out and placed on a table. Once I was able to view all codes and categories, I began grouping similar categories together to assist in identifying emerging themes. For example, I grouped together the
two categories of Planning to pursue a technology/ STEM career and Planning to enroll in a technology course and those two categories became the category of Future in Technology. This process was done with all remaining categories. Figure 4.10 is an image of the categories and codes printed out in order to begin pattern coding for theme identification.

In the second round of pattern coding, I reviewed and considered all the categories and continued to group them together. Through this round two themes were created, (a) factors and (b) influences. For instance, the category of Future in Technology was grouped together with four other categories to become the theme of Perceptions. Figure 4.11 shows second round of pattern coding for students open-ended survey responses.
Figure 4.11. Second Round of Pattern Coding for Students’ Open-ended Survey Responses

The final peer briefing was conducted. My dissertation chair asked questions to clarify the difference between perceptions of factors versus thoughts and feelings. It was explained that the perceptions were mostly from the females who haven’t taken a technology course at the time of the survey and thoughts and feelings were female students who were currently enrolled in a technology class. It was also discussed if all categories appropriately fit into the themes for students’ responses. My dissertation chair recommending changing the theme name of influences to factors. After the final peer debriefing, the categories and themes in Delve were updated to reflect the discussed changes. Figure 4.12 represents the themes in Delve for students’ survey responses.
Figure 4.12. Themes for Students’ Open-ended Responses in Delve

Figure 4.13 serves as a visual representation of the categories and themes grouped together from the students’ open-ended survey responses.

Figure 4.13. Visual Representation for Categories and Themes for Students’ Open-ended Survey Responses
Qualitative Themes and Interpretations for Students’ Open-ended Survey Responses

Two themes emerged from the data analyzed from the students’ survey responses: (a) Factors and (b) Perceptions. The themes for students’ open-ended survey responses are presented in Table 4.32. Pseudonyms were assigned to each of the female student participants to protect their identity.

Table 4.32 Themes, Assertions, and Categories for Students’ Open-ended Survey Responses

<table>
<thead>
<tr>
<th>Themes</th>
<th>Assertions</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors</td>
<td>Female student participants provided examples of activities and factors that encouraged and deterred them from selecting to enroll in a technology course.</td>
<td>• Types of technology activities&lt;br&gt;• Influences for choosing technology&lt;br&gt;• After school or summer program</td>
</tr>
<tr>
<td>Perceptions</td>
<td>The female students who have taken a technology class share their thoughts and feelings on the course work and learning environment. Those participants who have not taken a technology course share their ideas of what it will be like.</td>
<td>• Perceptions of technology activities&lt;br&gt;• Thoughts of technology lessons&lt;br&gt;• Thoughts on Technology Applications&lt;br&gt;• Feelings about technology courses&lt;br&gt;• A future in technology</td>
</tr>
</tbody>
</table>

Factors. In the literatures, three types of factors influencing the eighth–grade female choices when enrolling in a technology course were listed (a) personal, (b) organizational, (c) societal (e.g., Katz & Halpen, 2014; Stearns et al., 2016; & Leaper & Starr, 2019). The responses from the open-ended survey responses were consistent with
these three factors. The students’ theme of Influences had three categories. These
categories are (a) types of technology activities, (b) After school or summer programs,
and (c) influences for choosing technology courses.

**Types of Technology Activities.** Types of technology activities were coded for
technology activities that appealed to the female students, which correlated with the
organizational factors. When asked, what was the biggest influence when choosing to
enroll in a technology course, several of the females responded with types of technology
activities that interested them as reason to enroll. Eleven out of 66 eighth–grade females
stated that learning to type was an influence and seven out of 66 added learning how to
do things on a computer. Madison reflected, “learning the different parts of the computer
and what I can do on it that I didn’t know”. An additional eleven answered with a specific
Microsoft product, three for learning Word, and nine for learning Excel. The remaining
responses consisted of four responses of learning apps and one of functions of the
computer. Aurora expressed, “my favorite thing about technology classes are learning
new apps and how to work them”. All the female students’ responses for Types of
Technology Activities are written in a positive tone.

**After School or Summer Programs.** The second coded subcategory that is
aligned with the organizational factors is the grouping for after school or summer
programs. The largest realization for this subcategory is the fact that 61 out 66 eighth–
grade female students have not participated in any afterschool or summer school
program. Elena was one of the female students who confessed to not participating in after
school technology programs. “I have not participated in after school technology clubs or
summer camps”. This subcategory provided evidence that the eighth–grade female
students do not have exposure to a technology course outside of KISD’s required course. One female student, Toria explained, “I helped the tech guy, almost every day and at least twice a month during the summer”. She previously assisted the Technology Department after school and on weekends as an internship-like job experience. The remaining four female students have participated in Latina LEADS STEAM program, Camp Invention Summer camp, STEM Summer camp, and an after-school coding program.

**Influences for Choosing a Technology Course.** The last coded subcategories of influences for choosing a technology course included both factors of societal and personal. Societal factors are defined as an individual’s peers such as parents, friends, siblings, etc. (e.g., Katz & Halpen, 2014; Adams, Barber, & Odean, 2018). At this age, parental influence is probably one of the biggest influences on the eighth–grade female students. Nora supplied, “My dad works a lot with computers, and he is very successful so I thought this class would really help me.” Furthermore, Grace referred to her mom as the greatest influence, “My mom because she told me I need to learn how to type properly in order to get a job.” The eighth–grade female students appear to understand that they will be the minority gender in the technology sector. Theresa offered, “I think it is important to follow my dreams of engineering, I think my biggest influence is probably that it’s stereotypical of a guy to enroll in things like engineering/technology, but I want to change that”. The responses of the female participants suggest with encouragement and support they would be willing to enroll in a technology course.

Lastly, the female students had their own personal reasons for choosing to enroll in a technology course. Several of the responses outlined their own future financial and career goals. However, the comments were not focused on having a future career in the
technology field. They were more focused on learning technology features to aid the female participants in other future career fields. Leah, “I wish to start my own website someday in the future to promote my work”. Maya has aspiration to start her own business, “I want to have my own business and learning how to use Excel will be useful in that case”. Leilani viewed a technology career as a means to financial gain and not really something she would like to pursue. When asked her favorite thing about enrolling in a technology course, she responded with, “The money I would make if I decided to get a tech-based job”. The female participants view a technology course as a tool for future success and not necessary a career path.

**Perceptions.** There are several components related to perceptions of the eighth-grade female students for technology classes. Prior research lists some components as, hands-on learning, peers’ opinions, parents, and their instructors (e.g., Kressler & Kressler, 2020; Nealy & Orgill, 2019). Participants perceptions were grouped into five categories (a) thoughts on technology lessons, (b) perceptions of technology activities, (c) feelings about technology courses, (d) thoughts on Technology Applications, and (e) a future in technology.

**Perceptions of Technology Activities.** The perceptions of technology activities section depict the eighth-grade female students’ ideals surrounding using different types of technology. Through the coding process it was determined that the perceptions of technology were both positive and negative. It was also determined that the number of positive perceptions were significantly lower than the number of negative perceptions. There was a total of 25 female student responses that were coded for perceptions of technology activities and only 9 were positive in nature. Four female students responded
that they enjoyed using technology to complete projects. Chloe said, “I enjoy the projects that is included in my Technology Apps class.” Helen responded to the open-ended survey question with, “Technology does benefit us at school, especially if you want a job that includes you using technology most or all of the time”. The negative perceptions were mostly directed at using a computer as their technology device. Four female students explained that sometimes the computer runs to slow. Zoe said she dislikes staring at the computer screen for too long. Sara added, “not being able to type as fast as I write”. The fact that the majority of the comments were negative shows that the female participants have negative perceptions involving using technology to complete assignment.

