“Here we come:” The experiences of women enrolled in male-dominated STEM career technical pathway programs at a Midwestern community college

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“Here we come:” The experiences of women enrolled in male-dominated STEM career technical pathway programs at a Midwestern community college

by

Rachel Roth Erkkila

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Education (Educational Leadership)

Program of Study Committee:
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The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University
Ames, Iowa
2019

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>vii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>ix</td>
</tr>
<tr>
<td>CHAPTER 1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Background of the Study</td>
<td>1</td>
</tr>
<tr>
<td>Community Colleges</td>
<td>4</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>7</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>9</td>
</tr>
<tr>
<td>Research Questions</td>
<td>11</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>11</td>
</tr>
<tr>
<td>Theoretical Framework</td>
<td>13</td>
</tr>
<tr>
<td>Methods</td>
<td>14</td>
</tr>
<tr>
<td>Role of the Researcher and Limitations</td>
<td>16</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>18</td>
</tr>
<tr>
<td>Dissertation Organization</td>
<td>21</td>
</tr>
<tr>
<td>CHAPTER 2. LITERATURE REVIEW</td>
<td>22</td>
</tr>
<tr>
<td>History of Higher Education in the United States</td>
<td>24</td>
</tr>
<tr>
<td>History of the Community College</td>
<td>25</td>
</tr>
<tr>
<td>Community College Diversification and the Completion Agenda</td>
<td>27</td>
</tr>
<tr>
<td>Women and Post-Secondary Enrollment</td>
<td>30</td>
</tr>
<tr>
<td>Evolution of Women in STEM</td>
<td>32</td>
</tr>
<tr>
<td>Current State of Women and STEM</td>
<td>35</td>
</tr>
<tr>
<td>Community College Women and STEM</td>
<td>38</td>
</tr>
<tr>
<td>Social Cognitive Theory</td>
<td>45</td>
</tr>
<tr>
<td>Social Cognitive Career Theory</td>
<td>48</td>
</tr>
<tr>
<td>Choice</td>
<td>50</td>
</tr>
<tr>
<td>Social Cognitive Career Theory Applied to Women</td>
<td>51</td>
</tr>
<tr>
<td>Theory Related to Social Cognitive Career Theory</td>
<td>52</td>
</tr>
<tr>
<td>Social Cognitive Career Theory in Higher Education</td>
<td>53</td>
</tr>
<tr>
<td>Application of SCCT to Women in STEM Career Pathway Programs</td>
<td>55</td>
</tr>
<tr>
<td>CHAPTER 3. METHODOLOGY</td>
<td>62</td>
</tr>
<tr>
<td>Research Questions</td>
<td>62</td>
</tr>
<tr>
<td>Theoretical Framework</td>
<td>63</td>
</tr>
</tbody>
</table>
FINDINGS

Summary of the Participants ................................................................. 81
Participant profiles ................................................................................. 83

Cora ........................................................................................................ 84
Joyce ........................................................................................................ 85
Kelsee ...................................................................................................... 86
Lynn .......................................................................................................... 87
Mary Jane ................................................................................................. 89
Monique .................................................................................................. 92

Emerging Themes .................................................................................... 93

Theme One: Women are impacted by their family and learning experiences, both positive and negative, providing them with a clear self-perception of their abilities and challenges .......................................................... 94
Pattern 1a Family connection ................................................................. 94
Pattern 1b Pre-college and college learning experiences ....................... 97
Pattern 1c1 Self-perception of ability ...................................................... 101
Pattern 1c2 Pattern physical ability ......................................................... 103

Theme Two: The women made their decision to enroll in male-dominated programs with the knowledge that there is inequity in the field and in society ......................................................................................... 105
Pattern 2a Gender inequity in the field ................................................... 105
Pattern 2b Assessing career choice ......................................................... 108
Pattern 2b1 Socially influenced perception of career choice .................. 111
Pattern 2b2 STEM identity in career choice ........................................... 114

Theme Three: Women compensate for a perceived deficit of technical skills or knowledge through determination and a willingness to work harder to achieve success ........................................................................ 115
Pattern 3a Skill competence ................................................................. 115
Pattern 3b Determination ....................................................................... 116

Theme Four: The women want to prove their competence to help themselves and others with their skills and as role models .................................................. 118
Pattern 4a Desire to help ...................................................................... 118
Pattern 4b Agents of change ................................................................. 122
Social Cognitive Career Theory.................................................................124
  Interest Model Self-Efficacy, Outcome Expectations, Personal Goals ..........126
  Choice Model Self-Efficacy, Outcome Expectations, Personal Goals ..........129
  Performance Model Personal Goals....................................................134
Summary ..................................................................................................140

CHAPTER 5. DISCUSSION ........................................................................141
  Limitations ..........................................................................................141
  Research Questions .............................................................................142
  Analysis of the Themes .......................................................................142
  Implications for Practice and Policy ....................................................155
    Practitioners .....................................................................................156
    Administrators and Policymakers .....................................................159
  Future Research ..................................................................................162
  Conclusion ...........................................................................................164
  Personal Reflection ..............................................................................165

REFERENCES ..........................................................................................170

APPENDIX A. INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL ............183
APPENDIX B. INVITATION TO PARTICIPATE ........................................185
APPENDIX C. PROTOCOL INTERVIEWS ..............................................186
APPENDIX D. PARTICIPANT CONSENT FORM .....................................189
APPENDIX E. LITERATURE MAP ..........................................................193
LIST OF TABLES

Table 1. STEM career programs offered at the institution in the study ........................................20
Table 2. Demographics of the participants ......................................................................................83
LIST OF FIGURES

Figure 1. Social Cognitive Career Theory ................................................................. 63
Figure 2. Themes and patterns .................................................................................. 82
Figure 3. SCCT in decision-making .......................................................................... 125
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ABSTRACT

This research is an exploratory study that focused on describing the experiences of adult students who identify themselves as women enrolled in male-dominated Science, Technology, Engineering and Math (STEM) career pathway programs at a large Midwestern multi-campus community college. The study was undertaken to build on the research of women in community college STEM transfer programs and describe self-efficacy as women in male-dominated STEM career programs at a large Midwestern community college.

An examination of the history of women in STEM helps one to gain an understanding of women in male-dominated STEM career pathway programs in community college programs as women are currently enrolling in college at higher rates than men and have earned more than 50% of associates degrees awarded in 2013-14 (NCES). Community colleges provide an accessible educational option and are well positioned to accommodate economic needs (Garza & Eller, 1998; American Association of Community Colleges, 2015). Historically, men have dominated the market for jobs in high paying STEM and CTE fields. Adding to the research about women who persist in these programs and field is important to increase equity in representation.

This research explored the experiences of women in career and technical STEM programs within community colleges. Using qualitative methodology and phenomenological techniques, the researcher sought a social constructivist post-modern worldview that attends to student self-efficacy as grounded in social cognitive theory and social cognitive career theory with a focus on human agency and self-efficacy. Semi-structured interviews were employed for data collection and inductive analysis procedures.
In Lester’s (2010) research, women in these areas indicated family influence, mentorship and self-efficacy impacted their decision to pursue education in male-dominated career and technical programs. The findings of this study also included family as a strong influence, strong belief in one’s ability and a desire to contribute the field of study and the world. This study further contributed to the literature about women in STEM career pathway programs within the community colleges to enhance completion initiatives for this growing student population.
CHAPTER 1. INTRODUCTION

Community college completion rates, coupled with the disparity between men and women enrolled in STEM career pathway programs, have amplified the need to understand women and their participation in STEM career pathway programs. This exploratory study was conducted with a focus on describing the experiences of adult students identifying as women enrolled in male-dominated Science, Technology, Engineering and Math (STEM) career pathway programs at a large Midwestern multi-campus community college. The study examined the unique experiences of adult women entering or re-entering the community college in a STEM career pathway program in a community college setting. In this study, women refer to individuals identifying as a women and male-dominated assumes males are individuals identifying as male or as men. For purposes of this study, STEM career pathway programs are defined as community college associate of applied science, diploma or certificate programs in STEM related areas. STEM transfer pathway programs are defined as community college associate in arts programs designed to transfer to universities and baccalaureate granting colleges.

Background of the Study

Women enrolling in male-dominated career programs have experienced similar challenges to women enrolled in STEM transfer programs (Lester, 2010). Lester (2010) posited self-efficacy issues in STEM transfer programs are similar to those of women in male-dominated Career and Technical Education (CTE) programs at a large community college. Wang, Chan, Soffa, and Nachman (2017) noted students’ math and self-efficacy beliefs were positive predictors of their intent to transfer into STEM fields. While there is a
great deal of research on women in STEM, the women in CTE education programs do not receive equitable attention in the research (Blickenstaff 2005; Lester, 2010). This study was conducted to add to the current research on women in community college STEM transfer programs and describe the self-efficacy of women in male-dominated STEM career programs at a large Midwestern community college.

Examination of the history of women in STEM is necessary to gain understanding of women in male-dominated STEM career pathway programs in community college programs. Understanding is important because women are enrolling in college at higher rates than men (NCES, 2017). Although women earned more than 50% of associates degrees awarded in 2013-14 (NCES 2017), they continue to be underrepresented in many of the highest paying career fields. This disparity represents a loss of intellectual power and diversity of perspective in these economically important and lucrative fields (Lester, 2010; Maguire, Starobin, Laanan, & Friedel, 2012; Starobin, Laanan, & Burger 2010). This disparity, further means women earn less and, as a result, are more likely to live in poverty than men (Cawthorne, 2008).

Competition for global economic viability continues to increase for all countries, including the United States. Job growth within the Unites States has focused in industries requiring at least a two-year degree (Matthews, 2015). Thus, community colleges provide an accessible educational option and are well positioned to accommodate economic needs (American Association of Community Colleges, 2015; Garza & Eller, 1998). In 2015, there were 6.49 million students enrolled at community colleges (NCES, 2017). While community colleges are well positioned to facilitate an increase in degree earners because of accessibility, there are concerns about the community college program completion. Of those
students enrolled for the first time, full-time, less than a third (29.1%) graduated within three years of starting their program (NCES, 2017).

This economic transition to an environment requiring post-secondary education has been coupled with a national conversation about Science, Technology, Engineering and Math education (STEM). Historically, men have dominated the market for jobs in high paying STEM and CTE fields. Adding to the research about women who persist in these programs and field is important to increase equity in representation. The research related to STEM programs has indicated women feel uncomfortable in STEM programs and, if they persist, they are more likely to drop out of the workforce (Hill, Corbet, & Rose, 2010). Women in career and technical STEM fields have been virtually ignored in the research. According to Lester (2010), women in these areas have indicated family influence and mentorship, along with strong belief in their ability to be successful impacted their decision to pursue education in male-dominated career and technical programs.

The current researcher sought to explore the experiences of women in career and technical STEM programs within community colleges. Qualitative methods and phenomenological techniques were employed within a social constructivist post-modern worldview focused on student self-efficacy. The research was grounded in social cognitive theory and social cognitive career theory with a focus on human agency and self-efficacy. Using semi-structured interviews for data collection and inductive analysis procedures, the study was conducted to add to the literature related to women in male-dominated STEM career programs, as well as increase our understanding about STEM transfer programs within the community colleges to enhance completion initiatives for this growing student population.
Community Colleges

Community colleges in the United States, as they are known today, were conceived more than 75 years ago. This birth of a new type of post-secondary education was necessitated by the demands of the post-World War II economy (Drucker, 1996). The reality of the post-World War II economy demanded more skilled workers. To meet this need, community colleges were focused on missions of access and service (AACC, 2017). Community colleges were successful in providing access and enrolling students, providing opportunities for populations that were otherwise underserved. Today, despite success enrolling students, institutions of higher education are not producing enough graduates to meet the needs of business and industry at a rate required for economic global evolution (AACC, 2017; Lumina Foundation, 2016). The need is evident in that two thirds of the jobs created in the last ten years require a post-secondary credential (Matthews, 2015).

Coupled with changes in the post-World War II economy, the United States entered a race with the Soviet Union, increasing a need for an educated population. Evidence of this change can be seen in the race to have a presence in space. To counter the Soviet advances, the Kennedy administration pushed the race and Sputnik was born. This birth gave national attention to the need for education in the fields of Science, Technology Engineering and Math (STEM) for continued global economic and political viability (Thomas & Williams, 2009). The focus on STEM fields and the need to compete have spurred the continued national conversation about STEM education for decades.

In times of change, legislation is often needed to support national initiatives. Legislation supported the 1960’s space race and, similarly, it has supported STEM initiatives in the United States. For example, in 2007, President George W. Bush signed the law,
America Creating Opportunities for Meaningfully Promote Excellence in Technology Education and Science (America COMPETES) (Thomas & Williams, 2010). This law is one of several in recent decades that have promoted a growing national movement focused on increasing academic credential completion at community colleges through STEM career pathways.

While community colleges provide access for students, community college completion rates are low. The United States high school completion rates were at 83% in 2016 (FACT SHEET: President Obama Announces High School Graduation Rate Has Reached New High, 2016). Completion rates at the post-secondary have lagged behind, with only 46% of the population earning an associate degree or higher (NCES, 2017). Efforts related to college completion have focused not only on retention of enrolled students but also on filling the gap in the workforce with people who stopped out of post-secondary education before earning a credential. Because community colleges have been successful in increasing access to higher education, they are continually tapped as a conduit for increasing graduation rates and lifelong learning (Lumina Foundation, 2016). Due to their location, accessibility and affordability, it is also believed community colleges are exceptionally well suited to facilitate regional economic growth (American Association of Community Colleges, 2015; Garza & Eller, 1998). In 2015, there were 6.49 million students enrolled at community colleges; however, of those enrolled for the first time, full-time, less than one third (29.1%) graduated within three years of starting their program (NCES, 2017).

During the recent economic recession, the high school population also decreased (AACC, 2015). This amplified the pressure on community colleges to add people to the workforce who had earned academic credentials. In response, higher education institutions,
particularly community colleges, shifted their attention from access to success. Evidence of this change can be seen at the nation’s largest community college, Miami Dade College (MDC). According to Rodicio, Mayer, and Jenkins (2014), MDC began a movement to outline the skills students would need to be successful in the 21st century. Leaders in higher education, innovators, and researchers in all industries have expressed concern about this change in economics and population demographics. With state education budgets cuts, coupled with an increase in competition for student enrollment, community colleges have been experiencing pressure to graduate more students.

There has not only been a need to increase the number of people with academic credentials, but there has also been a movement for gender equality in education in the United States. Examples of the shift toward equality were the Civil Rights Act of 1964, which sought to improve equality for men and women of color as well as Title IX legislation which supported equality for girls and women. This legislation has supported an increase in the number of women starting or returning to higher education (Gilbert & Heller, 2013). The number of women pursuing higher education is a product of the dramatic change in cultural norms in the last two generations. Women’s roles were formerly that of full-time homemaker and mother. Today, women often play these traditional roles as well as those of worker and student (Compton, Cox, & Laanan, 2006). Nevertheless, this return to education can create hardships for women. Many women experience economic stress and often struggle to manage their relationships while pursuing their goals and managing their other responsibilities (Deutsch & Schmertz, 2011).