**Thoughts on Technology Lessons.** Open-ended survey responses that were coded Thoughts on Technology Lessons were reflective of the eighth–grade females’ individual comments about the technology lessons they personally learned. This section of coding was divided into positive and negative. The majority of positive thoughts centered around how the female students viewed learning new ways to use technology. Beth stated, “we learn cool and useful features on the computer”. Twelve different female students responded that they enjoyed learning new technology things for the future. Lastly, Anne explained, “I think everyone could find a way to import technology in their lives even if their job doesn’t have anything to do with it”. The negative comments demonstrated the elements of technology associated with the lessons that the female students did not like. Several of the responses were venting frustrations about the level of difficulty of the technology lessons. Nine female students responded that they found technology lessons to be confusing or complicated. Maria declared, “it’s frustrating when I don’t know how
to do anything on an assignment”. Overall, the female participants had mixed perspectives on learning lessons related to technology.

**Thoughts of Technology Applications.** Thoughts on Technology Applications were coded for eighth–grade female students who were enrolled in the Technology Applications course at KISD. At the completion of the open-ended survey, the female students had been in the Technology Applications class for three months. The positive and negative responses were coded based on the female students’ personal experiences in Technology Applications. As shown in the responses, the eighth–grade female students reportedly enjoyed the learning environment and the instructor. Olivia expressed, “I like it because the class is chill, and the teacher is chill”. Amelia wrote, “My favorite thing about tech (apps) is the fact that I can listen to music and work”. The negative comments were comprised of the workload that was required for the Technology Applications course. Sophia disliked, “having close deadlines for projects”. Isabella recalled, “It can be tedious, and I feel rushed”. The Technology Applications class encourages students to have independence that might not be available in other classes and the female students get to experience that independence for the first time in their academic path. According to the female participants’ responses, the instructor allows students to listen to music and complete assignments with minimal supervision, giving the students the opportunity for independent learning. Some of the female students view that as a benefit to taking a technology course and some other students view it as a deterrent for enrolling in a technology course.

**Feelings about Technology Courses.** Feelings about technology courses also contains subcategories of positive and negative. This category of responses is from
female students who have not been in a technology class prior to completing the survey. The positive responses describe a technology class as a fun, easy environment that promotes group assignments. Six eighth-grade female students answered that they felt a technology course would be fun and easy. Gabrielle said her impression of a technology course was, “doing group work and fun activities”. Monica proclaimed, “it’s pretty cool for people who like technology”. The negative responses were projections of what the female students believed a technology class would be like. Evelyn decided a technology class would be, “boring and a waste of my time”. Diane echoed that some point by responding with, “I think that technology classes are effective but shouldn’t be required. It should be optional to take, because if someone doesn’t plan at all to work in technology, they could spend their time doing something they enjoy/plan on doing in the future”. The feelings about technology courses seem to contain a personal bias from the female participants who may or may not enjoy the use of technology.

A Future in Technology. A Future in Technology incorporates two subcategories, planning to pursue a technology/ STEM career and planning to enroll in a technology course. Question 5 of the open-ended survey gave the female participants an opportunity to share any final thoughts they had about enrolling in a technology course. The eighth-grade female students used that opportunity to comment about possibly enrolling in a technology course or pursuing a technology career. Nine female students’ responses included the fact that all future jobs will require some form of technology knowledge. Some of the female students expressed their interest in the technology field. Naomi confessed, “I want to work in a technology related job”. While Naomi’s response was vague, some of the female students knew exactly which technology career field they
wanted to pursue. Brooklyn viewed a technology class as an avenue to obtain her dream job “It will be highly useful for my future career as a programmer”. Also, in their responses to question 5, the female participants stated their intentions to continue in a technology during high school. Genesis considered the course work for the eighth-grade technology course as part of her decision to continue in a technology course in the future, “It’s not too hard nor too easy, I like it and would take it again in high school”. Serenity was more direct with the technology course path she wants to enroll in for high school, “I really want to do robotics in high school.” While a majority of the comments were positive in tone, this category did confirm that a small amount of female students actually plans to continue in the technology sector.

Summary

After analyzing both quantitative and qualitative data sources it appeared that the eighth-grade female students had both positive and negative perceptions of technology courses. However, analysis of the data also determined that the female participants found a technology course to be useful in relation to their future career choices, whether or not it was in the technology field. The teachers’ interviews brought to light the fact that the eighth-grade female students do not have enough exposure to technology courses in middle school. Furthermore, the quantitative and qualitative data sources of the students’ surveys, and the teachers’ interviews presented the idea that parental involvement and encouragement is essential to an eighth-grade female students’ choice to enroll in a technology course. In chapter five, discussion will continue about the factors that influences the choices of the eighth-grade female students in technology courses.
CHAPTER 5

DISCUSSION, RECOMMENDATION, IMPLICATION, AND LIMITATIONS

The purpose of this action research was to explore the factors influencing eighth-grade females students’ choices regarding technology classes in KISD in order to make recommendations on how to increase the number of female students enrolling in technology classes. This chapter includes the quantitative and qualitative research findings as they relate to the research questions and the literature review. This chapter also includes recommendations, implications, and limitations.

Discussion

To address the research questions in this study, quantitative and qualitative data were collected, analyzed, and compared to the previous research found in the literature. The discussion section is divided into findings for three research questions (a) What are the eighth-grade female students’ perceptions about technology courses at KISD? (b) What are the factors that influence the eighth-grade female students’ choices of technology courses at KISD? (c) How do the eighth grade CTE teachers perceive the factors influencing the eighth-grade female students’ choices of technology courses at KISD?
Research Question 1: What are the eighth–grade female students’ perceptions about technology courses at KISD?

Research question 1 focused on the eighth–grade female students’ perception of technology courses at KISD and was analyzed using both quantitative and qualitative data collected from the student survey. The findings were compared to the current literature in the educational technology field.

The data from the quantitative findings suggested the eighth–grade female students at KISD generally have positive perceptions of a technology course. There was a total of ten survey questions that asked the eighth–grade female students’ perceptions about technology courses. Five of the questions were written in a positive tone and had a mean score ranging from 3.33-3.55. The question with the highest response ($M = 3.55$) was, ‘A technology class would include activities that I enjoy doing’. A total of 47.76% of the female participants agreed with Moderately agree that they would enjoy activities in a technology class. At KISD, the learning environment in technology courses deviate from that of core classes. The activities completed in a technology course are hands-on, project-based lessons designed to encourage a student-centered classroom. Nealy and Orgill (2019) researched that hands-on projects and lessons create positive perceptions of STEM courses. A mean of 3.55 suggests that the female students view the hands-on technology activities as a benefit to participating in a technology class. Furthermore, two survey questions in the perceptions section returned the same mean score ($M = 3.35$), ‘A technology class would be fun and enjoyable’, and ‘A technology class would be a good use of my time’. These two questions signify that the eighth–grade female students perceive a technology class to be enjoyable. This notion was verified in the female
students’ open-ended survey responses. During the open-ended survey responses, the eighth–grade female students reflected on classroom assignments by expressing their enjoyment for technology projects and the ability to learn new things that they could not learn independently. Kressler and Kressler (2020) conducted a researched study on the benefits of active learning in a STEM class and explained that interactive hands-on activities promoted positive perceptions of a STEM course. Mesas-Carrascosa et al. (2019) have done research to support the concept of hands-on projects increasing the female students’ interest in STEM related courses. The technology projects and components that the female students have experienced in class have aided to creating positive perceptions about technology courses, which could encourage them to enroll in more technology courses in the future.

There were five survey questions that asked about the eighth–grade female student’s perceptions of a technology class using a negative tone: an equal number to the positively worded questions. The negatively worded questions afforded the female students the opportunity to agree to negative statements. However, when asked a negatively worded question, the female participants responded with moderately disagree. For example, the question with the lowest mean score ($M = 2.50$) was, ‘A technology class would require me to give up too many other activities that I value’. Also, the question, ‘Considering what I want to do with my life, having a technology class is just not worth the effort’ ($M = 2.61$). With a response of slightly disagree, the female students do not believe that a technology class would hinder them from other activities. Compared to male students, female students have shown more interest in human relationship and contextual aspects of life versus technical aspects (Aeschlimann et al., 2016). Combining
the aspects of life that interest the female students with the lessons learned in a technology class could increase the interest of the female students.

The female students’ open-ended survey responses confirmed negative perceptions when the students reflected on lessons they did not enjoy or had no interested in learning. Kennedy, “my least favorite is the digital footprint because I wasn’t interested in learning it”. Skylar followed with, “making presentations because they require too much of my time and thinking.” The female students also voiced frustrations of working on assignments when they did not fully understand the technology lessons, which made the female student not enjoy a technology course and leading to negative perceptions. Allison stated, “I don’t like doing Excel because I get confused”. Rylee, “using hard programs and sites that require lots of thinking and a long process. A negative perception can be formed based on whether or not the female student can visualize herself in the STEM field (Kang et al, 2018). It is challenging for the female students to visualize themselves in a technology class when she is feeling confused and frustrated with the lesson. Reteaching or allowing extra time for confusing assignments would help to reduce frustration and increase understanding.

Piatek-Jimenez (2018) discovered parental influence, particularly mothers’ views on science and math was directly related to their students’ self-perception in the field of study. The survey questions did not ask the female students to speculate on their parents’ perceptions of STEM or technology classes. While the female students’ open-ended responses recognized parental influence as a factor, they did not directly correlate it to what formulated their own perceptions of a technology course.
Research Question 2: What are the factors that influence the eighth–grade female students’ choices of technology courses at KISD?

Quantitative data was analyzed from the student survey and qualitative data from the student open-ended survey questions and instructor interviews. Collectively, from all sources of data it was determined that are three categories of factors that influenced the eighth–grade female students’ choice of technology courses: (a) societal, (b) organizational, and (c) personal (e.g., Katz & Gorges, 2016., Stearns et al., 2016, Leaper & Starr, 2019).

Societal

A major societal factor was peer pressure. Katz and Halpen (2014) identified peer influences as affecting a female’s choice to enroll in a STEM course. The research study participants were asked to compare themselves to their classmates in performance in a technology course. Foud and Santon (2017) did a researched study that included SCCT and explained that societal factors such as peers and family situation came impact a women’s choice of a STEM path. When comparing themselves to other Technology Applications students, the eighth–grade female students considered themselves equal to boys ($M = 3.28$) and girls ($M = 3.28$) in terms of excelling in a technology class. This question returned the highest number of neutral responses of Neither disagree nor agree when compared to other students 64.17% for male students and 70.14% for females students. The participants did not mention peer influence as a factor during their open-ended responses.

A second societal factor was family influence. The female participants did not feel encouraged by their fathers ($M = 2.40$) or their mothers ($M = 2.66$) to enroll in a
technology course. This could be a deterrent or a reason for the female students to select other courses for high school. In the open-ended survey, two female students referred to their parent as an influence. Julianna, “my dad works a lot with computers, and he is very successful so I thought this class could really help me.” Kiara reiterated parental influence, “my mom because she told me I need to learn how to type properly in order to get a job”. In her interview, Ms. Wilson expressed the importance of parental influence. She reiterated the need for the female students to feel supported and encouraged to enroll in a technology course. Adams et al. (2018) conducted research that explained that family members can impact an eighth–grade female students’ choices through support or lack thereof. Female students are the minority gender in a technology classroom, and they require support from their families to be successful and feel included.

Ms. Jackson and Ms. Wilson listed social media as an influence for the eighth–grade female students’ choices. As classroom teachers, they have witnessed all students spending a significant amount of time watching social media on their cell phones, in class, hallways, or during lunch. The teachers perceived social media as one of the major influences because of the amount of time that the female students choose to spend on various types of social media. Social media influencers can be viewed as role models for the eighth–grade female students. Milgram, (2011) provided researched data to support the idea that role models are individuals who the female students look up to and have similar interests. Master et al (2016) research supported this concept further by highlighting the fact that the technology sector is lacking in female role models. Conversely in their open-ended responses, the students did not mention social media, for example TikTok or Instagram as a source of influence for their choice to enroll in a
technology course. The absence of open-ended survey responses that included social media as an influence, might be verification that the eighth-grade female students are not followers of social media influencers in the technology sector. Furthermore, it can be assumed that the eighth-grade female students do not consider social media influencers in technology careers to be role models.

**Organizational**

The teachers and the female students did agree on technology components of technology courses or field as a factor of influence. The eighth-grade female students agreed that technology use is promoted in other classes ($M = 3.27$). It is clear that teachers mention technology use in other classes because 40.30% of the female participants responded with Strongly disagree when asked if their teachers do not mention technology use in class. The type of technology used in a technology class was the subject of many of the students’ open ended survey responses. Many of the open-ended responses indicated that the female students were not familiar with operating a computer. Regina described a technology class as being able to “help you figure out your way with computers and typing” A total of 11 female students commented on their ability or inability to type. The eighth-grade female students offered examples of things that they did not like about being in a technology classroom. For instance, Lauren complained, “the fact that I have to stare at a computer screen for so long”. Aniyah experienced frustration with the slower processing speed of the computer, “using a computer that gives me a lot of hard work because of the lagging”.

The female students also mentioned how much work was involved in being in a technology class and many of them felt like there were too many independent projects.
Brynn was concerned about workload, “how much work we have and how we have to finish it all in one day” Heidi admitted, “technology is just overwhelming and has a lot of downsides.” The teachers however did not mention the female students’ frustration with technology components in their interviews. A repeated concern expressed by the teachers was the fact that the girls lacked exposure to technology or technology classes in order to feel as if they could be successful. A research study conducted by Sobieraj and Kramer (2020) provided a possibly explanation by outlining that women lacked confident and low self-efficacy in operational computer skills. In a second study it was determined that female students who do not engage with technology will lack confidence in their ability to use and will not pursue a future career (Lang et al., 2020). The study continues on to say that females should be encouraged to use computers and have increased exposure to computer usage (Lang et al., 2020). The teachers did not comment on the idea that a component of a technology class, such as the inability to type well, could be limiting the female eighth–grade students’ success. The eighth–grade female students need reassurance that they can be knowledgeable in computer usage. It’s possible the technology teachers are not fully aware of the female students’ limited knowledge of using a computer, which aids in the students’ frustration.