The financial constraints for women are significant according to the Center for American Progress. In 2008, females were 13.8% more likely to be poor compared to 11.1%
of men. Poverty among women is more prevalent than among men across all racial groups (Cawthorne, 2008). While there are many contributing factors to this income disparity, the larger toll of this statistic is played out economically at the national level. According to Cawthorne, “Poverty rates for males and females are the same throughout childhood, but increase for women of child bearing age and again in older age” (p. 4).

While equality and financial support has been legislated, gender equity has not occurred in STEM fields. Starobin and Laanan (2008) conducted a qualitative study of female transfer students in STEM programs. Their findings revealed that women seeking a baccalaureate degree in a STEM field are more likely to begin their educational journey at community college. In 2008, of STEM bachelor’s and master’s degree recipients, women were more likely than men to have attended a community college (Starobin, Smith, & Laanan, 2016). This disparity between men and women in STEM fields as well as the increasing number of women attending community college has led to a rise in the amount of research on women in the STEM transfer pathway at community colleges. Despite the growth in research related to community college women and STEM transfer, there is not an equal amount of research on women in career STEM pathways.

**Statement of the Problem**

The challenge, responsibility, and opportunity for community colleges to effect the United States economic development will require mobilization of community college STEM completion efforts (Dougherty & Townsend, 2006; VaNoy & Zeidenberg, 2017). This mobilization of community colleges requires a rethinking of community colleges’ academic experiences (Bailey, Jaggars, & Jenkins, 2015). The need is evident when examining community college program completion rates. Only half of the students enrolling in
community colleges actually complete the credential they are seeking (Achieving the Dream, Inc., 2017). These dismal community college completion rates, coupled with the disparity between men and women enrolled in STEM career pathway programs, have amplified the need to understand women and their participation in STEM career pathway programs.

The challenges of achieving a degree are more acutely felt by women despite a change in cultural norms which formerly kept the majority of them home and away from educational institutions. Today many women attempt to balance household, childrearing, and work responsibilities while pursuing post-secondary education (Deutsch & Schmertz, 2011). These unique circumstances of women have increased the challenge for community colleges to meet women’s diversified needs in the context of STEM career pathways. Furthermore, the research on STEM transfer pathways also suggests that women experience challenges in male-dominated STEM transfer pathways. Findings of a study by Lester (2010) revealed that women enrolled in community college career and technical programs experienced similar challenges in male-dominated environments.

Tinto (2012) called on institutions to create policies and take action to improve retention and completion by thinking about the student experience. While Tinto did not acknowledge the complexity and diversity of community college student arena, the need to consider student retention was positive. Bailey, Jaggars, and Jenkins (2015) reinforced the need for change and argued that community colleges need to shift focus from their original goal of enrollment expansion to one of program completion. More specifically, the current study examined the unique experiences of adult women entering or re-entering the community college in a STEM career pathway program in a community college setting.
Women experience a wide variety of challenges in a post-secondary academic setting. Little is known about the academic and social experiences of women in community colleges from the perspective of the women using their own words. There is even less known about women in male-dominated STEM career pathway programs. Capturing this unique perspective may shed light on what “works” for women and what is challenging for women in this educational environment. The outcomes might provide new insights for institution in this study as it answers the call to improve program completion and seek gender equity in career programs.

As community colleges continue to provide a viable conduit for movement among social classes and act as a vehicle for economic development, the perspective of women must be included in the conversation. Research is needed to support gender equity in STEM career pathways and a rethinking of how to teach and support students at community colleges.

**Purpose of the Study**

The goal of the study was to capture and describe the academic and social experiences of the participants. Using qualitative methods, this researcher sought to gather a deep and rich description of the experiences of the women in the study using an exploratory approach and phenomenological techniques. Participants’ experiences were recorded using their own words. This study may provide a woman-centered worldview to the STEM and CTE dialogue. A social constructivism paradigm further shaped the study. The social constructivism paradigm is appropriate for deep understanding (Merriam & Tisdell, 2016). Creswell (2013) stated that meanings and understanding are formed by social interactions and influenced by historical and cultural experiences. Jones, Torres, and Arminio (2013)
supported the use of phenomenology to better understand the essence of the experience of the participants.

Whenever examining issues of race, religion or gender, a postmodern lens must also be considered (Creswell, 2013; Rossman & Rallis, 2012). “The basic concept [Postmodernism] is that knowledge claims must be set within conditions of the world today and in multiple perspectives of class, race, gender and other group affiliations” (Creswell, 2013, p. 27). This study was sensitive to the postmodern, post-structural power issues related to aspects of the participants’ experiences. Because this study sought to understand the participants’ views, a social constructivism interpretative framework was utilized. The framework is appropriate when a researcher wants to understand not only the participants’ views, but also how they are socially and historically situated (Creswell, 2013; Moustakas 1994).

While the participants did not write, conduct or analyze the data collected, they were asked to review interview transcripts. The opportunity for participant review of transcripts provided a point for clarification, elaboration on context and ensured validity of the data collected in the study. This procedure is supported by the social constructivist framework in that multiple realities exist and are related to the participants’ lived experiences. From an epistemological standpoint, the participants’ experiences are influenced by the researcher and the researcher by the participants’ experiences. Inductively analyzation techniques were utilized. Efforts were made to bracket the researcher’s experiences with the phenomena to limit the researcher’s influences on phenomena. Moustakas (1994, as cited by Frye, 1995) suggested phenomenological researchers look at their research with naïveté to the phenomenon of interest. Creswell (2013) also acknowledged the importance of this
positionality stating, “Researchers recognize that their own background shapes their interpretation flows from their own personal, cultural and historical experiences” (p. 25).

**Research Questions**

This study was guided by the following research questions:

1. What are the influences that shaped participants’ decision to enroll in a male-dominated STEM career pathway program?
2. What are the lived experiences of women enrolled in a male-dominated STEM career pathway program?
3. How might social cognitive career theory explain these influences and experiences?

**Significance of the Study**

There has been limited research dedicated to exploring women’s experiences at community colleges. This literature becomes minute when limiting the parameters to women experiences in STEM career pathway programs. As a result, each study’s contribution, whether small or large, is important to bringing a voice to the women community college students. This voice is necessary at a macro level in the United States in higher education as the world continues to be understood within the constructs of society designed by a patriarchy. Frye (1995) exemplified the need for more research pointing out a lack of research on women in two-year colleges in a review of the history of women in community college from 1900-1970. He further suggested that even without a significant amount of research related to community college women, there is evidence that women teachers and administrators pushed their STEM students to move beyond the pursuits related to their roles viewed women as nurturers (Frye, 1995). Twenty-three years later, there is still a need to understand how women experience community college and STEM programs.
Understanding the experiences of women will continue to grow in importance as their economic influence grows and as the workforce needs continue to evolve. Each state has a need for a talented workforce to support their economies. As community colleges continue to be viewed as a catalyst for economic growth regionally, understanding the experiences of women is critical. Women enrolling in community colleges are persisting at higher rates than men and, therefore, women’s perspectives warrant much attention. This study is worthy of undertaking because community colleges continue to design academic experiences using strategies based on models that are not attentive to the needs of the women learners (Cox & Ebbers 2010). Much of research on women and STEM is related to women and transfer; however, this ignores women enrolled in career pathway STEM programs. These programs lead to the quick entry into the workforce. This, in turn, can have a positive financial impact on the women, as well as their community and ultimately the nation. The disparity of representation between women and men in STEM careers is persistent. As the United States continues to seek relevance in a world driven by a global economy, diversity in the workplace is essential. Unequal representation of women in STEM fields limits opportunities for variation of perspective and restrictions innovation.

While this study may seem small, the impacts for the Midwestern region where the study was conducted are worthy of attention from a social and economic standpoint. Overall, adding to the research related to the women community college students could lead to more deliberate practices and policies geared toward increasing gender equity in programs and increasing graduation rates. By increasing gender equity in STEM career pathways one increases diversity, increases opportunity for innovation and increases financial stability for
women, thereby increasing opportunity for a more robust economy where the United States can continue to be a global leader.

**Theoretical Framework**

Issues of self-efficacy were explored among the participants in this study. Bandura (1977) developed a theory in the 1970’s which attributed human actions to an individual’s negative or positive behaviors to their personal impulses and inclinations rather than their predestined nature. Bandura’s (1986) Social Cognitive Theory explained psychosocial functioning as triadic, causative, and reciprocal in nature. This model is called the Triadic Mode of Reciprocal Causation and more closely examines the interaction of personal, behavioral and environmental factors related to the human thought and behaviors.

Stajkovic and Luthans (1998) examined Bandura’s social cognitive theory and self-efficacy which was applied in the construction of this study and analysis. The social cognitive theory is concerned with cognitive aspects of behavior control and self-regulation extending beyond issue of knowledge acquisition and behavior change and will provide a lens for the research. In addition, connections for social cognitive theory in the area of self-efficacy were also explored. The connection was simply stated by Stajkovic and Luthans, “This increasingly recognized psychological construct deals specifically with how people’s beliefs in their capabilities to affect their environment to control their actions in ways to produce desired outcome” (p. 63).

Not only do perceptions of self-efficacy impact student behavior, but they may also impact students’ resilience, commitment to their goals and persistence. Schunk and DiBenetto (2015) outlined how teachers’ understanding of self-efficacy is important stating, “Self-efficacy also helps determine how much effort students expend, how long they persist
when confronting obstacles, and how resilient they are in the face of adversity. Students with a strong sense of self-efficacy approach difficult tasks as challenges to be mastered rather than threats to be avoided” (Schunk & DiBenetto, 2015, p. 516).

The final question of this study relates to participants’ perceptions of the influence their education program may have on their future; this aspect of self-efficacy and motivation theory will also support these questions. Azizli, Atkinson, Baughman, and Giammarco (2015) also called on Bandura’s social cognitive and self-efficacy theories to explore the relationship between self-efficacy, future planning and life satisfaction. They examined 242 undergraduates and found positive correlations between general self-efficacy levels and life satisfaction levels (Azizli et al.).

**Methods**

The purpose of this study was to capture a rich description of women community college students enrolled in a male-dominated STEM career pathway program. A qualitative research approach was employed as recommended by Creswell (2014), for a social constructivist worldview can be used when the researcher’s goal is to understand the view of the participants. Further, Merriam and Tisdell (2016) espoused the qualitative researcher interested in the construction of knowledge may use a social constructivism approach.

Approval to conduct this study was obtained by the Institutional Review Board (IRB) at Iowa State University as well as the sample community college (see Appendix A). After IRB approval was acquired, students were recruited as participation using a purposeful maximum variation process. According to Creswell (2013), looking for a sample that has the maximum variation will allow the researcher to account for the diversity among campus locations of the participants (Creswell, 2013).
This study was conducted with the women students enrolled in male-dominated STEM career pathway programs at a large Midwestern community college. The Midwestern community college is referred to as Midwest Community College (MCC). MCC was selected due to its size and involvement with community college STEM initiatives at a national level. The student demographics are also a good fit for the study. The average student age is 23 years old. The college enrolls more than 36,000 credit students and is 55% female (Denman & Company LLP, 2016). In addition, MCC graduates have a 96% employment rate. Approximately one third graduate in five years, one third transfer within five years without graduating and about one third leave the institution without graduating or enrolling in another institution (Personal communication with Executive Director of Institutional Effectiveness at MCC, 2016). These factors support the selection of MCC as the site for this study.

Students, identifying as women, enrolled in male-dominated STEM career pathway programs at MCC were invited to participate (Appendix B). In an effort to add breadth to the study, a three interview protocol based on the theory of Moustakas (1994) was employed (Appendix C). This interview series first collected background and contextual information; the second interview probed for details of the phenomenon. The final interview captured the words the participants used to describe how they make meaning of their experiences.

Invitations to participate, using purposeful and snowball sampling techniques, were sent with the goal of securing participation agreements (Appendix D) from eight women enrolled in male-dominated STEM career pathway programs. The researcher interviewed all participants using a semi-structured interview protocol. Student participants were interviewed a minimum of three times. Interviews were scheduled for a duration of
approximately 60 to 75 minutes. Each interview was conducted in a quiet and comfortable location on one of MCC’s campuses or at a location convenient to the participant. Each interview was audio recorded and transcribed verbatim using Rev.com. The interview data were de-identified and encrypted before transmission to Rev.com. While a rich description of the sample was sought, feasibility issues suggested limiting the sample size to ensure the study could be completed as recommended by Rossman and Rallis (2012).

The exact words of the participant interviews were reviewed and analyzed to inductively categorize the data (Creswell, 2013). These categories were further reviewed to identify emerging themes. Member testing, analytical memoing and peer review were engaged to increase reliability. A peer review team discussed themes, subthemes, and interpretation before conclusions were made. A review of MCC program recruitment material and Midwest Community College websites supplemented and further contextualized the data, and contributed to the analysis and outcome reports.

**Role of the Researcher and Limitations**

The design and methods selected enabled the researcher to explore the academic and social experiences of the participants in the study. I also acknowledge my positionality. In phenomenological study design the researcher seeks to separate from assumptions and preconceived ideas about the participants and phenomenon being studied (Moustakas, 1994). Because the participants were women and the researcher was also a women, this could be considered as having insider status with the participants. My goal as the researcher was to set aside personal viewpoints and richly describe the participants’ lived experiences. Never having experienced life as another gender, being a woman is pervasive to my conscious existence and, therefore, impossible to approach from an uninformed standpoint. I also
acknowledge additional commonality with the participants. I attended a two-year school post-secondary school and transferred to earn a bachelor’s degree. I returned to education at the graduate level to further my career despite having many professional, financial, and family responsibilities. Participants may have similar background and experiences. While some of these aspects of positionality may increase participation, cooperation and trustworthiness with the participants, (Creswell, 2014) they also present a challenge for bracketing. Bracketing entailed separation from prior conceptions and beliefs.

As the researcher, I further acknowledge I am a white woman which status may have afforded me a privilege some of the participants may not share. I am also married to a supportive spouse with whom I share two children, one of which is completely disabled. I am also the breadwinner in the household. My overall dedication to student success may be evident in my choice to spend the last 15 years working at public community colleges. Prior experiences of mine also speak to my commitment to higher education which may also increase trustworthiness with participation. This trust may have enabled participants to feel comfortable sharing their experiences. During each phase of the study, every effort was made to ensure confidentiality of the participants and meet the parameters as approved by the IRB. Throughout the study, I kept a journal about the experience in acknowledgement of social and historical influences impacting my interpretations.

While there are limitations with all research, in this case study, the sample was small, regional in nature, with limited scope for the sake of time. One may be able to make naturalistic generalizations that deepen the understanding of women enrolled in male-dominated career pathway programs. Because the topic is under researched, there are a vast number of paths for exploration and further research. The focus of the study was centered on
students’ academic and social experiences in relationship to their self-efficacy while enrolled in a STEM career pathway program in comparison to their other academic experiences.

Areas not proposed in this study but would be beneficial to include in future research include issues of race, academic preparedness, and socioeconomic status within the population of study.

**Definition of Terms**

The following terms were defined for use in the study:

*Academic Experiences* – An instruction experience in the form of a course or program in an academic setting. The experience could occur on a campus or at another location as well as within an online learning environment. The academic experience can include instructor-led experiences, field experiences as instructor-organized or peer-organized learning experiences.

*CTE* – Career and Technical Education, often known as vocational education.