Personal

Both sets of participants referred to the possibility of future opportunities associated with enrolling in a technology course. The female students view a technology course as a means to learn technology-related tools to help them be successful in other future careers. Based on their survey responses the eighth–grade female students did not see themselves pursuing a job in the technology field ($M = 2.35$). A total of 35.82% chose
Moderately disagree to pursuing a technology career in the future. Moreover, the female students were not interested in jobs in the technology sector (\(M = 3.26\)). Common sentiments reflected in the eighth–grade female students’ open-ended survey responses were, “learning how to type will help me get a better job or learning how to use a computer will help me make money in the future”. Research confirmed women are less likely to then men to aspire to work in the STEM field (Xu, 2016). Wang and Degol (2017) emphasized that women only make up 25 percent of STEM degrees and a mere 20 percent of undergraduate degrees in engineering and computer science are held by women. A small number of the eighth–grade female students articulated interested in pursuing a technology course or career in the future. The female students who did express interest in a future career in the technology field were specific to engineering or robotics.

In their interviews, the teachers speculated that the eighth–grade female students were not fully aware of the opportunities available to them in a technology course. The teachers referred to scholarship opportunities that were available to the eighth–grade female students to help pursue a career in technology. The two teachers both agreed that there would be an increase in the number of female students interested in taking a technology course or pursuing a career in the technology field if they had more exposure to a technology course or field.

One major factor that varied from the teachers’ perspective to that of the students is the factor of academics. In many cases the Technology Applications course is the first technology related course that the eighth–grade female students have experienced. The female students replied that they enjoy technology related subjects (\(M = 3.36\)). Furthermore, 40.30% of the female participants agreed that they enjoy technology related
subjects. Although, compared to other subjects the eighth–grade female students did not favor technology related subjects more than other subjects ($M = 2.65$). Individually, 34.33% declared that they did not enjoy technology classes more than other classes. The teachers mentioned other STEM courses they felt were needed in order to help the female students feel successful in a technology class. The perceived need of an advanced level mathematics course was indicated during the teachers’ interviews. This idea provided the assumption that a certain level of mathematics classes was required in order to willingly participate or enroll in a technology course. In their open-ended survey responses, the eighth–grade female students did not mention any other academic classes that they are currently or previously have taken. The students did not mention any courses they thought they would need to take in conjunction with the technology class, whether it was for the Technology Applications course or for future high school courses.

The current literature did not name a particular class needed to be success in a technology course. However, several authors stressed skills all students needed to learn to elevate their level of success in technology courses. Those skills included troubleshooting (Wong, 2017), critical thinking and higher-order thinking (Barlow & van der Westuizen, 2011), and 21st century skills (Liao et al., 2016).

Success in class was another factor examined as an influence in the eighth–grade female students’ choices in technology courses. The eighth–grade female students stated they received adequate grades in their Technology Applications course. The quantitative data collected from the survey demonstrated the female students’ ability to be successful in a technology class. The survey question, “I get good grades in a technology class” ($M = 3.64$) indicates the female students consider themselves to have the ability to be
successful in a technology course. While they did not regard technology as one of their best subjects ($M = 2.64$) and 44.78% neutral responses. The eighth–grade female students did agree that they do well in a technology class ($M = 3.35$) with 35.82% Neither disagree not agree. Muenks et al. (2020) researched female students’ perceptions of STEM courses and their perceived success. This research declared that there is a direct correlation between the female students’ level of perceived success in a technology course and the teachers’ belief in the female students’ ability to be successful. A portion of Ms. Jackson’s interview corroborated the research study because she believed that part of her job as a female technology instructor is to build confidence in the eighth–grade female students to feel they could be successful in a technology class. Ms. Wilson viewed the female students’ perception of their own success in their current technology class as an indication of future success. Ms. Wilson also believed that the adverse could happen as well, if a female student was currently struggling in a technology course, then future success would be difficult to achieve.

In this research study, the eighth–grade female students did not comment on how successful or unsuccessful they felt in a technology class in their open-ended survey responses. They did answer the open-ended survey response questions with things that they enjoyed about the Technology Applications course. When the eighth–grade female girls were enrolled in the Technology Applications course they enjoyed listening to music in class, the teacher, and the independence that was allotted in the course. The items that the female students listed are possibility reasons to help them be successful by providing an inviting learning environment.
Research Question 3: How do the eighth grade CTE teachers perceive the factors influencing the eighth–grade female students’ choice of technology courses at KISD?

Previous literature determined three overarching factors influencing the choices of eighth–grade female students’ enrollment in technology courses, (a) societal (Koch & Gorges, 2016), (b) organizational (Milgram, 2011), and (c) personal (Mone, 2016). In their interviews, the teachers mentioned each of these factors as influencing the female student’s choice, which aligned with the literature.

**Societal factors**

In this research study, societal factors are peers, parents, and societal stereotypes. Peers influence the eighth–grade female students’ choice to enroll in a technology course because they can conform to traditional gender roles (van der Vleuten et al., 2018). Ms. Wilson agreed that female students do not choose to enroll in technology classes because, “they would be separate and in a unique field of study and non-traditional.” Ms. Jackson continued by explaining her female students view technology courses as, “boyish and deters them from selecting those courses”. The eighth–grade female students might be reluctant to enroll in a technology course for fear of not fitting in with their peers in the future.

Holmes et al. (2018) listed parental influence as a societal factor and explained that students with parents in the technology field are more likely to enroll in a technology course. Parental influence is extended to familial influence to include siblings or family members who may reside with the female student. Ms. Wilson verified this influence by commenting on the idea that family support was imperative for females to experience success in a technology classroom. Both teachers indicated that family support was
necessary for the eighth–grade female students to know that they could be successful in any technology course. Vrieler et al. (2021) confirmed through research that family support was a factor because it was determined that parents overestimated their sons’ abilities in courses like Computer Science and underestimated their daughters’ abilities.

Cultural stereotypes had a negative correlation with the eighth–grade female choice to enroll in a technology course at KISD because stereotypes were viewed as deterrents. Starr (2018) completed a researched study that referred to STEM stereotypes describing individuals as socially, awkward, unattractive, and naturally intelligent. The study proceeds to explain that stereotypically, individuals in STEM classes or career field are often referred to as geniuses and women normally are not described as genius. In their interviews both teachers spoke about the common stereotypes that females face in technology classes. Ms. Jackson addressed the fact that female students have expressed their apprehension for technology classes because the courses are not geared toward females. Unknowingly, Ms. Wilson included her own biased perspective regarding gender in technology courses. There were three separate comments made during her interview that perpetuated gender stereotypes. Ms. Wilson made repeated comments about the eighth–grade female students not having adequate knowledge about careers in the technology field. Ms. Jackson also spoke about the female students lacking information that would make a technology class fun These types of comments implied the eighth–grade male students had knowledge about available careers in the technology sector. Additionally, she explained during course selection, “girls stick to dance while boys stick to sports”. Her statement insinuated that dance is not a sport and disregarded females who play sports such as soccer or basketball. Furthermore, Ms. Wilson expressed
strong feelings about the need for proper math courses when exploring technology classes. She claimed that math teachers were not encouraging the eighth–grade female students to be good at math and were not informing them about the upper-level math courses to take to be successful in other STEM classes.

Organizational factors

Organizational factors consisted of the teachers as role models and the classroom environment in which the female students learn. Stearns, Bottia et al. (2016) defined a role model as someone who the female students could look up to. The researchers went on to say that female role models in the STEM fields found it easier to recruit more females than their male counterparts. Contradictory to the research of Stoerger et al (2017) which states that there is a lack of female role models in the technology arena, Ms. Jackson and Ms. Wilson are both female technology instructors for all eighth–grade students at CPMS. During her interview, Ms. Jackson described herself as a younger female teacher. Based on her age and her profession, Ms. Jackson is someone that the girls can look up to as a role model. Ms. Wilson, while she is older, she herself is also a female technology instructor that the girls can see have some longevity in the technology sector. The eighth–grade female students are taught by both teachers in the same school year, one semester CCR and the other for Technology Applications.

The eighth–grade female students experienced vastly different learning environments for each teacher's classroom. Ms. Jackson kept the main overhead classroom lights off. The room was decorated with lamps and strings of teal lights hung up around the classroom giving a soft lighting affect while students worked. Her classroom also incorporated a Comfortable Corner, which is a seating area with hanging
lights, two beanbag chairs, and pillows for comfort. She has a teal painted accent wall with teal decorations around the room to create a welcoming environment. The room was fully equipped with desktop Mac computers one for each student to work on. Additionally, there were Bluetooth speakers strategically placed around the room for soft music to play while the students worked on their projects. Ms. Wilson had all overhead fluorescent lights on during the time that students were working. The classroom also had a full set of Mac desktop computers, one for each student. All classroom walls were white cream-colored brick. While this classroom lacked welcoming ambience, it did highlight technology careers with technology posters all around the classroom.

**Personal factors**

The third factor that influences the eighth-grade females’ choice of technology courses are personal factors. There are subtle cues within the STEM fields that perpetuates the idea that males are more successful than females. McCarty et al. (2020) contributed evidence of this in a researched study that provided an example of an advertisement of a STEM conference that highlighted three men and only one woman. This was video evidence of men being more successful than women in the STEM field. Ms. Jackson and Ms. Wilson supplied examples of how female students feel that they are not capable of success in a technology career. Ms. Wilson said that the female students needed to be given the opportunity to see that they could be successful in a technology course or career. Ms. Jackson referred to the lack of social media role models in the technology field, she also explained that this was a means for the female students to witness female success in the technology sector. Female students do not have the opportunity to see female role models in a technology career. Social media would provide
a platform for the eighth–grade female students to experience the day-to-day operations of a technology career in an online environment.

**Recommendations for Recruiting Practices to Increase the Number of Female Students in a Technology Classroom**

**Recommendations for Teachers**

The purpose of this action research was to explore the factors influencing eighth–grade females’ choices regarding technology classes in KISD. The intended outcome of this study was to identify recommendations for recruitment practices that would increase the number of female students in technology classes. At KISD, high school CTE teachers participate in information and recruiting events twice a year. During the event, teachers have the opportunity to talk to parents and students about the parameters of their individual programs. This is the most opportune time for STEM or technology teachers to specifically encourage female students to enroll in the courses they teach. My first recommendation to teachers during these recruiting events would be to stress the importance of STEM and technical education for the female students. I would recommend the technology teachers to explain in the contemporary learning environment, the STEM educational track helps fill the unemployment gap in the United States (Peters-Burton, et al, 2018). Technology teachers should utilize the opportunity to discuss the future high school technology courses and careers available to the eighth–grade female students. In conjunction to speaking to the parents and students, the technology teachers could have flyers available with the statistics of females in technology careers.
Furthermore, during these recruiting events teachers are encouraged to have their current students as presenters. It is imperative that the technology teachers select female students as presenters during their recruiting events. This will allow the eighth-grade female students to potentially view the female high school technology students as role models.

Additionally, the second recommendation for technology teachers would be to display projects created by the female presenters. The lack of female mentors has been recognized as a reason that female students do not select to enroll in a technology course (Stoerger, 2017). The female students who attend the recruiting event will be able to witness the high school female students who would be their mentors. The technology courses at KISD are project-based classes and give all students hands-on opportunities, which simulates the 21st Century skills the female students would need to be successful in a technology career (Van Laar et al., 2019). Demonstrating projects created by the female high school technology students will provide a visual display of the skills that a female student can obtain when she enrolls in a technology course. It can increase the number of eighth-grade female students who choose to enroll in a technology course by helping her visualize herself in the technology field (Kang, et al., 2018).

The final recommendation for the teachers is changes for their classroom environment. In the classroom, I would recommend technology teachers create a non-gender specific classroom learning environment. In an attempt to prevent the female eighth-grade students from being discouraged to choose a technology course, the classroom set-up of non-gender items is essential (Cheryan & Meltzoff, 2016). For instance, in the Robotics classroom placement and accessibility to tools. The female
students should be utilizing the classroom tools and equipment as equally as the male students. I would also encourage technology teachers to not assume that all students have basic computer skills. I would recommend having student complete a technology questionnaire at the start of the course to obtain a level of understanding of their prior technical knowledge.

Lastly, communicating with parents though email outlining the projects that all students will be working on in class. That way parents are provided the opportunity to learn and understand the skills their student is learning in a technology class.

**Recommendations for Students**

The classroom learning environment is comprised of both teachers and students. All students play a role in their own success in every classroom, this includes a technology classroom. The eighth–grade female students should take responsibility in participating in the lessons taught in their CCR class. These lessons explain in detail all of the high school endorsements and course tracks available to them. Being active participants and asking questions where necessary will provide the female students a well-rounded perspective of what courses they want to pursue in the future. Female students who lack confidence in their knowledge of STEM courses will shy away from selecting a STEM course because they question their ability to be successful (van Aalderen-Smeets & Walma van der Molen, 2016). During the recruiting events or tours at KCC, the female students should ask questions to all the CTE and STEM teachers to help them make an informed decision about their future course selection. Taking the initiative to ask the necessary questions will decrease the trepidation to select a technology course for high school.
Recommendations of School Administration

School districts are challenged with the need to put policies and practices in place to increase non-traditional enrollment (Mone, 2016). When considering which policies to put into place, I would encourage school districts to consider the best way to make a fair and equitable learning environment in a technology course. Frequently, male students are encouraged to actively pursue stem courses technology courses which lends itself to gender stereotypes (Bartow, 2016). As a way to circumvent gender stereotypes actively encouraging female students to select and pursue a technology course in high school will help increase the confidence of the eighth–grade female students.

The academic planning nights are planned at the district level and include all CTE programs, sport teams, and extra-curricular activities. The CTE district administrative team takes on the role of inviting parents and guardians to attend the recruiting events. Information is communicated to the parents and guardians through QR codes, social media, LMS message board and email to increase the number of attendees. The recruiting events can be information overload. I would recommend providing background information for the CTE courses that will be on site. It will allow parents and guardians to prepare questions ahead of time versus being surprised by the variety of high school courses available. By creating the information needed for parents to have an overarching understanding of the endorsements and courses available to their upcoming high schooler, it encourages conversations between parents and their students about high school options.

Lastly, maintaining social media sites and highlighting female technology students will help break the gender barrier by showing all students that technology
courses are not just for boys. Furthermore, parents will be able to see that their female
students will be welcomed and encouraged to be successful in a technology course.
Viewing the social media video clips of the activities completed by students in
nontraditional roles will be beneficial both parents and students because it will expand
their knowledge of the technology content taught in class.