*College Completion Agenda* – The Agenda supports the national goal for the United States’ 1,200 community colleges to achieve a 50 percent increase in the number of students earning workplace suitable degrees and certificates (AACC, 2017).

*Community College* – “Community colleges are centers of educational opportunity. They are an American invention that put publicly funded higher education at close-to-home facilities, beginning nearly 100 years ago with Joliet Junior College. Since then, community colleges have been inclusive institutions that welcome all who desire to learn, regardless of wealth, heritage, or previous academic experience” (AACC, 2017).

*Female, Male, Women and Men* - For the purposes of this study, females and women are defined as persons identifying as females or women regardless of gender assigned to them at
Males and Men are referenced as persons identifying as male or men regardless of gender assigned to them at birth.

**Male-Dominated Programs** – Male-dominated programs with historically enrolled men at a majority level. The sample institution offers more than 200 programs of study according to their college website. Programs included in the study are marketed by the sample institution as STEM career pathway programs. As shown in Table 1, the program inclusion list includes the following one- and two-year certificate, diploma and associate in applied science programs: (1 = 1-year diploma or certificate; and 2 = 2-year diploma or AAS degree).

**Phenomenology** – A method of qualitative inquiry. “A phenomenological study describes the common meaning for several individuals of their lived experiences of a concept of phenomenon” (Creswell, 2013, p. 76).

**Self-Efficacy** – A person’s belief in his or her ability to be successful in a pursuit or a task (Bandura, 2006).


**Social Cognitive Theory** – This theory espouse a person’s action and reactions are socially constructed. These actions and reactions are cognitive in nature and based upon observing the behavior of others (Bandura, 2006).
Table 1. STEM career programs offered at the institution in the study

<table>
<thead>
<tr>
<th>Science</th>
<th>Engineering</th>
<th>Technology</th>
<th>Math</th>
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</thead>
<tbody>
<tr>
<td>Agriculture (1, 2)</td>
<td>Civil Engineering Technology (2)</td>
<td>Advanced Manufacturing Technology (2)</td>
<td>Accounting (1, 2)</td>
</tr>
<tr>
<td>Biotechnology (1, 2)</td>
<td>Robotics &amp; Control Systems Engineering Technology (2)</td>
<td>Building Trades (1)</td>
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<tr>
<td>Chemistry (2)</td>
<td>Electronics Engineering Technology (1, 2)</td>
<td>Business Information Systems (2)</td>
<td></td>
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<tr>
<td>Environmental Science (2)</td>
<td></td>
<td>Computer-Aided Design (1, 2)</td>
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<tr>
<td>Fire Science Technology (2)</td>
<td></td>
<td>Computer Science (2)</td>
<td></td>
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<tr>
<td>Fitness &amp; Sports Management (2)</td>
<td></td>
<td>Data Communications</td>
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<tr>
<td>Veterinary Technician (2)</td>
<td></td>
<td>Telecommunications (1, 2)</td>
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<tr>
<td>Water Environmental Technology (1, 2)</td>
<td></td>
<td>Graphic Design (1, 2)</td>
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<td></td>
<td>Informatics (1)</td>
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<td>Information Technology</td>
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<td></td>
<td></td>
<td>Network Admin (2)</td>
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<td></td>
<td></td>
<td>Management Information Systems (2)</td>
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<td></td>
<td>Tool &amp; Diemaking (1, 2)</td>
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<td>Wind Turbine Technology (2)</td>
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<td></td>
<td></td>
<td>Web Development (1, 2)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Welding Technology (1)</td>
<td></td>
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</tbody>
</table>

**STEM Career Pathways** – For the purposes of this study, community college programs leading directly to employment that are related to STEM fields.

**STEM Fields** – Science, Technology, Engineering and Math programs. STEM fields may include workers with an associate degree or other sub-baccalaureate credential who are employed in occupations requiring scientific, technological, engineering or mathematical capabilities. The National Center of Education Statistics includes the following areas in the STEM program definition: mathematics, physical sciences, biological/life sciences, engineering/engineering technologies, science technologies and computer/information sciences https://nces.ed.gov/pubs2014/2014001rev.pdf.
STEM Transfer Pathways – Community college programs designed for transfer to a baccalaureate granting institutions in STEM related fields.

Women Students – Students self-identifying as women by having identified as female on the application for admission or identifying as female through snowball sampling techniques.

Dissertation Organization

Chapter 1 provided the introduction. Chapter 2 presents a review of the literature related to the development of the community college, the completion agenda, STEM education, STEM women at community colleges and the tenets of social cognitive theory as founded in the seminal work of Bandura, as well as the work of Lent, Brown and Hackett. Chapter 3 presents the methodology and research design proposed for the study. Chapter 4 discusses the results, and Chapter 5 provides a summary of the findings, implications for practice, and recommendations for future research.
CHAPTER 2. LITERATURE REVIEW

The purpose of this study was to capture, describe, and analyze the academic and social experiences of women enrolled in male-dominated STEM career pathway programs at a Midwestern multi-campus community college. The study was guided by the following questions:

1. What are the influences that shaped participants’ decision to enroll in a male-dominated STEM career pathway program?
2. What are the lived experiences of women enrolled in a male-dominated STEM career pathway program?
3. How might social cognitive career theory explain these influences and experiences?

The literature examined in this chapter centers on illuminating the experiences of women enrolled in career pathway programs in the context of the rising STEM education conversation and the community college completion agenda. The review begins with a historical review of the evolution of the community college within the landscape of higher education. The literature provides background to the study and demonstrates the change in mission of community colleges from one of an access point for underserved students to a mission of workforce development. Attention is given to the history of women in community colleges. The new emphasis to credential more learners to support the knowledge-based economy and specifically women in STEM career fields frames the context for this study.

The topic of community college completion is explored in the context of the national STEM education initiatives. This national call for community colleges to be the catalyst for
increasing a credentialed population is not exclusive to women or men. Women and their perceptions, however, are central to this study. Therefore, pertinent literature on women in the community college context is explored. Examining the past history and current experiences of women as they enroll and work to persist in male-dominated STEM career pathway programs at community colleges is central to the chapter.

Finally, the seminal social behavioral theories of Bandura (1977, 1981, 1982, 2006) and the tenets of social cognitive career theory, which influenced Lent, Brown, and Hackett (1994) are provided to ground the study. Bandura was concerned with cognitive aspects of behavior control as they relate to achievement of goals. Lent, Brown, and Hackett (1994) built on Bandura’s social cognitive theory and applied career choice. This model, Social Cognitive Career Theory, is explored regarding its applicability to women at community colleges is also discussed in the chapter.

The literature for this study was gleaned from empirical sources including doctoral dissertations, peer review journals, scholarly books, data and reports from nationally recognized research centers and foundations (U.S. Department of Education, Integrated Post-Secondary Education Data System, The Lumina Foundation). The Iowa State University Library, Des Moines Area Community College Library and Google Scholar provided access to the published research. The research for this study was initiated by using the following keywords: community college, women learners, underrepresented learners, community college STEM, social cognitive theory, social cognitive career theory and self-efficacy. A map of the literature reviewed is provided in Appendix E.
History of Higher Education in the United States

Institutions of higher education have been present in the United States beginning in colonial times. Early institutions began as denominational institutions and were often more about classical studies and discipline than practical education (Paschal, 2016). In the post-Revolutionary War American era, social class structure experienced and upheaval and economic needs were changing. Higher education institutions adapted from their denominational roots to a more secular model, better suited to support industrial capitalism and encourage the growth and the expansion needs former slave territories were seeking (Paschal, 2016).

Changes in the late 19th century allowed a middle class to grow in the United States. This evolution within social classes and democracy drove a need for more productive higher education institutions. This need for productivity was driven by wealthy white businessmen (Loss, 2015). The scholastic changes were modeled after a German university model with a focus on research. These changes, while modeled on German systems, were influenced by American ideals by combining research, teaching and public service (Loss, 2015).

Evidence of the American version of higher education with its social and economic application to research, teaching and public service is found in the Morrill Act of 1862 (the Morrill Act). This Act provided States with land to create places to educate all social classes in the fields of agriculture, home economics and mechanical arts. Further evidence of education being a vehicle for social change can be seen in revision to the Morill Act in 1880. These modifications were made to increase access for people of color by mandating admission standards not exclude people of color. The amendment required institutions to demonstrate their admissions requirements did not exclude people of color. Duemer (2007)
argued the Morrill Act was born out of the need to drive the agriculturally focused economy but proved to be a catalyst for social change. This connection of economic needs being driven by higher education persisted in the early 20th century with the establishment of junior colleges and normal schools.

**History of the Community College**

“As a distinctly American invention, the comprehensive community college stands between secondary and higher education, between adult and higher education, between industrial and formal technical education” (Ratcliff, 1994, p. 3). This distinctly American new type of higher education has roots in junior colleges. Junior colleges were designed to mimic the first two years of four-year institutions. As early as the 1920’s, junior colleges began to acknowledge and discuss the need for a change in the traditional curriculum in order to meet the needs of a changing society (Gleazer Jr, 1994).

The Truman Commission of 1947 changed the higher education landscape by building on the thoughts of junior college and creating policy and giving shape to national goals to fill the country’s educational needs (Gilbert, & Heller, 2013). According to Boggs (2011), the Truman Commission’s focus and commitment to financially support access to higher education through open enrollment institutions spurred growth and development of community colleges. This new type of post-secondary education was necessitated by the demands of the post-World War II economy (Drucker, 1996). Specifically, the advances in the manufacturing economy demanded more skilled workers (Drucker). This need for education to fuel the economy, coupled with legislative support of the Truman Commission, spurred the development of community colleges nationwide. In 2015, there were 1,123 community colleges in operation (Project Information, 2017).
The policies of the Truman Commission focused on providing access to those otherwise left out of higher education. Building on the tenets of junior colleges, community colleges were focused with missions of access and service (AACC, 2017). Community colleges were non-selective, conveniently located and affordable, opening up an avenue to education attractive to minorities and women (Cox & Ebbers, 2010).

During the proliferation of community colleges of the 1960’s and 1970’s the idea of access to higher education through the community college solidified and the diverse nature of the comprehensive community college continued to develop. While community colleges’ open door policies increased access, the challenges facing learners did not disappear. The California Postsecondary Education Commission report of 1976 raised concerns about retention, persistence and the increase in part-time student enrollment. The Commission’s dialogue moved beyond issues of curriculum and program offerings to acknowledge the individual characteristics of learners and the impact on student performance. Expanding beyond issues of access, Gleazer (1994) also acknowledged students as individuals who bring varying levels of educational experience, which impact their learning needs (Gleazer, 1994).

Over time, the United States evolved from an agricultural economy to a manufacturing economy. In the late 20th century and at the outset of the 21st century the United States was evolving into a knowledge based economy making education and skill development for employment essential (Drucker, 1996).

What is clear is higher education continues to evolve in audience, structure and mission. As the U.S. economy, political climate and established cultural issues continued to
transform society and education, understanding the history and evolution of higher education is relevant to current research.

**Community College Diversification and the Completion Agenda**

Donaldson and Townsend (2007) noted that of the 7.1 million people enrolled in higher education, 43% of all undergraduates were 24 years of age or older in 1999-2000. This is significant because only a decade prior to this, only 5.73 million undergrads age 24 or older were enrolled (Donaldson & Townsend, 2007). These societal changes include a growth in adult students pursuing higher education.

Brown, Pascarelli, and Terenzini (2005) outlined a bias in the focus on the 18-22 year old population having a negative impact on adult students. Despite the value of this population in relation to economics, Kasworm (2014) suggested that higher education institutions have hindered the persistence of adults. Kasworm suggested institutions frame their completion initiatives to include adult students’ unique needs. Using benchmarks, curricula, alternative delivery formats, policies and support services, the persistence could be increased. Compton, Cox, and Laanan (2006) agreed with Kasworm that adult learners require options for experiential credit, alternative formats for program delivery and support services. In addition, they connected the need for practical applicability of program knowledge for the workplace and urged more thought and effort be made to engage adult learners with more social-related supports (Compton et al., 2006). Cohen, Brawer, and Kisker (2014) noted that as each level of education is completed, it acts as a ticket to the next socioeconomic level.

Despite the increase in community college enrollment, more research has been focused on university undergraduates. Beach (2010) examined the literature about the
history of higher education in the 20th century. Beach found stunningly little published research related to community colleges in comparison to higher education as a whole (Beach, 2010). Crisp, Carales, and Nunez (2014) contended that published scholarship regarding community colleges increased due to large scale national programs, such as Achieving the Dream and the Puenta Project.

The demands of business and industry will require millions of new jobs by 2025. Institutions of higher education are not credentialing enough students to meet the demand of business and industry, with a predicted shortage of more than 16 million jobs (Tovar & Price, 2014). The Unites States has made strides increasing high school graduation rates, but postsecondary education achievement lags. Within the 25-64 year-old age range, the United States ranks only sixth globally in persons with an associate degree or higher (Handel, 2013; Price & Tovar, 2014). National concern about the deficit of credentialed workers gained attention during the Obama Administration. Community colleges have been making efforts to answer the call. Today, the United States stands waiting to see how the Trump Administration will interpret the community college role in the national economy.

Community colleges were designed to increase access for underserved populations and lifelong learning. Community college missions have adapted and are now seen as a catalyst to support national economic needs beginning at a local level (Beach 2010). In 2015 there were 6.49 million students enrolled at community colleges (NCES, 2017). If the students complete in-demand credentials, community college graduates could fill much of the workforce need.

The formula for success in supporting these learners in their efforts to complete an academic credential continues to elude community colleges nationwide. Everett (2015)
reported only 46 percent of students enrolling in community colleges, with the intent of earning a credential or transferring, do so within six years. Lumina and the National Student Clearinghouse reported 44 million people in the United States have earned some college credit but do not have a credential. Nationally, 22 percent of the adult population has postsecondary education but no credential (Blackwell, 2016; Blackwell & Pinder, 2014; Everett, 2015). These numbers illustrate a huge loss of human capital and a serious missed economic opportunity.

Mertes and Hoover (2014) sought to replicate a research study regarding undergraduates with community college students. They used student fall-to-fall retention as their dependent variable. Mertes and Hoover (2014) included high school grade point average, age, gender, ethnicity, credit load, educational goal, remedial need, financial aid receipt among several other independent variables. After analysis, they concluded that it is difficult to draw quantitative conclusions about enrollment and retention due to the heterogeneous nature of community college students. Related to this, they suggested a more institutional-based analysis research focus rather than one that is generalized. They suggested students’ intent and program changes may impact persistence (Mertes & Hoover).

The college completion agenda has developed in the last 20 years and is not only driven by the nation’s economic needs but also by the call for transparency by policymakers. This call is further fueled by decreasing state budgets and poor program completion rates, resulting in a loss of human potential (Bailey, Jaggars, & Jenkins, 2015).

The diversity in student enrollment at community colleges complicates the delivery of education and fulfillment of U.S. needs for an educated workforce. Historically, community colleges have taken a model of service designed for traditional age students and offered it in
the evening as a response to the needs of adult students. Cox and Ebbers (2010) cited Terrell (1990) saying, “Researchers suggest that programs that have been developed to meet the needs of adult learners are really cleverly disguised attempts to morph adult learners into traditional models” (p. 339). This approach to service does not account for the diverse needs of the populations served at community colleges. The traditional approach to education does not address the challenges women face as they pursue their educational goals. When more than 50 percent of community college learners are women and enrolled part-time, ignoring the challenges runs contrary to success in the national community college initiatives.