Implications

The lack of girls choosing to enroll in a technology class is a problem not only in
my classroom but in technology classrooms around the country. This study has two major
implications: (1) personal implications and (2) implications for future research.

Personal implications

During this action research study, I was able to gain valuable insight into my
personal role in the field of education. Reflecting on the survey responses from the
eighth–grade female students and teachers’ interviews has allowed me to consider
changes that I will be implementing in my classroom and during recruiting events.

Classroom. Miller and Hurlock (2017) suggested putting policies in place to
encourage the increase of female students who choose to enroll in technology courses.
Currently, there is a lot of emphasis on the fact that my classroom is made up of
predominately teenage males. Conducting this action research study has supplied
evidence to support that emphasis could be a deterrent for female students choosing to
enroll in a technology course, namely my Robotics classroom. As a female robotics
instructor, it is essential that I create an environment that is welcoming for all students
and one that will illustrate female students as part of the active learning environment.
Young et al. (2017) defined equity in STEM as fair and equal for all genders. The goal
will be to represent as many of the female students as possible to show the eighth-grade female students that there are in fact female robotics students. This is intended to help increase the number of female students in my robotics class and decrease the stereotype that robotics or technology classes are for males. Research has indicated that female students need role models and the ability to view themselves in a non-traditional role (Stearns et al., 2016).

I will begin by altering the way I create instructional videos. The instructional videos I have created previously and used in class only included myself as the instructor demonstrating the material. Going forward, I will record instructional videos that have me as the instructor explaining the process of the lesson, for instance building the chassis of a 4x4 rover, and having the activity of the lesson demonstrated by my female and male students. Utilizing both male and female students will demonstrate collaboration between all students in my classes. Additionally, as students finish classroom projects, I will choose the projects completed by the female students are posted on the school’s social media pages.

Furthermore, I will display photos and video clips of the CTSO teams working to build their projects. These teams are comprised of a mixture of male and female students. This will allow potential future students to observe the male and female robotic students working productively and collaboratively. This approach will have two benefits, (1) the female students will have the opportunity to view an inclusive learning environment and (2) set the expectations for male students that they will be required to work with the female students who are enrolled in the course. It is also intended to emphasize the notion that skills learned in the Robotics class will be beneficial to all students (Milgram, 2011).
**Recruiting events.** There are two elements to recruiting practices at KISD, (a) parents, and (b) students and each element will need a separate approach. Currently, there are two Academic planning nights each school year, one in the fall and one in the spring, where parents of eighth–grade students receive information about their child’s options for high school classes and endorsement tracks. Parents have the opportunity to speak to teachers who teach CTE and STEM courses at KCC such as Robotics, Video Game Design, Animation, Information Technology, etc. They also get to witness equipment used in class and view projects created by students. During academic planning nights, I will use my audience of parents as a platform to help increase the number of female students who enroll in technology courses. This action research study highlighted the reality of eighth–grade female students’ inclination for parental support when enrolling in a technology course. When speaking to parents, I will prepare flyers with statistics of women in technology careers and the available high school courses aligned with those careers. I will display projects created by my current female Robotic students with an explanation of the work completed by the female students. I will provide details about course sequence as a way to supply as much knowledge to the parents as possible. Finally, I will make my work email available to parents who might have questions about the Robotics course after the Academic Planning night.

The second element to recruiting events are the female students. The eighth–grade female students attend Academic Planning nights with their parent or guardian. This allows them to receive the information with their parents and ask any questions they may have to the CTE and STEM teachers. In addition to the Academic Planning nights, KCC conducts academic tours for all eighth graders from all eleven middle schools in KISD.
The tours are guided by third-year students of KCC and students in each program of study present to the eighth–grade students. KCC students provide an overview of the course, Career and Technical Student Organization (CTSO) associated with the course, and projects completed in class. As a way to increase the interest of the eighth–grade female students who tour the Robotics class, I will have my current female students as one of the Program of Study presenters. In the course of the tour, the female presenter will discuss her own projects and provide insight into her own experience as an upper-level Robotics student to include the competitions she has attended as part of her CTSO. As part of their presentations, I will have my current female students expound on the Robotic industry certifications they have received or are working towards and explain their future intentions with their industry certifications. I will also be present during tours to ensure the female students observe a female Robotics instructor. To assist in providing additional visual aids during tours, I will have a slide show running of students working in class and completed projects. My school email will be posted on the white board for any students who may have questions after the tours.

**Future research**

The findings of this research suggest several implications for future research. These implications include (1) evaluation of factors that influence the choice of eighth–grade female students to enroll in a technology course, (2) evaluation of teacher’s perspectives of the factors that influence the choices of their eighth–grade female students to enroll in a technology course, (3) longitudinal study of female student who chose to enroll in a technology course.
Evaluation of factors that influence the choice of eighth-grade female students to enroll in a technology course. This action research study identified three categories (societal, organizational, and personal) as well as seven subcategories (gender, success, academics, related to technology field/courses, careers, future opportunities, and social media) of influences impacting the choices of eighth-grade female students to enroll in a technology course. A study that combined all seven factors could provide insight into which factor had more weight in regard to the choices of the eighth-grade female students. Student surveys and focus groups could outline which factor the female students demeaned more important and recommendations could be made based on order of importance furthermore a research study that reviewed the technology components that interested or disinterested the female students would be beneficial and increasing female enrollment in a technology course. In this research study, it confirmed that there were several projects or components of technology lessons such as Word, Excel and typing ability that were considered to be a deterrent or a reason for choosing a technology course. A research study such as this could provide examples of student work as a means to examine what types of technology lessons or projects made the eighth-grade female students feel successful in a technology classroom. Lastly, a study that researched some of the conflicting responses would be worthwhile. For instance, the female student participants viewed themselves as successful in a technology course but did not prefer a technology course over other course selections. A researched study to provide answers as to why they feel success but choose other courses would benefit the field.

Evaluation of teacher’s perspectives of how to address the factors that influence the choices of their eighth-grade female students to enroll in a technology course.
This researched study asked the teachers to participate in interviews and give their perceptions of the factors influencing the eighth-grade female students’ choices in enrolling in a technology course. In this study, they were in fact the teachers of the eighth-grade female participants. The teachers were asked their opinion on which factors affected their students’ choice, was there a factor more important, and to give their professional opinion of the female students’ thoughts for enrolling in a technology course. Going forward, it would be beneficial to conduct a research study that asks the teachers how they address these influences within their own classrooms or if they use particular lessons to assist the female students to feel more included. A researched study that indicated how to address the factors affecting the eighth-grade female student choices within the classroom could be beneficial to increasing the number of female students in a technology class. It could contain insight into what strategies effectively helped increase female enrollment and look at which strategies were ineffective. Surveys and interviews with the teachers would be essential in this type of study to gain useful insight.

**Longitudinal study of female students who chose to enroll in a technology course.** In the literature regarding young girls in STEM or technology courses, there were not studies conducted over time that followed the female students who chose to enroll in a technology course. It may be valuable to conduct surveys, interview or focus groups to document the journey from middle school through high school graduation of the eighth-grade female students who selected to enroll in a technology course. This could help provide insight into the course the female students selected, if they continued to enroll in technology courses, and their experiences in those courses. It could also address if those
female students have post-secondary plans for a technology career. A second area of limited research was the relationship between social media and technology courses. Social media and social media content plays a major role in the eighth–grade female students’ social environment and this is where they find role models. A more extensive researched study into female social media influencers from the technology sector would help determined whether or not social media is a major or minor factor into the choices of eighth–grade females.