Women and Post-Secondary Enrollment

The landscape of higher education has shifted in the last five decades. Formerly, higher education was accessible for the financial and intellectual elite (Gleazer 1980). The shift in postsecondary education was spurred on by national legislation in the 1940’s, 50’s and 60’s. The growth of higher education and the creation of community colleges brought about new options for underserved populations touting mission statements with ideas of access and lifelong learning (Gleazer, 1980). Community colleges proliferated and colleges flung open the doors of postsecondary education for underserved populations such as adults, minorities and women (Baum, Kurose, & McPherson, 2013).

Women saw this opportunity for access to education and acted. Today, adult women are undertaking higher education at higher rates than men (Deutsch & Schmertz, 2011). This increase in the number of women pursuing higher education is a product of the dramatic change in cultural norms of the last two generations. As the knowledge economy evolved, women’s roles as homemaker and mother opened up, allowing them into the classroom and the workforce (Deutsch & Schmertz, 2011). Twombly (1993) attributed past increases in
community college enrollment to the increase in women participating in higher education (Twombly, 1993).

Despite this massive increase in female enrollment, women have been the focus of very little research (Townsend 1995; Twombly 1993). Twombly (1993) advocated for further research writing, “In light of the increasing importance of the community college, especially for women, the economically disadvantaged, and minorities, it is critical to understand how these constituencies are conceptualized within the context of this specific educational setting” (p. 188). The need is urgent as women have many responsibilities outside their role of students (Deutsch & Schmertz, 2011). They are often working mothers only able to attend on a part-time basis (Cox & Ebbers, 2010).

According to the Center for American Progress, these hardships include financial concerns. In 2008, females were 13.8 percent more likely to be poor compared to 11.1 percent of men. Further, women are poorer than men in all racial groups (Cawthorne, 2008). While there are many contributing factors to this income disparity, the larger toll of this statistic is further played out economically at a nation level. Cawthorne (2008) stated this challenge, “Poverty rates for males and females are the same throughout childhood, but increase for women of child bearing age and again in older age” (p. 4). An increase in research is necessary to address the challenges often unique to women. There is opportunity for community colleges to take their one-size-fits-all college enrollments, retention and graduation processes and adapt their practices to respond to the unique perspective and needs of women.
Evolution of Women in STEM

The amount of published literature continues recede when discussing women, and there is even less to be found on women in male-dominated STEM career pathway programs. To understand why there is a paucity of literature on women in male-dominated STEM career pathway programs, the history of women in STEM education needs to be examined.

The first engineering school in the United States was focused on military engineering. West Point, founded in 1802, was a military engineering school exclusively for men and continued to limit admission to men until 1976 (United States Military Academy). This exclusivity in admission was reflective of the patriarchy within United States society. Prior to the 20th century, there was no place for women in STEM.

Roots of Science, Technology, Engineering and Math (STEM) education, as it is known today, can be seen as early as 1904 with the founding of Stuyvesant High School in New York City, New York. While the school exists today for talented and gifted girls and boys who reside in of New York, its early mission was a bit different. In 1904, the mission was to educate boys with technical skills for the workforce (Thomas & William, 2009). The move to allow girls admission did not occur until 1969 when 14 girls were admitted to study. Student enrollment at Stuyvesant High School is now 43% female. Additional early high schools with similar roots in STEM include Brooklyn Technical High School, Bronx High School, and Cass Technical High School in Detroit, Michigan (Thomas & William, 2009).

The growth of STEM education has been influenced by global social, political and economic forces. In 1958, President Eisenhower created the National Aeronautics and Space Agency (NASA) in response to the Soviet Union launching a satellite to gather intelligence (Baum, Kurose & McPherson, 2013). These events are often considered as the launching
events leading to the drive for STEM education in the United States (Chickorre, 2008; Garret, 2008; Geldis, 2014). Also in 1958, the federal government enacted the National Defense Education Act (NDEA) which funded education for students gifted and talented in science, mathematics, engineering or modern foreign language, (Title II, Sec 204). The $1.4 billion distributed over four years was to ensure students with financial need were not excluded from the talent pool (Title I, Sec 101).

The 1960’s Presidential race to the moon fueled the nation’s interest in science and further legislation followed. In 1972, Title IX was enacted requiring equity in funding for both girls and boys in federally subsidized educational programs. By the 1980’s NASA was financially contributing to support the Society of Women Engineers, (SWE) whom subsequently actively lobbied Congress for support of the Gender Equity in Education Act (GEEA), (Taylor & Weigand, 1999).

In the 1990’s an example of these forces, on a national and global scale, can be found in the political and economic issues driving ideas of education in science, engineering, technology and math fields (Blackley & Howell, 2015). “In the U.S., the rhetoric about STEM is founded in political reactionism to the potential disposition of the U.S.’s global superiority” (Blackley & Howell, 2015, p. 102). Further fueling this movement were economic crisis points. This need to sustain global power was driven by economics and supported and funded by politician and governments (Williams, 2011).

As was addressed earlier, the drive to move students into science, technology engineering and math related educational and career paths continues to grow. The issue of gender inequity in these fields is not a new one whose roots can be seen in the history of higher education. It could be argued that in western society gender inequity is inescapable as
the design and execution of our human experiences was devised with a dominantly male perspective (Yee, 1977).

This perspective was challenged in the 1960’s and 1970’s women’s movement. In 1977, Yee was surprised to find women pursuing science and technology careers were more interested in equity of opportunities and less concerned with correcting culturally based inequity in science and technology fields. Hughes’ (2014) examination of women in science referenced the evolution of STEM, noting in 1889, only six women earned PhD’s in United States. This number increased to 36 by 1900. This shift allowing women to pursue STEM fields moved at a glacial pace. By 1954, 260 women received PhD’s in science representing only 6 percent of science doctorates awarded that year (Hughes, 2014).

This inequity in science played out in discriminatory ways for women. An example of this discrimination can be found in Rosalind Franklin, a research assistant in Kings College in London. Franklin’s data regarding discovering the crystallized structure of DNA was taken by two male scientists without her permission. The scientists, Watson and Crick, later received the Nobel Prize for the discovery. Franklin was not mentioned in the work except to criticize her appearance and mood (Hughes, 2014).

It is important to note the 1960’s brought the women’s movement and Title IX in 1972. Title IX required all institutions receiving federal support to comply with the regulations of the statute. Very broadly, to comply, the legislation mandated institutions provide equitable opportunities for each gender paying attention to the interests and abilities of individuals. The law further required institutions demonstrate evidence of effective program expansion (Carpenter & Acosta, 2005). Despite the women’s movement and Title IX, the atmosphere in the science field continued to be challenging for women.
Hughes (2014) conducted a narrative life history analysis of three women from three different generations, all working as faculty in STEM science fields at a large research institution. In particular, Hughes wanted to understand the participants’ perception of gender roles, lack of role models, overt and subtle discrimination. The atmosphere was described as chilly, discriminatory and sexist. Each woman shared examples of sexual harassment, unfriendly environments and isolation. This study echoes the findings of Rosser (2003), who found women in STEM in the 1970’s, 1980’s and 1990’s experienced similar discrimination and isolation related to their gender.

Discrimination, like that experienced by Franklin, did not always include theft of intellectual property. It was still sexist. Institutional policies were gender biased. McGrayne (2005) compiled a review of qualitative knowledge regarding the chilly climate experienced by women in science and technology careers from 1990-2005. Women were not considered for positions and tenure due to the potential they may start a family or need maternity leave. They were often considered to be too big a distraction to the male scientist and were not allowed to work among them (Hughes, 2014; McGrayne 2005). Cultural and institutional biases often forced women to choose between a career and having a family (Wyer, 2001). While in the 1980’s women began to talk about issues of discrimination, the issues and the chilly climate remain in the 21st century (McGrayne 2014; Wertheim, 2006).

**Current State of Women and STEM**

To understand the evolution of gender inequity in STEM fields one must acknowledge the all-encompassing influence of the patriarchy of U.S. culture. The first universities in the United States were founded as a place for affluent men to pass the time before coming home to a life of leisure among the aristocracy (Geldis, 2014). The structure
of universities was inherently dominated with masculinity and social systems and institutional policies were designed by men and for men typically enrolled at universities (Hughes, 2014).

Historically, science and research were considered masculine in nature (Toglia, 2013). Feminist researchers would argue social perception of technology has been shaped and conceptualized from a male perspective (Rosser, 2005). An early example of this male-dominated perspective can be seen when examining early medical and psychological research. In 1980, Ruth Hubbard examined this research and outed this gender bias in her field of biology. She pointed out research subjects were nearly exclusively male (Wyer, 2001). Even today, the culture for women in STEM fields could be considered “chilly” (Seymore & Hewitt, 1997) and stereotypically male in perception (Cheryan, Jiang, Montoya, & Ziegler, 2016). The chilly reception experienced by early women of STEM often plays out today in less overtly discriminatory ways. Despite legislation outlawing gender discrimination more than 30 years ago, Togila (2013) reported gender equity in career and technical education has not improved.

Despite the legislation and the national push for higher education institutions to drive economic needs through education, gender inequity in STEM has improved only slightly. Evidence inequity persists in looking at the U.S population in 2014. The population was 50.8% female which comprised 47.74% of the civilian workforce (STEM Connector, 2017). Women, however, represented only 1 in 10 workers in science and engineering fields (STEM Connector, 2017).

Blickenstaff (2005) examined 30 years of literature related to the underrepresentation of women in STEM fields and found nine pervasive explanations. These included biological
issues, academic preparation, attitude, an absence of role models, science curricula, male favoring pedagogy, chilly atmosphere, cultural pressure to conform, and an inherently masculine worldview in scientific epistemology (Blickenstaff). Some explanations are not accurate or detrimental to understanding the phenomenon. (Blickenstaff). Blickenstaff did not propose there was a simple solution and acknowledged that the issues were intermingled and therefore complex.

Lester (2010) identified barriers affecting women and girls entering into STEM career pathways as socio-psychological, institutional, cultural in nature and not intellectual (Lester, 2010). Within the social psychological realm, Lester attributed self-efficacy, math anxiety and perceptions of professional life in a technical field and attitudes about science as impacting female enrollment in STEM fields. The research of Lent et al., (2001) complemented this self-perception idea when they found lower levels of perceived self-efficacy in math and science had a greater impact on female students than male students. The topic of math anxiety is not one that is new. This psychologically based barrier is more prevalent in women (Betz, 1978; Stage, Krenberg, Eccles, & Rossi-Baker, 1985). Male students were found to believe math to be more useful than female students found it (Armstrong, 1985; Brush, 1985; Schofield 1982; Sherman & Fenima 1977). The perception of technical fields, according to the females, are more solitary and antisocial than other fields and therefore less preferable to them (Creamer & Laughlin, 2005). Attitudes toward science also negatively influenced female STEM enrollment (Starobin & Laanan 2005).

Evidence that the issue with the lack of women is STEM programs is not an intellectual issue, but rather a social issue, can be found in According to the Committee on Science, Engineering and Public Policy (2007) findings. The report stated women in college
engineering programs are among the most qualified college students and yet they are more likely to drop out of the program before entering the workforce. Even before women can drop out of college, female high school students with just as many math and science credits and slightly higher grades than male students are not choosing to enroll in STEM programs (White House, 2010).

Eccles (1983) found deep connections in female student attitudes regarding math and science. They found a student’s belief or perception about her ability affected her interest and performance in courses in these areas. Ceci and Williams (2010) further noted female teenagers rarely planned to pursue careers in heavily focused math fields. Ceci and Williams also found that when females perceived math and science to be challenging, test anxiety more often followed and further diminished efforts to pursue math and science.

Despite the barriers to enrollment, the number of women earning bachelors in STEM has grown. The number of women in physics, engineering and computer sciences, however, is disproportionally low when compared to the number of women earning bachelor’s degrees in organic and social science areas (Hill, 2010; Association for Psychological Science, 2010). The result is fewer women are working in fields that provide the highest level of economic return.

**Community College Women and STEM**

The challenge, responsibility and opportunity for community colleges to impact the United States economic development will require mobilization of community college completion efforts (Dougherty & Townsend, 2006). This mobilization requires a rethinking of community college’s academic experiences. The need is evident when examining
community college program completion rates. Only half of students enrolling in community colleges actually complete the credential they are seeking (Achieving the Dream, Inc., 2017).

Despite this massive increase in female enrollment, women have been the focus of very little research (Twombly, 1993). Women have many responsibilities outside their role of students (Deutsch & Schmertz, 2011). They are often working mothers able to attend on a part-time basis (Cox & Ebbers, 2010). These challenges, often unique to women, are opportunities for community colleges to take their one-size-fits all college enrollments, retention and graduation processes and adapt practices to respond to the unique perspectives and needs of adult women. Twombly (1993) advocated for further research writing, “In light of the increasing importance of the community college, especially for women, the economically disadvantaged, and minorities, it is critical to understand how these constituencies are conceptualized within the context of this specific educational setting” (p. 188).

Cox and Ebbers (2010) examined female persistence in the community college. Open admission increased the opportunity for women to enter higher education; however, women have more social challenges when trying to enter or re-enter at a community college and to persist. While community colleges are a natural choice for women with the convenience of location and cost, women have the additional concerns for childcare, financial support, varying degrees of family support and balance issues of home, work and family responsibilities (Cox & Ebbers).

Despite the previously referenced challenges, adult women are enrolling in community colleges at higher rates than men. Blackwell and Pinder (2014) examined the motivation of first generation women pursuing higher education. They identified factors
related to their school and family life along with an intense internal drive to succeed as most influential to motivation.

There is still inequitable representation of genders in all educational and occupational fields. Deutsch and Schmertz (2011) and Andreas and Adamuti-Trache (2008) found women attained post-secondary degrees at similar rates as men; they completed their awards more quickly, they were overrepresented in lower status jobs and earned lower salaries (Deutsch & Schmertz, 2001). Wickersham and Wang (2016) and Snyder and Dillow’s (2013) NCES data provided evidence to view community college as the conduit for closing the gap in the deficit in STEM qualified graduates. They pointed to the make-up of undergraduate population as female with nearly 50 percent enrolled in community colleges. “As such, the community college sector contains a critical and often overlooked supply of female talent that, through the upward transfer function, can help diversify—and close the gender gap within—the population of baccalaureate recipients in STEM” (Wickersham & Wang, 2016, p. 1,001)

While the accessible nature of the community college is suitable for closing the gap of women in STEM programs, increasing the number of STEM prepared graduates is not a simple task. Jackson, Starobin, and Laanan (2013) advocated higher education institutions use multiple approaches to address the gap including articulation/transfer agreements, support systems, and faculty collaboration and increasing STEM visibility on community college campuses.

These challenges include issues of gender bias. Baily and Holmaersottir (2015) sought to understand how gender equality efforts and education could address the issues beyond parity. They posited that women, even when are represented in equal numbers,
experience education differently. Specifically women typically have different needs, resources, responsibilities and decision-making power (Baily & Holmaersottir). To further examine the STEM aspirations of community college women, Jorstad, Chen, and Kollasch (2017) used a large scale survey to collect data about self-efficacy, social capital and transfer knowledge. Students (n=565) from five Midwestern community colleges participated. The results showed age, enrollment status (full-time/part-time) and math preparedness were significant predictors of STEM transfer intent.

Laursen, Austin, Soto, and Martiniz (2015) examined 19 ADVANCE IT institutions supported by National Science Foundation dollars and tasked with looking at gender biases in institutional policies as a key to supporting women faculty in STEM fields. Using qualitative methods they found thirteen interventions to improve structures, practices and culture that would benefit not only women but men as well. They also uncovered unconscious bias against women scientists; social stereotypes around race, gender, ethnicity and other personal characteristics (Laursen et al., 2015). These issues created barriers for faculty women in STEM and could contribute to the entry into and retention of talent in STEM fields.

Lester (2010) compared the barriers experienced by women in STEM programs to barriers faced by women in male dominated career and technical programs at community colleges. The experiences of the women in Lester’s research were laden with gender bias in the classroom and the workplace, while being subject to discriminatory practices based on gender. Different from Lester, Packard, Gagnon, LaBelle, Jeffers, & Lynn (2011) studied persistence of women in community college STEM transfer programs. The women described positive classroom and support services prepared them for successful transfer to a
baccalaureate granting institution (Packard et al., 2011). The gap and lack of research continues to follow as students transfer. Packard et al. further found positive academic and student support service experiences at the community college became negative to the point that two of the 22 women in the study who persisted then transferred to a non-STEM major within the first semester after transfer from the community college (Packard et al.).

While there are still many challenges to be explored with women in STEM, some progress has been made. In 2014, according to the National Science Foundation, women earned 37 percent of degrees in science, math, engineering and mathematics (National Science Foundation, 2014). This number, however, is deceptive when one considers there is still inequity in certain STEM related fields (Cheryan, Jiang, Montoya, & Ziegler 2016). For example, women are not a minority in the field of biology, and women earned 44 percent of mathematics undergraduate degrees compared to 18 percent of computer science undergraduate degrees (Cheryan et al.).

Understanding this disparity among STEM programs is not simple. Tillberg and Cohoon (2005) examined the lack of women in computing majors and found precollege experiences with supportive parents and teachers as a catalyst for their interest in computer science fields and eventual enrollment in the major. Once enrolled in STEM majors, MacPhee, Farro, and Canneto (2013) found women and minorities with low socioeconomic status as benefitting most from mentoring interventions.

Community college have historically been the gateway for people otherwise left out of higher education (Gilbert & Heller, 2013). By design, community colleges present an opportunity for access and therefore social mobility and economic stability for minorities and women (Chapple, 2005, as cited in Cohoon, Aspray, & Cohoon 2008). With community
college being asked to play a larger role in STEM initiative (Van Noy & Zeidenberg, 2017), the specific issues facing community college women must be considered when looking to increase gender equity in STEM fields. Deutsch and Schmertz (2011) cited Andreas and Adamuti-Trache (2008), noting that women attained post-secondary degrees at similar rates as men, they complete their awards more quickly and they were overrepresented in lower status jobs and earn lower salaries (Deutsch & Schmertz, 2011). This fact, coupled with the persistent shortage of graduates in STEM fields intensifies the need for scholarship related to women and STEM. Wickersham and Wang (2016), as cited in Snyder and Dillow’s (2013) NCES data provided evidence to view community college as the conduit for closing the gap in the deficit in STEM qualified graduates. They pointed to the make-up of undergraduate population as female with nearly 50% enrolled in community colleges. “As such, the community college sector contains a critical and often overlooked supply of female talent that, through the upward transfer function, can help diversify—and close the gender gap within—the population of baccalaureate recipients in STEM. (Wickersham & Wang, 2016, p. 1,001)

The literature chronicles the historical academic privilege to male students and careers. The opening of community colleges to meet the work-skill needs of communities by opening access to education to women along with the women’s movement, the United States has seen some progress regarding women in STEM fields. Further, it is clear that the pipeline of women in STEM and the academic advancement of women in these fields has proven to be less than equitable. Further research in this area is needed to better understand the barriers women face in the selection of STEM education and careers to create change in STEM.

This study is grounded in theories of social cognitive theory and social cognitive career theory with a focus on elements of self-efficacy. While there are many areas of research that could be explored regarding community college women, understanding the participant’s vocational choice and issues of self-efficacy will support the research. This theoretical background helps to contextualize each participant’s description of their academic and social experiences for this study.

Broadly, concepts of self-efficacy are concerned with a person’s or a group’s self-perception of capability and achievements (Bandura 2006). The concept of self-efficacy comes out social cognitive theory and looks at humans as agents capable of development and adaption to change (Bandura). Building on this broad concept of self-efficacy, Bandura believed people, acting as their own agent, can overcome their current situation through cognitive self-regulation, by imagining their future; to construct, assess and modify alternative courses of action to reach their desired goals. Bandura (2006) outlined four core properties of human agency which included intentionality, forethought, self-reactiveness and self-reflectiveness.

The foundations of social cognitive career theory (SCCT) will be examined in relationship to the questions posed in this study. Specifically, the constructs and evolution of social cognitive theory will be explored as the basis of SCCT. Further, the connection and use of social cognitive career theory as applied in higher education research will be contextualized and discussed. Finally, the applicability of SCCT will be demonstrated as an appropriate theoretical basis for exploring the experiences of women in STEM career pathways at community colleges.
Social Cognitive Theory

The birth of social cognitive theory is rooted in the field of psychology. The field of psychology is defined simply in Merriam Webster’s dictionary “as science of mind and behavior; the mental or behavioral characteristics of an individual or group.” A prominent psychologist and scholar, Bandura, a professor at Stanford University, is credited with social cognitive theories as part of his work in developmental and educational psychology. According to Bandura (2006), “Psychology is the one discipline that uniquely encompasses the complex interplay among biological, intrapersonal, interpersonal, and socio-structural determinants of human functioning” (p. 177).

In the 1960’s traditional models of psychoanalytical and behavioral theories of causation gave less weight to personal environmental factors as influences on human behavior. These behavioral theories attributed a person’s negative or positive behaviors to their personal impulses and inclinations (Bandura, 1977). Bandura developed a framework to address the factors downplayed in these traditional models. Social Cognitive Theory explained psychosocial functioning as triadic, causative and reciprocal in nature (Bandura, 1986). This model is called the Triadic Mode of Reciprocal Causation and more closely examines the interaction of personal, behavioral and environmental factors related to the human thought and behaviors (Bandura, 1990).

Early evidence of Bandura’s departure from traditional psychological traditions as tools for understanding human learning can be seen in the widely known 1960’s Bobo doll experiment. This experiment was concerned with children’s observational learning and measured children’s attention, memory, imitation and motivation as they witnessed aggressive behavior toward the Bobo doll. This experiment led Bandura to theorize that
there are four processes related to observational learning beyond personal impulses. These processes include attention, symbolic representation, transformation into action, and motivation incentive (Bandura, 2012). This means people must pay attention to the behavior, and then conceptualize the action. Next, people must be motivated to act on the concept (Bandura).

These early experiments led to an approach to human learning that builds on observational learning and highlights a person’s belief in their ability to influence their life or human agency. This concept is most often discussed as self-efficacy. Further, Bandura’s theory posited a person’s aspirations, his or her personal levels of self-efficacy influence motivation and ability to persevere in the face of challenges. Social cognitive theory further suggests the effects of self-efficacy impacts one’s life journey on a cognitive, motivational, affective, and decisional level. Building on the broad concepts of agency and self-efficacy, Bandura (1977) believed people, acting as their own agent, could overcome their current situation through cognitive self-regulation, by imagining their future to construct, assess and modify alternative courses of action to reach their desired goals. (Bandura, 2006).

According to Bandura (1977), personal self-efficacy levels are subjective and malleable within four areas within individuals. These four areas that influence self-efficacy within an individual or group are personal mastery, social modeling, social persuasion and a sound physical and emotional state. A mastery of a goal or a positive experience of overcoming failure can produce an increase in self-efficacy. Being socially connected to others who are successful and are like themselves can produce social modeling and increase self-efficacy. Closely related to this is the concept of social persuasion. In this scenario, a person is influenced by a successful person with encouragement to see himself or herself as
successful as well. These factors require that a person be in a physical and emotional state that will allow them to acquire mastery, connect to others socially and be open to others offering mentoring and other social supports (Bandura, 1990).

These four areas of influence and their application are not innate or fixed. They are changeable and can increase overtime and with different influences. A person’s self-efficacy operates for people on a cognitive, motivational, emotional and decisional level. Positive or negative (cognitive) thoughts influence how a person thinks and reacts to challenges (motivational). Influencing their behavior is the emotional and physical response to stress, which also in turn affects decision-making (Bandura, 1977).

Social Cognitive Theory is built on a model called the Triadic Mode of Reciprocal Causation. This model attends to the personal, environmental and behavioral aspects of self-efficacy. The model assumes human environments are socially constructed. The socially constructed human experience is driven by the interplay between personal, environmental and behavioral determinants. (Bandura, 2012). Humans only control their reaction to the environment (Bandura, 1977). A person’s ability to influence his or her situation is called human agency (Bandura, 1977).

Further, environments can be classified as imposed, selected and created (Bandura, 2006). Imposed environments are not selected but rather selected for or forced upon a person. When in an imposed environment, humans only control their reaction to the environment. A selected environment is one which allows a person more control over their lived experience. They have more choices within the environment. Bandura (2006) used the example to illustrate selected versus created environment in talking about college students selecting a college to attend. Many students make this same choice of environment. The
student then creates their environment or lived experience in the program they choose, the extracurricular activities they choose to participate in and the friends with whom they spend their time (Bandura, 2012).

**Social Cognitive Career Theory**

Building on Bandura’s social cognitive theory, Lent, Brown, and Hackett (1994, 2000) devised a framework to predict and explain development of vocational choices, academic pursuits and academic performance. This fairly new framework was called Social Cognitive Career Theory (SCCT). SCCT takes the cognitive and motivational aspects of social cognitive theory and extends them for application in the study of academic performance, health behaviors, and organizational development (Lent et al., 2005). This theory is typically field, or domain specific, and has been used to study and measure specific aspects of fields, populations or situations. This framework is widely used in the United States and is gaining use worldwide (Blanco, 2010).

Social Cognitive Career Theory is concerned with three main variables. These variables are self-efficacy, outcome expectations and goals. Self-efficacy, as explained earlier, is not predetermined or existing at a fixed level. Rather, it is malleable and is socially constructed. Self-efficacy varies by situation and environment. Outcome expectations are also influenced by individuals’ self-efficacy levels and the belief the effort and persistence will provide the positive fulfillment and appropriate rewards. Personal goals also play an important role in SCCT. Specifically, choice or performance goals are influenced by a person’s outcome expectations and level of self-efficacy in the domain (Lent et al., 1996).
Social Cognitive Career Theory combines trait-based and developmental career theories (Lent & Brown, 2005). Trait-based theories are rather stable models for prediction based largely on personal genetics as influencing agents in career choice. Whereas, development-based theories are concerned with career choice within each stage of human development throughout a lifetime (Lent, 2002). By mixing two genres with Bandura’s concepts of human agency and self-efficacy, Brown et al. (1994) created a framework attentive to a wider range of human development and experience in vocational choice. The framework accounts for interests, abilities and values. The theory further allows for variation in how people negotiate milestones and challenges throughout their life. The framework acknowledges that inconsistency exists within the human experience. Albert and Luzzo (1999) summarized SCCT as emphasizing the importance of personal agency, based on Bandura’s social cognitive theory, in career decision-making process to explain the internal and external influences that affect an individual’s agency.

Social Cognitive Career Theory is organized into a three-segment model. The first segment is concerned with the development of academic and career interests and is called the interest segment. The second segment focuses on the formation of education and vocation selection and is considered to be the choice segment. The third segment of the model is the performance model and is related to the nature and results of academic and career performance. These segments are flexible and weave issues of self-efficacy, outcome expectations and goals together with other important environmental and contextual factors related to individuals such as race, gender/ethnicity, etc. (Lent, 2005; Lent & Brown, 2013).
The interest model is concerned with the exposure and experiences children have to activities in the home, at school and in recreational and peer environments. Within these experiences children and adolescents increase or decrease self-efficacy and adjust outcome expectations based upon positive or negative experiences. Patterns of likes and dislikes are formed and these, in turn, influence future efforts in the areas of exposure.

Lent, Brown, and Hackett’s (2002) SCCT framework can be useful in examining career development over a lifetime as exposure, interests, self-efficacy and values change. As a person’s socially constructed situation changes, his or her choices may evolve as the context changes. Gender and ethnicity play a large role in the interest model. The model takes in account for differences in gender socialization in career aspiration. For example, females are typed to have a predisposition to helping professions and males to science-related professions (Hackett & Betz, 1981). These socially developed ideas and behaviors can also influence or limit the opportunities for exposure and impact learning experiences of children and adolescents. This may further affect their levels of self-efficacy, outcome expectations and ultimately their performance.

Choice

The choice segment is also concerned with self-efficacy, interests and outcomes. The model further categorizes career choice into three components. These components are the initial expression of choice or goal, actions taken toward goal execution and performance experiences affecting future choices. This model further takes into account factors affecting the choice. Other influences may include environmental, social, economic and cultural factors. This model accounts for these contextual supports and influences a person’s first choice of career. These factors can create distal effects and contextual supports and barriers
in career choice. Ultimately, career choice may not be related to a person’s interest due to personal circumstances, cultural influences, self-efficacy beliefs, outcome expectations and the influence of his or her support system. Again, environmental factors also play a role a person’s ability to choose his or her career path (Lent & Brown 2005).

Performance/Persistence

Performance is the final of three segments in SCCT. This segment is concerned with achievement and particularly achievement in the face of obstacles (Lent & Brown, 2005). This persistence, in the face of academic challenges, is often equated to professional competence. Again, the interplay of self-efficacy and outcome expectations are connected in this performance segment of the model. A person’s perception of his/her ability is influenced by one’s belief in their ability, informed by past experiences and informs their performance attainment (Lent & Brown, 2005). Lent further outlined how self-efficacy is complementary to SCCT, and suggested a person with slight over confidence or a slightly elevated sense of self-efficacy related to personal individual ability can be highly effective in motivating a person to achieve at higher levels.

Social Cognitive Career Theory Applied to Women

“Social Cognitive Career Theory was designed to aid understanding of the career development of diverse array of students and workers, taking into account factors such as race/ethnicity, culture, gender, socioeconomic status, age and disability status” (Lent et al., 2002, p. 282). The theory is rooted in social cognitive theory, which in the broadest sense theorizes that the self-efficacy levels are based on experiences and feedback. Exposure and socially constructed perceptions, however, vary among genders and therefore this variance may influence career choices. For example, Betz and Hackett (1981) found college women
have a higher sense of self-efficacy and performance in traditionally female dominated professions. As self-efficacy was discussed earlier, these levels are related to exposure and experiences within the domain. Research to understand the exposure and experiences of community college women in male-dominated STEM programs could lead to better understanding of how women make career decisions, how they can be supported to persist and ultimately how to improve gender equity in STEM fields. Betz and Hackett’s 1981 study is more than three decades old and the need to understand self-efficacy related to women’s vocation is still not well understood.