**Limitations**

As with all researched studies, this action research study has limitations that are required to be noted. The limitations are discussed in the following two categories (1) methodological limitations and (2) limitations associated with findings.

**Methodological limitations**

All action research studies have limitations because the research is specific to the researcher and does not apply to a general audience (Mertler, 2017). This action research study applies directly to the researcher because it is dependent on the structure of the school district in which she is employed. Due to the structure of the district, the researcher had limited access to the research study participants because they were not her students. As a high school teacher at a specialty campus, the researcher taught an upper-level course to grades 10-12. This action research study required participation from the eighth–grade female students because that is when all students are required to choose their endorsement for high school courses. By the time the female students are in tenth grade and eligible to enroll in an upper-level robotics course, the students have been in
their chosen endorsement for two years. The researcher had no educational relationship with the study participants and had limited access to them.

The number of open-ended survey questions were also a limitation. The teacher participants suggested a small number of open-ended responses to help receive quality responses. The teachers stated that a larger number of open-ended responses would result in responses that did not add value or no response at all. Additionally, the survey needed to be completed in one class period and open-ended responses can be considered time consuming.

The number of available teachers for interview was another limitation. Each middle school in KISD has one CCR teacher and one Technology Application teacher. For alignment and validity purposes, it was imperative to interview the teachers of the student who completed the survey. Each middle school has a separate set of diverse students and school culture. It would not have added value to this researched study to interview teachers who taught at a different middle school than the participants.

Lastly, in inability to run a full reliability analysis for the survey instruments was a limitation. The instruments that were used in prior studies did not supply an ample set of questions to conduct analysis for each set of scales. The grouping of questions was relevant to the research and appropriate for the age group of the participants, but the limited number of questions related to factors of influence hindered the opportunity for a reliability analysis for each group of factors.

**Limitations associated with findings**

There are limitations associated with the open-ended survey responses. Mertler (2017) provided an explanation that open-ended survey questions are typically time
consuming and ambiguous. Since the district does not authorize student interviews for research projects, the researcher had to include open-ended survey questions in order to gain students insight without simply answering a question on the Likert scale. The open-ended survey questions created a platform for the students to freely state their opinion. Some open-ended questions were completed without a direct response or one-word answers making it difficult to analysis the student’s true perspective. Also, none of the survey questions asked the female students’ their thoughts or perspectives on social media influences in relation to a technology class.

Conclusion

This action research study attempted to find ways to increase the number of eighth-grade female students choosing to enroll in a high school technology course. This research study also gave the eighth-grade female students a voice into why they would choose to enroll in a technology course. During the course of this study, I have a better understanding of the teamwork required between the parent, teacher and the student when selecting a nontraditional course role. All parties need to be involved and supportive in order to help achieve success in a technology classroom. Overall, I will continue to actively recruit female students into the Robotics and technology courses at KISD.
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Mathematics (STEM): Current knowledge, implications for practice, policy, and


Table A.1 Demographic Survey Questions

<table>
<thead>
<tr>
<th>Demographic questions</th>
<th>Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Asian</td>
</tr>
<tr>
<td></td>
<td>Caucasian</td>
</tr>
<tr>
<td></td>
<td>Black American</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
</tr>
<tr>
<td></td>
<td>Pacific Islander</td>
</tr>
<tr>
<td>Intended Endorsement</td>
<td>Arts and Humanities</td>
</tr>
<tr>
<td></td>
<td>Business and Industry</td>
</tr>
<tr>
<td></td>
<td>Multidisciplinary</td>
</tr>
<tr>
<td></td>
<td>Public Service</td>
</tr>
<tr>
<td></td>
<td>STEM</td>
</tr>
<tr>
<td>Current course enrollment</td>
<td>College and Career Readiness</td>
</tr>
<tr>
<td></td>
<td>Technology Applications</td>
</tr>
</tbody>
</table>

Please answer the following questions using the below scale.
1= Strongly Disagree
2= Moderately Disagree
3= Neither Disagree nor Agree
4= Moderately Agree
5= Strongly Agree

Table A.2 Perceptions Toward Technology Survey Questions

<table>
<thead>
<tr>
<th>Females’ Perceptions Toward Technology</th>
<th>Survey Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptions</td>
<td></td>
</tr>
<tr>
<td>1. A technology class would be fun and enjoyable.</td>
<td></td>
</tr>
<tr>
<td>2. A technology class would be too stressful and tiring.</td>
<td></td>
</tr>
<tr>
<td>3. Considering what I want to do with my life, having a technology class would be worth the effort.</td>
<td></td>
</tr>
<tr>
<td>4. Considering what I want to do with my life, having a technology class is just not worth the effort.</td>
<td></td>
</tr>
</tbody>
</table>
5. A technology class would be a good use of my time.
6. A technology class would demand too much of my time and effort.
7. A technology class would require projects that I like working on.
8. A technology class would require too much work.
9. A technology class would include activities that I enjoy doing.
10. A technology class would require me to give up too many other activities that I value.

<table>
<thead>
<tr>
<th>Factors that Influence Students’ Selection</th>
<th>Survey Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success in class</td>
<td>11. Technology is one of my best subjects.</td>
</tr>
<tr>
<td></td>
<td>12. I have always done well in technology classes.</td>
</tr>
<tr>
<td></td>
<td>13. I get good grades in technology classes.</td>
</tr>
<tr>
<td></td>
<td>14. I do badly on tests in technology classes.</td>
</tr>
<tr>
<td>General interest</td>
<td>15. I enjoy technology related subjects.</td>
</tr>
<tr>
<td></td>
<td>16. I enjoy technology related subjects more than others.</td>
</tr>
<tr>
<td></td>
<td>17. I am not interested in technology related subjects.</td>
</tr>
<tr>
<td>Career goals</td>
<td>18. I would take a job in a technology related field.</td>
</tr>
<tr>
<td></td>
<td>19. Jobs in the technology field do not interest me.</td>
</tr>
<tr>
<td>Peers</td>
<td>20. Compared to male students I excel in a technology class.</td>
</tr>
<tr>
<td></td>
<td>21. Compared to female students I excel in a technology class.</td>
</tr>
<tr>
<td>Family</td>
<td>22. My father encourages me to take a technology class.</td>
</tr>
<tr>
<td></td>
<td>23. My mother encourages me to take a technology class.</td>
</tr>
<tr>
<td>Organizational factors (Female Instructors, Classroom Environment, etc.)</td>
<td>24. Technology is promoted in my classes.</td>
</tr>
</tbody>
</table>
25. My teachers do not mention technology in my classes.

Please use the space provided to answer the questions in your own words.