**Theory Related to Social Cognitive Career Theory**

While heavily saturated with Bandura’s Social Cognitive Theory, Krumboltz, Mitchell, and Jones (1976) also influenced components of SCCT. These theories take account for the learning experiences, interests, values and choices that influence individual selections (Lent et al., 1984; 2002). Super (1990) espoused educational and career plans, like Bandura, are based in the field of psychology. Super’s theory of career choice, further suggested career selection occurs through a series of vocational tasks related to individual growth, exploration establishment, maintenance and disengagement. This theory further looks to personal self-concept, as it develops over time and stabilizes into young adulthood, as playing a large role in occupational choice.

Gottfredson’s (1996) Theory of Career Circumscription and Compromise is also related to SCCT. It was influenced by Bandura and takes a socio-psychological standpoint. This theory is related to self-concept, but takes a deeper look, putting on a lens to assess the level of idealism versus realism of occupational roles (Gottfredson). This assessment of conscription and compromise takes place over time (Gottfredson). According to Rojewski
(2005), career interest develops through four developmental phases. Self-conception reflection processes advance and career choice can occur when there is congruence between realistic and idealist aspirations and an individual’s occupational self-concept is defined.

A sociological perspective of career choice theory related to SCCT is found in status attainment theory of Blau and Duncan (1967). This theory suggested socially constructed powers are more influential on career choice than personal forces (Rojewski, 2005). Hotchkiss and Borrow (1996) Fassinger (1985), Fitzgerald, Fassinger and Betz (1995), and Jencks, Crouse, and Muesser (1983) found career choice experiences differed greatly for women, racial/ethnic minorities and those in different social classes. The status attainment model, however, is most predictive for white males for whom career pathways are well projected by their parent’s education level, socioeconomic status, and personal abilities (Rojeweski, 2005). Hellenga et al. (2002) attributed the shortcoming of the model for prediction of choice because historically, social systems supported white males. Rojewski (2005) argued women and racial/ethnic minorities are more reliant on personal qualities, personal tenacity and determination for their achievements and failures.

**Social Cognitive Career Theory in Higher Education Scholarship**

“Cultures are diverse and dynamic social systems not static monoliths.” (Bandura, 2002 p. 269). Culture continually changes, and the mission of higher education has changed with this. The diversification of culture, coupled with the changing needs of the U.S. workforce, have warranted additional evolution and development in understanding how students choose a career path. Despite colleges’ success enrolling students, institutions of higher education are not producing enough graduates to meet the needs of business and industry at a rate required for economic global evolution (AACC, 2012; Matthews, 2015).
The economic evolution is evident in that two thirds of the jobs created in the last ten years have required a post-secondary credential (Matthews, 2015). The college completion movement seeks to address the large gap in the population of people without post-secondary credentials. While the United States high school completion rates are at 83%, academic credential rates for people beyond high school still lag behind with only 46% of the population earning an associate degree or higher (National Center for Education Statistics, 2017).

Liao, Edlin, and Ferdenzi (2014) sought to understand community college persistence through the lens of self-efficacy and motivation and examined intrinsic motivation and extrinsic motivation. Their model did not predict persistence based on intrinsic motivators, but rather on extrinsic motivators. These motivators operate on a continuum from punishment avoidance to gain rewards such as success in life. The results of a study of 242 undergraduate participants by Azizli, Atkinson, Baughman, and Giammarco (2015) revealed a positive relationship between general self-efficacy and life satisfaction.

Bandura’s social cognitive theory is built on the premise that humans are involved in determining the direction of their life. This concept is often referred to as human agency. Lent, Brown, and Hackett (2005) built on human agency concepts, espousing a student’s levels of self-efficacy impacts their career selection processes. Building on Bandura’s views on agency and socially constructed self-efficacy, Rojewski, (2005) posited SCCT as a natural fit for higher education scholarship. Social Cognitive Career Theory enables researchers to better understand student career selection, academic success and student persistence, and how it is related to their social demography and interactions with their home and in school environments. The connection has been acknowledged by Stajkovic and Luthans (1998),
“This increasingly recognized psychological construct deals specifically with how people’s beliefs in their capabilities to affect their environment to control their actions in ways to produce desired outcome” (p. 63).

Not only do perceptions of self-efficacy impact student behavior, but they also may impact students’ resilience, commitment to their goals and persistence. Schunk and Dibenedetto (2015) outlined how teachers’ understanding of self-efficacy is important stating, “Self-efficacy also helps determine how much effort students expend, how long they persist when confronting obstacles, and how resilient they are in the face of adversity. Students with a strong sense of self-efficacy approach difficult tasks as challenges to be mastered rather than threats to be avoided” (p. 516).

**Application of SCCT to Women in STEM Career Pathway Programs**

The sense of self plays a role in women’s educational pursuits. Betz (2005) believed it is important to help women find fulfilling, satisfying and economically sufficient careers. The need is amplified as the number of women pursuing higher education grows to the dramatic change in cultural norms in the last two generations. Betz referenced Gilbert (2002), and Barnett and Hyde’s work (2001) to further explain this social change moving women into the workforce with the term “work family role convergence” (Betz, 2005, p. 253). In other words, this convergence of work and family experiences has a significant impact within the lives of men and women. The powerful shift in societal norms, with women moving from working inside to working outside the home, is consistent for women in all age ranges (Betz, 2005). Further, Betz advocated for research and assistance for women as they make career choice and development. Calling upon Lent, Brown, and Hackett’s (2002) Social Cognitive Career as well as the work of Farmer (1977) and Harmon (1977),
Betz (2005) advocated for more exploration of socialized barriers, beliefs, and behaviors of women to promote the importance of math as key for entry into society’s best careers in science, technology, engineering and math.

Research on the factors influencing women to enter or not enter and persist in traditionally male-dominated STEM fields can be applied using the concept of self-efficacy. The need to understand women’s STEM career aspirations, framed by self-perception and efficacy, is not new. Astin (1984) found females were more likely to pursue traditionally female-dominated career fields because of the perception that they are more accessible than male-dominated career pathways. Lent, Brown and Larkin (1984, 1986, as cited by Betz (2005) also found low self-efficacy in male dominated careers or careers requiring mathematical or technical capability can diminish self-perceived career options for women. Chen and Solberg (2017) examined survey data from 1,579 students in 14 U.S. high schools to determine if access to caring and engaging adults influenced youth vocational identity. The study revealed those with access to caring adults were more likely to gain confidence in their ability to execute career search activities and, therefore, cultivate a more developed vocational identity. Rodriguez, Cunningham, and Jordan (2017) took an intersectional approach to study vocational identity development in women of color to demonstrate community college women are not a homogenous group, with students playing many roles beyond that of student.

Kelly and Hather (2013) also found issues of self-efficacy impacted career decision. Amelink, Artis and Liu (2015) used a mixed methods approach to examine self-efficacy levels among 30 (7 female and 23 male) California community colleges students enrolled in an eight-week summer research program at the University of California at Berkeley.
Students were given a pre-survey, a post survey, and also asked to complete weekly journals. The study revealed four domains of self-efficacy – mastery of experience, vicarious experience, social persuasion, and physiology areas – influenced self-efficacy levels. Mentoring and a collaborative environment (social persuasion) provided a positive effect on community college students’ self-efficacy levels.

While Chen and Solberg’s (2015) study was not specific to a particular gender, gender played a role in vocation choice. Sellars, Satcher, and Comas’s (1999) research on women revealed gender stereotyping in relationship to occupational choice to be pervasive in American society. Furthermore, while females had greater aspirations for higher level careers than male students (Hanson, 1994; Wahl & Blackhurst, 2000), female students were more likely to self-restrict occupational expectations. According to Gottfredson (1981, 1996) and Hall (1994), gender is the most influential and persistent factor in occupational development. Cheryan, Ziegler, Montoya, and Jiang (2017) reviewed commonly used factors for investigating gender disparity across STEM fields and found three factors most influential: (a) a masculine culture that then decreases a sense of belonging; (b) a lack of early applicable experiences with computer science, engineering and physics; and (c) gender gaps in self-efficacy.

There is a great deal of quantitative research dedicated to understanding the factors influencing women and girls’ enrollment and persistence in STEM programs and STEM transfer programs as early as elementary school. For example, Frome, Afleld, Eccles and Barber (2006) examined a longitudinal data set from the State of Michigan. They followed 1,000 women from age 18-25 to understand changes in their occupational aspirations and
found job flexibility, time-consuming jobs, and the low intrinsic value of science were the strongest predictors of occupational aspirations in male-dominated fields.

The research related to women in STEM is still focused on transfer and university women. Research related to girls and women enrolled in community colleges is almost non-existent (Lester, 2010). This lack of research requires attention. Lester (2010) noted, “The attention to women in STEM programs in community colleges is crucial to a holistic understanding of how women progress through the educational pipeline” (p. 51). This lack of understanding of women in male-dominated career and technical (vocational) programs is also overlooked and is a topic worthy of research (Lester, 2010). Previously, Blickenstaff (2005) recognized incongruent nature of literature related to women in STEM fields. In review of nearly 30 years of literature dedicated to explaining the underrepresentation of women in STEM fields, Blickenstaff focused on research related to the issues identified as keeping women from studying science or working as scientists. Blickenstaff noted some felt this deficit was not a problem. Gender inequity, however, leaves women who might otherwise have made contributions in the technical fields out of the picture. This inequity also decreases the diversity of viewpoints which can limit solutions or weaken knowledge in the STEM fields (Blickenstaff, 2005).

The concepts of social cognitive career theory are directly tied to self-efficacy. As stated previously, generally women are more likely to have lower levels of self-efficacy compared to men. Therefore, examining women community college pathways in relationship to self-efficacy should lead to a better understanding of how women get into the STEM career pathway, what influenced their enrollment, and what they expect to achieve in this pathway. Schunk (1991) explored issues of self-efficacy in academic achievement. He
supported the need for more research related to self-efficacy. According to Schunk, researchers interested in self-efficacy most often employ quantitative methods.

A recent example of a quantitative predictive study is Johnson, Starobin, and Laanan’s (2016) research on self-efficacy, vocational interests, social capital, academic achievement, transfer capital, and student validation for White and Latina/o community college students. Findings of the study revealed that self-efficacy, transfer capital and student validation levels accurately predicted STEM vocational choice. Inda, Rodriguez, and Pena (2013) further tested SCCT in their study of 579 college sophomore engineering students. Using quantitative methods they measured self-efficacy beliefs, outcome expectations, interests, goals and social support. Findings revealed SCCT confirmed women have lower self-efficacy and interest in engineering, but there was no statistically significant difference between men and women in outcome expectations and goals (Inda et al.). Lee, Flores, Navarro, and Munoz (2015) explored self-efficacy in a longitudinal test of SCCT’s academic persistence model with Latina/o, and white women and men in engineering. They discovered no significant differences among race, but they found women engineering students were more likely to persist from one year to another more often than they reported strong intentions to continue in their program of study.

In an effort to explore issues of self-efficacy and their relationship to STEM education, Nugent, Barker, Welch, Wu, and Nelson (2015) used SCCT to explore STEM interest of youth age 10-14 while attending a National Science Foundation sponsored camp in robotics held throughout the United States. While their model did not show a significant relationship between self-efficacy and career orientation, Nugent et al. supported the use of
SCCT as a model to be used in many environments to support empirical research and bolster understanding of STEM career choice (Nugent et al.).

While these quantitative predictions are helpful and add to the research on STEM education, they does not provide a depth of understanding of individuals. With this depth in mind, Schunk (1991) advocated for more qualitative inquiry to “yield data rich sources for examining the role self-efficacy plays in academic motivation” (p. 226). Wickersham and Wang (2016) took a narrative approach to understanding two female community college students’ intent to transfer to universities in STEM fields. Using qualitative semi-structured interviews, students were asked about their self-efficacy in math or science, their knowledge about transfer and their goals or career plans. While the research explored the experiences of only two women, it was evident that both personal and academic experiences are intertwined and are a complex negotiation for women. Because social cognitive career theory is attentive to the dynamic environmental influences on self-efficacy and research on women in STEM points to lower self-efficacy for women, it is an appropriate lens for inquiry into women in community college STEM career pathways.

Community college students are diverse in many ways, including age, race/ethnicity, socioeconomic status, academic preparedness, family status (parent, non-parent) and the list can be extended. The dynamic nature of social cognitive career theory allows for exploration of career development over a lifetime and can begin to account for the diversity that exists among community college students. Specifically, employing a theoretical framework around social cognitive career theory will allow exploration how issues of self-efficacy intersect in career interests, choice and performance without discounting the diversity of the participants’ background, environments and circumstances (Lent, 2002). As a result, through qualitative
inquiry, understanding the factors influencing women as they choose these career pathways may bring a deeper understanding of how self-efficacy, goals or perceived barriers can impact outcome expectations.
CHAPTER 3. METHODOLOGY

The purpose of this study was to explore, examine and explain the experiences of women enrolled in male dominated STEM career programs at a large Midwestern community college. The goal was to capture a rich understanding of the participants’ academic and social experiences. Specifically, the study sought to describe how experiences of students led them to enroll in these programs, how they currently experience the academic program, and how they connect to their peers and their faculty. As outlined in Chapter 1, the researcher believes human interaction is socially constructed and, therefore, understanding each student’s background and past educational experiences is important to understanding her vocational choice. This qualitative study was conducted using phenomenological techniques. The researcher’s perspective were bracketed and data were collected with the goal of capturing the essence of each participant’s perspective. This chapter outlines the approach used in the study: the research questions, research design, theoretical framework, data collection, and analysis strategies.

Research Questions

The study was guided by the following questions:

1. What are the influences that shaped participants’ decision to enroll in a male-dominated STEM career pathway program?

2. What are the lived experiences of women enrolled in a male-dominated STEM career pathway program?

3. How might social cognitive career theory explain these influences and experiences?
Theoretical Framework

The study was grounded on a theoretical framework based on Social Cognitive Career Theory (see Figure 1). Social Cognitive Career Theory (SCCT) is concerned with career choice and the inputs influencing these decisions. The authors of SCCT, Lent Brown and Hackett (1994), were influenced by the seminal research of Albert Bandura. Bandura’s research was concerned with social cognitive behavior. Lent, Brown, and Hackett (1994) adapted Bandura’s ideas of self-efficacy and human agency as strong influences on human behavior, to learn more about vocational choice and decision-making.

In phenomenological research, the researcher must put aside when she or he knows about the phenomenon under study and look with naivety. This naivety is called bracketing or epoche. This is essential according to both Husserl and Moustakas. Specifically, this process of bracketing allows the researcher to actively seek to set aside their prior knowledge and understanding of the phenomenon of interest.

Figure 1. Social Cognitive Career Theory (adapted from Lent et al., 1994)
with the phenomenon to get at the essence of the experience. Describing the essence is the goal of phenomenological studies. Essence is the synthesis of the textural (account from all angles) and structural description (the how of the experience) of the human experience being studied (Merriam & Tisdall, 2016; Creswell, 2014; Moustakas, 1994).

**Research Design**

This study explored and described the academic and social experiences of female STEM students at MCC. A qualitative research methodology was employed. Qualitative research methodology is described as “…an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem” (Creswell, 2017, p. 4). As supported by Merriam and Tisdell (2016), the researcher is the main instrument for collecting data, and completing analysis using inductive strategies with the goal of creating a rich description of the phenomena being captured.

Qualitative research moves beyond the positivist approach of hypotheses and experiments, giving control about what can be known to the researcher. A positivist researcher believes reality is somewhat fixed, therefore inquiry can be accomplished using deductive methods. Conversely, this study was executed using inductive methods and an interpretive framework. An interpretive approach seeks to transfer what can be known back into the participants in a more naturalistic way (Rossman & Rallis, 2012). Looking at participants in a naturalistic way, within the environment of the phenomenon, participants were interviewed at their campus. This decision was made to further contextualize the descriptions provided in the interviews.

The participants were asked questions designed to inform the overall research questions. The specific experiences of the participants were described in this study with the
goal of recording their perspectives in their own words based upon their way of interpreting or making meaning of their own background, academic and social experiences. Qualitative research naturally embraces the complexities of participant’s lived experiences without forcing standardization or adherence to rigid frameworks and is sensitive to the personal background of the participants and uses inductive analysis for to capture a rich description of the phenomenon (Creswell, 2013; Merriam & Tisdell, 2016; Rossman & Rallis, 2012).

**Epistemology**

According to Crotty (1998), “Truth, or meaning, comes into existence in and out of engagement with the realities in our world. There is no meaning without the mind. Meaning is not discovered, but constructed” (p. 8). This construction is married to the social world because the social world influences individuals and how they experience the world. Therefore, knowledge is socially constructed and meaning is made with direct influence from the social world.

This study advanced using an epistemology of social constructivism, to describe the experiences of the participants and understand how they construct meaning. Social constructivism is also described as interpretivism and is meant to enable researchers to depend on participants views to describe the complexities of the phenomenon (Creswell, 2013; Merriam & Tisdell, 2016). Merriam and Tisdell further espoused the use of qualitative research methods when a scholar is interested in the construction of knowledge using a social constructivism approach. They also supported the use of qualitative research methods when a scholar is interested in the building of knowledge using a social constructivism approach. This researcher believes knowledge is collaboratively and socially constructed. Meaning making and knowledge construction is created through complex personal negotiations.
between the larger world and the person experiencing it. Social construction was at work in this research; at work in the collaboration between researcher and participants. The participants were influenced by the experience as well as the researcher. Capturing the essences of the participants was supported by the collaboration each participant experienced with the social structures influencing their lived experience. Their experiences were constructed, challenged and legitimized by social structures within the larger culture, their subcultures and familial influences as well the historical and political influences which are constantly churning.

**Methodology**

An approach to building knowledge based in social construction meshes well with the phenomenological techniques used for this study because phenomenology relies on the perspective of the participants and their unique lived experiences. Phenomenological methods are based in philosophy and are concerned with developing descriptions of the essence of a phenomenon (Creswell, 2013). This essence is arrived at by describing the conscious lived experience of participants. This study followed the ideas of Moustakas (1994) and transcendental phenomenology. Transcendental phenomenology seeks to bracket the experiences of the researchers from the phenomenon under investigation (Creswell, 2013). Moustakas (1994) acknowledged a researcher cannot fully set aside their personal experience with the phenomenon, but phenomenological researchers must make efforts to look at things with naiveté.

The experience explored in this study was a women’s choice to enroll in male-dominated STEM career pathway programs. Phenomenology is concerned with the consciousness of the participants in relationship to their experience with the phenomenon.
This conscious perceiving and reflection is how humans come to make meaning in their experiences. From this perception and reflection comes knowledge. “Perception is the regarded as the primary source of knowledge, the source that cannot be doubted.” (Moustakas, 1994, p. 52).

**Sample Selection**

Approval for the study was secured by the Institutional Review Board (IRB) at Iowa State University as well the sample community college. After IRB approval was acquired, students were recruited for participation using a purposeful maximum variation process. According to Creswell (2013), using a sample that had the maximum variation enabled this researcher to account for diversity among the campus locations of the participants.

This exploratory study was conducted with the students a large Midwestern community college, referenced as Midwest Community College (MCC). MCC is located in the mid-western part of the United States and is a multi-campus community college. MCC includes rural, suburban and urban campus settings. Students at all campuses, meeting the criteria for inclusion in the study were invited to participate. MCC was selected due its size, and the student demographics were a good fit for the study. The average student age was 23. The college enrolls more than 36,000 credit students and is 55% female, whereas the college administration is predominantly male. In addition, Midwest Community College graduates have a 96% employment rate but approximately one third graduate in five years, one third transfer within five years without graduating, and approximately one third leave the institution without graduating or enrolling in another institution. Altogether, with the previous mentioned factors related to site selection, was the researcher’s ability to gain access to the sample. MCC is supportive of doctoral student research. It is active in STEM
community college education initiatives at the state level, and participates in the discussions regarding STEM education at the national level. The researcher’s status as a female, a two-year college graduate, and longevity employed at the community college encouraged a rapport between the researcher and the participants with whom she was speaking (Rossman & Rallis, 2012). All of these factors made the selection of MCC an appropriate institution.

**Participant Recruitment**

Students who identified as female on their application for admissions and were enrolled in a male-dominated STEM career pathway programs at all MCC locations were invited to participate in this study. For the purposes of this study, STEM career pathway programs were defined as community college programs of study in Science, Technology, Engineering and Math related fields, designed to lead directly to a career rather than transfer to a university of baccalaureate granting college. The population was selected because there has been no specific research related to women STEM career pathways programs, and the persistent disparity in program enrollment numbers in women and men in STEM career pathways is large. By describing the participants’ experiences a better understanding of the academic and social experiences of these women can be gained. It may also add visibility to a population ignored in discussions about STEM at the institution, state, and national levels.

The researcher received approval from the Institutional Review Board at Iowa State University and the Office of Institutional Effectiveness (OIE) at MCC. The OIE at MCC provided the researcher with potential participant names, and email addresses for females meeting the criteria of enrollment in STEM career pathway programs. Invitations to participate were sent to potential participants via their MCC email address and any personal email addresses on record with MCC. The goal was to identify a maximum of 15 students to
participate. While a rich description of the sample is sought, feasibility issues suggest limiting the sample size as recommended by Rossman and Rallis (2012). Six women agreed to participate.

This purposeful sampling techniques is among several types of sampling techniques that can produce participants that reflective of the average person experiencing the phenomenon (Creswell, 2013; Merriam & Tisdall, 2016). Because the population of women in these programs was small, additional sampling techniques were employed. For example, a snowball sampling technique is also considered purposeful (Merriam & Tisdall). In the snowball technique, participants are solicited to locate others experiencing the phenomenon under investigation. The using multiple approach to gain participation in the study maximized the opportunity to achieve an appropriately sized sample and allowed for additional variability among potential participants. In this study, two participants responded to the email, two participants were identified with the help of campus advising staff, and two were identified by campus admission staff.

**Data Collection**

As with most qualitative inquiries, the researcher is the main instrument for data collection in a qualitative study. This was also the case in this study. Before data collection began, the researcher wrote a bracketing statement. Data collection was conducted using interviews. Interviews are a common method for collecting data in phenomenological studies (Bevan, 2014). In this study, a series of three in-depth interviews were utilized. Although a maximum of 15 participants were sought, 6 women agreed to participate.

The interviews captured the essence of academic and social experiences of women in STEM career pathway programs using a three interview protocol. A series of three
interviews were conducted with each woman. The time period between each interview was three day to two weeks. The longest time period for any of series of interviews was three weeks. This timeline was used to limit opportunities for attrition among the participants (Siedman, 2006). Seidman (2013) believed this spacing of interviews enables participants to reflect without losing the link to the prior experience. All interviews were conducted on the campus most convenient for the participants. Quiet and comfortable classrooms were selected to ensure privacy. Interview duration varied between 45 and 90 minutes each.

In all cases, the first interview was used to establish rapport between the researcher and the participant and to collect participant background information. The second interview allowed the participant to share additional details regarding their experiences and the third interview was designed to allow the participant to share reflections and further explore their perceptions and meaning within their experiences. After each interview, the women were asked to review the transcript for accuracy. They were also asked to share any thoughts and feelings they experienced while reviewing the transcripts. This technique was used to increase validity as supported by Creswell (2014).

The interview protocol was comprised of semi-structured questions. The first interview collected background information. The second interview collected data about the details of the experience itself, and the third interview allowed for reflection. The third interview also attended to the participant’s process for meaning making. Using a multi-tiered interview protocol in phenomenological interviewing is supported by Moustakas (1994), Giorgi (1997), and Seidman (2013). Using a three interview protocol also adds validity of the data by enabling the researcher to check for consistency and congruency of statements between interviews (Bevan, 2014). This protocol, according to Bevan, further ensures the
natural world of the participants has been captured, the details and meaning surrounding the phenomenon are accurately described and thoroughly clarified. Validity is further increased by comparing the data to current literature related to the phenomenon (Moustakas, 1994; Seidman, 2013). The literature regarding women in male-dominated STEM career pathway programs was outlined in Chapter 2 and referenced in Chapter 5.

Each interview was audio recorded and transcribed verbatim using Rev.com as the transcription service. Each woman was identified by her pseudonym only throughout the study, including during transcription. Before transmission to Rev.com data were encrypted. All data were de-identified to ensure confidentiality of the participants. A key of the participant names and contact information as well as their pseudonyms was created and stored electronically in the university’s electronic mail box (Cybox). This key was used to authentic identification for data integrity purposes only and will be destroyed three years after the conclusion of the study.

Data Analysis

The purpose of this study was to describe the experiences of each unique participant and capture the essence of the phenomenon. Every effort was made to represent the participants’ experiences with respect and accuracy. Prior to analysis, the researcher used a reflective journal. A journal was maintained to bracket and identify any biases, assumptions or viewpoints held about the phenomenon. The journal also provided an opportunity to record my thoughts about the data and reflect on emerging themes and patterns.

Transcripts of each interview were read without preconceived ideas about the phenomena, which is supported by Moustakas, (1994). This process of self-reflection was used to limit preconceived ideas and, according to Moustakas, “This is the step in coming to
know things, in being inclined toward seeing things as they appear, in returning things to
themselves, free from judgments and preconceptions” (p. 90). As supported by most
qualitative researchers (Creswell, 2013), the interview transcripts were read again to fully
realize the depth of the data collected. After this process was completed, each transcript was
reviewed and each statement was considered for coding. Participants’ own words, or in vivo
coding, was employed. In vivo coding honors the participants’ voice (Saldana 2016). Using
these codes and inductive procedures, the data were categorized into themes. The researcher
actively practiced epoche, or bracketing. According to Moustakas (1994), epoche is the
process of self-reflection and self-dialogue to reduce the effect of preconceived ideas,
attitudes and biases. This is the first step in phenomenological reduction. Phenomenological
reduction is used to analyze data using transcendental phenomenological methods, in which
“...the task is that is describing in textural language just what one sees, not only in terms of
the external object but also internal act of consciousness, the experience as such, the rhythm
and relationship between phenomenon and self” (Moustakas, p. 90).

Data were analyzed using a modified Stevick-Colaizzi-Keen methodology as
described by Moustakas (1994). This process includes several steps. First the researcher
wrote a textural description of her experience with the phenomenon. Using the verbatim
transcripts, consideration was then given to all statements and the researcher identified
significant statements, giving each statement equal weight. Moustakas called this process
horizontalization. Horizontalization provides the context or background to participant
experiences. All non-overlapping statements become the invariant horizons or units of
meaning. These horizons are then clustered into themes. Together, the themes and
significant statements form the textural descriptions of each participant’s experiences in the
male-dominated STEM career pathway programs. Phenomenological techniques are closely tied to the context of the experience. A detailed description of the experience is considered the structural description and is important to understanding the context of the phenomenon.

The next step used in the analysis was imaginative variation. Imaginative variation is comprised of the task of looking at the data with different perspective, angles, roles or functions (Moustakas, 1994). The researcher considers the structural qualities or underlying forces which bring the textural aspects of the phenomenon into being. When the textural and structural descriptions of all participants are synthesized together, then a composite description can be created. This composite is considered to be the essence of the phenomenon (Creswell, 2014).

In keeping with phenomenological methods of Moustakes (1994), each statement was given equal consideration and in vivo or open coding was applied. Short phrases were examined and coded word-for-word. More than 1,000 statements were coded as they related to the three primary framing questions. Another round of coding revealed potential commonality among the codes. These common codes were further reviewed using phenomenological reduction techniques to elicit units of meaning and give focus to the data (Moustakas). Among the codes, 56 initial units of meaning (codes) were elicited. An analysis of the code revealed redundancy of meetings which reduced the concepts to 36 patterns. The patterns were further clustered and only clusters common to all participants were further examined. This produced 21 common pattern clusters. These pattern clusters, common to all participants, were printed on note cards to further explore their relationships. Visually similar or related clusters were arranged on a table. The arrangement and rearrangement allowed for another perspective to be considered, and served as a tool to
further visualize the relationships among the clusters. This additional visualization enabled
me as the researcher to examine directionality connections in decision-making as well as how
lived experiences influenced each participant’s career choice and the influences impacting
the student’s decision to persist.

There is debate on issues of validity and trustworthiness in qualitative research. Nevertheless, the use of purposeful sampling techniques and peer review for triangulation ensured validity at each phase of the study. Member testing, described previously, was also applied to increase reliability. During the analysis phase of the study, peers reviewed significant statements, themes, and subthemes before interpretative descriptions were made. In each phase of the study, every effort was made to ensure confidentiality of the participants. The parameters of the IRB were addressed, and full acknowledgement of my own social and historical influence regarding the researcher’s interpretations remained bracketed in this context.

Conclusion

Much research has been undertaken with the goal of understanding the lack of women in Science, Technology, Engineering and Math (STEM) pathways. A great deal of research has been dedicated to understanding women, with attention to social cognitive theory as well as social cognitive career theory and its many related theories. The preponderance of these studies are quantitative. Chen and Solberg (2017) explored career search self-efficacy using a sample size of 1,579 high school student in 14 high schools in the U.S. Social Cognitive Career Theory (SCCT) was the theoretical frame for a study of career self-efficacy in youth ages 10-14 attending a robotics campus (Nugent, Barker, Welch, Grandgenett, Wu, & Nelson, 2015). A longitudinal test of SCCT was conducted by Lee, Flores, Navarro, and
Kanagui-Munoz (2015) which examined persistence factors related to self-efficacy among 350 Latino/a and white men and women engineering students. Scheuermann, Tokar, and Hall (2014) used SCCT as a lens to explore 3,614 African American Women’s level of self-efficacy in the context of prestige levels. Social Cognitive variables were also examined by Hui and Lent (2017) in Asian American college students. These examples of quantitative studies using social cognitive theory and self-efficacy measures were supported by Stajkovic and Luthans (1998) as tools for better understanding motivation from academic and work related performance. While there are many more examples of quantitative studies, Schunk (1991) advocated for more research related to self-efficacy in the form of case studies and oral histories.

While quantitative data tell a portion of a story, they do not provide a rich description of the experiences of the participants. The participants’ experiences are rarely shared using their words and stories. This qualitative exploratory study used phenomenological techniques to provide verbatim accounting of the experiences of women. This is important because the world is socially constructed and, therefore, can be interpreted differently for each participant. Furthermore, this qualitative study allowed for inductive analysis of issues for the participants that related to their levels of self-efficacy, outcome expectations, and goals in their chosen career pathway.