Table A.4 Open-ended Survey Questions

<table>
<thead>
<tr>
<th>Open-ended Questions</th>
<th>Survey Item</th>
</tr>
</thead>
</table>
| Influencing factors    | 1. What is your favorite thing about technology classes and why?  
2. What is your least favorite thing about technology classes and why?  
3. What is your biggest influence in choosing to enroll in a technology class?  
4. Have you participated in afterschool technology clubs or summer camps? If so when and which one(s)?  
5. Please add any additional comments about technology classes. |
## APPENDIX B

### Table B.1 Original STEM Specific Cost Perceptions Scale Survey Modification

<table>
<thead>
<tr>
<th>Original STEM Specific Cost Perceptions Scale</th>
<th>Modified Survey Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A STEM major would be too stressful and tiring.</td>
<td>A technology class would be fun and enjoyable.</td>
</tr>
<tr>
<td>Considering what I want to do with my life, having a STEM major is just not worth the effort.</td>
<td>A technology class would be too stressful and tiring.</td>
</tr>
<tr>
<td>A STEM major would demand too much of my time and effort.</td>
<td>Considering what I want to do with my life, having a technology class would be worth the effort.</td>
</tr>
<tr>
<td>A STEM major would require too much work.</td>
<td>Considering what I want to do with my life, having a technology class is just not worth the effort.</td>
</tr>
<tr>
<td>A STEM major would require me to give up too many other activities that I value.</td>
<td>A technology class would demand too much of my time and effort.</td>
</tr>
<tr>
<td></td>
<td>A technology would require projects I that I like working on.</td>
</tr>
<tr>
<td></td>
<td>A technology class would require too much work.</td>
</tr>
<tr>
<td></td>
<td>A technology class would include activities that I enjoy doing.</td>
</tr>
<tr>
<td></td>
<td>A technology class would require me to give up too many other activities that I value.</td>
</tr>
</tbody>
</table>

### Table B.2 Original DIM-Computer Technology Version Survey Modification

<table>
<thead>
<tr>
<th>Original DIM-Computer Technology Version</th>
<th>Modified Survey Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>__ is one of my best subjects</td>
<td>Technology is one of my best subjects.</td>
</tr>
<tr>
<td>I have always done well in __</td>
<td>I have always done well in technology classes.</td>
</tr>
<tr>
<td>I get good grades in __</td>
<td>I get good grades in technology classes.</td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>I do badly in tests of __</td>
<td>I do badly on tests in technology classes.</td>
</tr>
<tr>
<td>How much do you enjoy __ related subjects?</td>
<td>I enjoy technology related subjects. I enjoy technology related subjects more than others.</td>
</tr>
<tr>
<td></td>
<td>I am not interested in technology related subjects.</td>
</tr>
<tr>
<td>How likely would you be to a job in a __ related field?</td>
<td>I would like a job in the technology field.</td>
</tr>
<tr>
<td></td>
<td>Jobs in the technology field do not interest me.</td>
</tr>
<tr>
<td>Compared to other students, how good are you at __?</td>
<td>Compared to male students I excel in a technology class.</td>
</tr>
<tr>
<td></td>
<td>Compared to female students I excel in a technology class.</td>
</tr>
</tbody>
</table>
APPENDIX C

CCR and Technology Teachers’ Interview Protocol

Introduction:

Thank you for agreeing to do this interview and sharing your experience of working with eighth grade female students’ as they chose their high school endorsement.

I would like to make you aware that this interview will be recorded to ensure accuracy and your confidentiality will be protected.

Warm-up:

- How long have you been teaching and what certifications do you hold?
- What class do you teach?
- How long have you been teaching this class?
- What other classes have you taught?

Body:

- In your professional opinion what factors influence the eighth-grade female students’ choice of a technology course?
- Do you think one factor has a greater influence over the other?
- In your professional opinion what is the 8th grade female students’ thoughts about enrolling in a technology class?
- For the eighth-grade female students that chose a technology course what drives their choice?
- As the female students are learning about each endorsement, in your opinion, what is their perception of the technology courses offered?

Conclusion:

158
• Is there anything else you would like to talk about?

I appreciate your time and insight.
APPENDIX D

Table D.1 CCR and Technology Applications Teachers’ Interview Protocol Modification

<table>
<thead>
<tr>
<th>Original Interview Protocol</th>
<th>Modified CCR Teacher Interview Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>How old are you?</td>
<td>How long have you been teaching and what certifications do you hold?</td>
</tr>
<tr>
<td>What class do you currently teach?</td>
<td></td>
</tr>
<tr>
<td>What is your favorite subject?</td>
<td>How long have you been teaching this class?</td>
</tr>
<tr>
<td>Who or what influences your ideas about science, in other words, how do your ideas and feelings about science form?</td>
<td>What other classes have you taught?</td>
</tr>
<tr>
<td>In your professional opinion what factors influence the eighth-grade female students’ choice of endorsement?</td>
<td></td>
</tr>
<tr>
<td>Do you think one factor has a greater influence over the other?</td>
<td></td>
</tr>
<tr>
<td>When you think about the subject of science in general what thoughts or ideas do you have?</td>
<td>In your professional opinion what is the eighth-grade female students’ thoughts about enrolling in a technology course?</td>
</tr>
<tr>
<td>For the eighth-grade female students who chose a technology course, what drives their choice?</td>
<td></td>
</tr>
<tr>
<td>What are your thoughts about studying science?</td>
<td>As the female students are learning about each endorsement, in your opinion, what is their perception of the STEM endorsement?</td>
</tr>
</tbody>
</table>
APPENDIX E

UNIVERSITY OF SOUTH CAROLINA

PARENTAL CONSENT TO BE A RESEARCH SUBJECT

Your student is invited to volunteer for a research study conducted by Shasta Colon. I am a doctoral candidate in the College of Education at the University of South Carolina and a teacher at KISD. Your child is being asked to participate in this study because she is in the eighth grade, and she will be selecting her high school endorsement this year. This study will include an electronic survey using a QR code.

The following is a short summary of this study to help you decide if you would like your student to be a part of this study.

The purpose of this study is to learn about the attitudes, perceptions, and factors that influence eighth-grade female students’ choice of technology classes. The intention is to use the survey data to make recommendations on recruiting practices to increase the number of females who chose to enroll in technology classes.

If you agree to allow your child to participate please scan the code below to begin the survey.
Dear College and Career Readiness/Technology Application instructor,

My name is Shasta Colon. I am a doctoral candidate in the Education Department at the University of South Carolina. I am conducting a research study as part of the requirements of my degree in Doctor of Education, and I would like to invite you to participate.

I am studying the factors that influence the eighth-grade female students’ choice of enrolling in the technology courses. If you decide to participate, you will be asked to meet with me for an interview about your perceptions of the factors influencing the eighth-grade female students.

In particular, you will be asked questions about your experience in working with the eighth-grade female students as they are making their course selection for high school. If you feel uncomfortable answering some of the questions, you do not have to answer any questions that you do not wish to answer. The meeting will take place a mutually agreed upon time and place and should last about 30-40 minutes. The interview will be audio recorded so that I can accurately transcribe what is discussed. The tapes will only be reviewed by members of the research team and destroyed upon completion of the study.

Participation is confidential. Study information will be kept in a secure location at the University of South Carolina. The results of the study may be published or presented at professional meetings, but your identity will not be revealed.

I will be happy to answer any questions you have about the study. You may contact me at or my faculty advisor, Alison Moore at

Thank you for your consideration. If you would like to participate, please respond to this email and we will schedule a time and place that is convenient for you.

With kind regards,

Shasta Colon
APPENDIX G

District Research Approval Letter

Shasta Colon
Doctoral Candidate
University of South Carolina
College of Education

Dear Shasta Colon,

This is to inform you that your request for action research, Where Are the Girls?
Exploring Influences on Female Eighth Grade Public School Students' Choices of Technology Classes in Texas, has been approved by the Killeen Independent School District. It is our understanding that research will be conducted in the fall of 2021. Any surveys or interviews must be completed outside of the school day. At the conclusion of the study, please send a copy of methodology and findings section of your research.

Thank you,
Institutional Review Board Approval Letter