In a 2010 qualitative inquiry of women in male-dominated career and technical (CTE) programs, Lester (2010) used a case study approach. In the current research, I used phenomenological techniques to describe the “what” and “how” of women’s experiences in male-dominated STEM career and technical programs at large multi-campus community college. As Lester pointed out, “Research on women in STEM has identified self-efficacy,
perceived ability, curricula exclusion, and sexist attitudes as barriers to retention among women students” (p. 56). In one of a few explorations of community college women in CTE programs, Lester used case study to interview ten women in two different community colleges. Lester also analyzed promotional documents, course syllabi, campus newspapers, and images of women in CTE to assess the climate for women in these programs. In this particular study, Lester combined evidence from related literature and qualitative data to identify issues and make suggestions supporting women in CTE programs.

Using phenomenological methods illuminates details and complexity in each participant’s background experiences as well their experiences in their program. Berg (2004) supported this process: “By concentrating on a single phenomenon, individual, community or institution, the researcher aims to uncover the manifest interaction of significant factors characteristic of the phenomenon, individual, community or institution” (p. 251). Berg further suggested research like this can illuminate “…nuances, patterns, and more latent elements” other methods might be overlooked in other methods of inquiry (p. 251). Use of this process, coupled with my own interest in learning about issues of self-efficacy, outcome expectations and the participants’ goals as supported by social cognitive career theory, makes case study methodology appropriate for future study. While the data produced in my study are not widely generalizable, they did provide a rich understanding of the phenomenon which can be used to counter the lack of research on women and advance the exploration of women’s experiences in STEM career pathway programs. This descriptions of their experiences will be useful for community college faculty and administration as well as state leaders and legislators.
Chapter 1 provided an introduction to the topic of women in male-dominated STEM career pathway programs, and Chapter 2 outlined the related literature. Chapter 3 described the methods used in undertaking this study. Chapter 4 presents the findings, and Chapter 5 provides an analysis of the findings and implications for stakeholders.
This study explored the experiences of women enrolled in male-dominated STEM Career Technical Education (CTE) pathway programs. While there is a plethora of research about women in STEM transfer programs, there is a void of research on women in male-dominated STEM CTE pathway programs. There is a wide range of research on career choice. However, there has not been an in-depth examination of the factors that influence women’s decision to enroll in male-dominated CTE programs. A qualitative approach was used in this study. This approach was selected to hear from the participants using their own words. Data were collected using phenomenological techniques. The results of this exploratory study provided a rich description of the lived experiences of the participants.

The exploratory inquiry was framed by two main questions to examine influences in the lived experiences of the women in the study as related to their educational and career pursuits. A third framing question was used to examine possible connections to the established theoretical framework of Social Cognitive Career Theory. The questions framing the study were:

1. What are the influences that shaped participants’ decision to enroll in a male-dominated STEM career pathway program?
2. What are the lived experiences of women enrolled in a male-dominated STEM career pathway program?
3. How might social cognitive career theory explain these influences and experience?

This chapter: (a) presents a contextual profile of each woman in the study; (b) describes the women’s educational experiences; and (c) explores factors influencing their
enrollment in male-dominated STEM career pathway programs. Participant’s stories are shared as they relate to framing questions one and two which produced four themes common to all the women in this study. After the theming findings are presented, framing question three describes influences impacting each woman’s career choice with the elements of social cognitive career theory.

The findings presented in this chapter are a result of a series of three interviews with each of the six women who participated in the study. Observation of public STEM related activities at Midwestern Community College was also carried out in an effort to contextualize the interview data. This observation did not entail classroom observation or direct observation of the women in the study; rather, the events observed were college-supported activities that were also open to the public. The events included a state-wide STEM festival geared toward middle school children and a STEM club meeting.

Analysis began by reading the transcripts of the interviews several times to become fully engaged with the participants’ own words. Each statement of the transcript was considered, and short phrases and statements related to the framing questions were coded using an open, in vivo coding techniques. The data were then recorded to reveal commonality among the codes. Using phenomenological reduction, meanings were elicited to focus the data. Further review of the data removed redundancy and revealed 36 patterns in the data. Data were then themed revealing 4 large themes with 11 overall patterns. Pattern clusters common to all participants were arranged on notecards to visualize the data in another form. This final phase of analysis connected the patterns to the larger themes to further validate the patterns. This final visualization considered the intersection of influences related to each woman career choice and the influences impacting the student’s decision to persist.
The process described previously and in Chapter 3 yielded complex common themes that were interconnected and yet unique to each women in how they made personal meaning. The connection in the themes in this inquiry were examined with an understanding that the participants are influenced by their social world. Women’s perspective or sense of reality is impacted by larger social influences. Their perspective is rooted in their family experiences and impact their choices. This social constructivist perspective is theoretically supported by Lent, Brown, and Hackett’s (2013) Social Cognitive Career Theory. While there was similarity among the women in this study, each woman’s perception and concept of reality was distinctive to each individual. Emerging themes included:

- **Theme One:** Women are impacted by their family and learning experiences, both positive and negative, providing them with a clear self-perception of their abilities and challenges.

- **Theme Two:** The women make their decision to enroll in male-dominated programs with the knowledge that there is inequity in the field and in society.

- **Theme Three:** Women compensate for a perceived deficit of technical skills or knowledge through determination and a willingness to work harder to achieve success.

- **Theme Four:** The women want to prove their competence to help themselves and others with their skills and as role models.

In all cases, the participant’s decision-making process was influenced or impacted by their family influences, both positive and negative and learning experiences both positive and negative. Each participant had a developed sense of self, their ability and interests which moderated their career discovery and their decision making process. This did not mean they
had no doubts or questions about the tasks required within the career field. These questions took the form of an awareness of challenges associated with their choice, including a willingness or tolerance for risk associated with their unconventional choice. All of the women in this study felt a connection to a larger context for themselves and their career. The context may relate to their personal goals, the local economic needs, world issues, gender equity or spiritual fulfillment. The concepts of self-efficacy influenced each phase of the women’s lived experience and career choice. While there was variation in where and how the women explained self-efficacy, concepts of self-efficacy were present among the four themes and influenced the participants’ determination to persist within their program.

The remainder of this chapter will present a summary of the participants as well as profile each participant. The data shared in the profile are intended to give insight into the unique experience of each woman. Emerging themes will also be shared. The complexity of each woman’s lived experience brought forth emerging subthemes under the larger themes. Each of the subthemes is addressed under it’s the larger theme. A short summary will conclude the chapter. Figure 2 presents an outline of the larger themes as well as patterns.

**Summary of the Participants**

Data collected in this exploratory study were in the format of three face-to-face interviews with each participant. Participants were invited to participate via email and by using snowball techniques. Students who identified as female were 18 years of age or older, enrolled in male-dominated CTE programs of study, diploma or associate in applied science degree were invited to participate. The criterion for inclusion as a male-dominated CTE program included associate in science and diploma programs with predominantly male identifying student enrollment or predominantly male identifying teaching faculty.
The sample included six women enrolled in four different programs and one diploma program. Of the six campuses at Midwest Community College, two are represented. One campus is suburban and one is rural. Participants ranged in age from 18-36. Two of the four women were married and one woman had dependents. All of the women were raised in homes with married parents and all were raised with at least one sibling. Two of six women were first generation college students. Three women were Caucasian, one was of mixed race.
and one was of Asian descent. Two of the six women were born in the United States. Table 2 provides a description of each woman, and includes her pseudonym, age, first generation college student status, marital status, parent marital status, siblings, dependents, self-reported race, program and degree.

Table 2. Demographics of the participants

<table>
<thead>
<tr>
<th></th>
<th>Joyce</th>
<th>Kelsee</th>
<th>Lynn</th>
<th>Mary Jane</th>
<th>Cora</th>
<th>Monique</th>
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<td>Welding Technology</td>
<td>Wind Turbine Technology</td>
<td>Wastewater Technology</td>
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</table>

Key
N = No, Y=Yes
M=Married, S=Single
Note- Race self-reported

Participant profiles

The nature of this inquiry was exploratory and dedicated to understanding and describing the lived experiences of the participants. In particular, interview questions sought to elicit a description of the influences impacting each woman’s career choice, career goals and influences and actions related to their goals. The following participant profiles are meant to provide the reader context and insight into the essence of their narratives.
Cora

Cora is 23 years old and from a small town (suburban) in mid-Missouri. She is the youngest of three daughters. One sibling is one year older than Cora and the other is six years older. Cora’s parents are one male and one female. They are married and both have advanced degrees working in the health industry. According to Cora, her parents are “hippies” who enjoy the outdoors. Cora and her two sisters traveled a lot as a family while growing up. Cora enjoyed science classes and math when it was part of another subject like physics where math can be applied. She likes English because she loves to read. She loves sports and loves to climb things that are high. Cora is grateful for teachers that taught her in a way that was better for her to learn when she was in high school. Teachers often created alternative assignments to accommodate Cora’s unconventional learning needs.

According to Cora, her parents raised her without concern for gender roles. It was not necessarily discussed as such, but rather they let her do as she pleased when it came to how she spent her time and what type of clothes she chose to wear:

_They let me buy any clothes I wanted. I didn’t realize there was anything weird about it until the tiny farm town made me feel weird about it. They just do not have established gender roles in our house._

Her father did the cooking, and her mother paid the bills. Cora characterized her father as sensitive and the person that you would go to: “If you hurt yourself or you were sad, you would go to Dad and get a really soft, level-headed response and the hug you wanted.” Cora shared that she did not know that dressing in traditionally male clothing was unusual. She was surprised when in middle school other kids called her “butch” and she initially did not understand the derogatory nature of their comments. She decided to start wearing skinny jeans in high school because “it was just easier.”
Cora is a curious person by nature and likes to learn all there is to know about a subject of her interest. She was “obsessed” with sharks and the ocean and spent two years at another community college pursuing general education course but had little academic success. During this time frame she broke her legs. During the down time, she taught herself to play the banjo, and a mandolin, as well as: “Any the ukulele, soprano, baritone, and tenor.” She can play guitar, the piano and trumpet. She took piano as a child and therefore can read sheet music. After her legs healed Cora spent a couple years backpacking around Arkansas, as her father once did as a college student.

When Cora was done exploring Arkansas, she decided to go back to college and pay for it herself. Cora works two part-time jobs to pay for her education and living expenses. Cora is currently studying wind turbine technology. She will complete her program in summer 2019. She likes the idea of climbing to “places most people won’t or don’t get to see or do.” She also likes the idea of sustainable energy and showing women they can excel in this field.

Joyce

Joyce grew up on a farm (rural). The farm is 350 acres of crops placing it slightly above average size for a small family farm. The family farm grew crops rather than raising cattle. The family included two other children. The parents are one male, one female. Joyce is the middle child and the only female child in the family. Her father runs the family farm. Her father grew up on a dairy farm but left his parents farm to start his own crop farm.

Joyce is 19 years old and enrolled in college the fall after graduating high school. Joyce does not have any children of her own. She is employed part-time while attending college. Joyce has a full scholarship which pays for her tuition. Joyce took college level
general education credits while enrolled in high school. “I mostly took my gen eds, just to get them out of the way.” Joyce is studying agribusiness at Midwestern Community College. She was curious about many subjects including agriculture. This curiosity led Joyce to explore nursing as well as agriculture as a potential fields of study. She was involved in Future Farmers of America (FFA) while growing up. She was president of 4H in her high school. In high school, he father encouraged her to study agriculture if it was her interest: “My dad was like ‘If you really like ag, you need to get into it every semester.’ So if it worked with my schedule, I tried to get in every semester.” Before college, Joyce was active in sports, like basketball. Joyce “likes to be busy”. Joyce is currently in her first semester of study at the community college and enrolled in an associate in applied science program. She intends to get a job in insurance or seed sales when she completes her associate of applied science program.

Kelsee

Kelsee is 23 years old and grew up on a rural family farm. The farm was 30 minutes from town. She had grandparents five miles from their home and grandparents that lived in town. She spent a great deal of time for both sets of grandparents while growing up. Kelsee has a brother and she considers it a close relationship: “We are only like 20 months apart so we’re really close.” The family farm is a crop farm with more than 2000 acres and the family has a custom hay bailing business. Her father is full-time farmer and her mother is an accountant. Kelsee’s brother plans to go back to the family farm when he is done with his education.

Kelsee started a 4H chapter at her high school. She baby sat local children to make money. She was a swimmer and worked as life guard in the summers. Kelsee was involved
in organized sports as well. These sports included, softball, volleyball and track. She enjoys
the outdoors and liked to plant flowers for her grandparents. Kelsee reported the things she
enjoyed has in the jobs she has held this far related to kids: “I love being around kids, so the
babysitting, the life guarding; anything to do with kids. I mean, some days I was like, these
kids could leave me alone or not show to the pool, but they always make your day, and may
it’s just the little, things so that was fun.”

Kelsee is enrolled her second year of post-secondary education and is pursuing an
associate of applied science program with an agribusiness focus. She graduated from her
local high school. While in high school, Kelsee also took college courses sociology and
human growth and development in high school. The instruction was delivered online. Kelsee
also took college courses in the nursing field while in high school. She changed her plan
from nursing to agribusiness when she earned a full scholarship for the agribusiness program
at Midwestern Community College. The scholarship pays her tuition and she covers her
housing and living costs with money from her college savings. Since enrolling in the
associate in applied science program, Kelsee has decided to transfer to a nearby university.
Her interests lie with precision technology and she plans to major in agricultural studies with
a minor in agricultural technology at the university.

Lynn

Lynn came to the United States from Mexico five years ago when her mother left her
biological father to escape an abusive relationship. Lynn lives with her mother and stepdad.
Lynn has a younger brother. He is in seventh grade. Lynn feels her brother does not take his
academic life seriously. She encourages him and tries to help him see the importance of
education. Lynn described her educational experience in Mexico: “...mine (school) was
good. I loved that the teachers really cared about us. I went until, I went all elementary and
the first year of middle school and it was really good. I was a good student I guess, straight
A's.” When they moved to the United States to be with family, Lynn did not speak English.
Within three years Lynn learned English. She excelled academically and completed several
Advanced Placement courses while in high school. Her favorite classes were art and a course
in electricity. She completed high school and graduated with her class. Lynn is a first
generation college student.

To support her education, Lynn works part-time at a fast food pizza restaurant. She
shared that customers often yell at her at her job and she found this painful:

Well, for work, like some people are really racist, or discriminative, just for
stupid reasons. They start to yell, and they just throw the pizza at you, and
they throw stuff at you, and they keep telling you bad words. They keep
cursing, and I mean, I can just stand there, and wait for them to, like, cool
down, or just leave, but inside, it's, like, "Man." I want to cry.

Lynn’s parents wanted her to go into to nursing or veterinary medicine rather than
electrical construction trades. Her stepfather feels this career is dangerous. She said, “He
wants me to be like a secretary or a doctor or a nurse or a vet, something like that. So he just
wants me to be safe, I guess.” Lynn believes her stepfather would also feel the career is too
dangerous for her brother should he decide to pursue this career: “So, even if I'm a male and
I go into that, into those fields, it's the same level of riskiness.” When she began her
program, her academic advisor made her aware that there was another woman registered for
the program. However, the woman never attended classes. Lynn has made a connection with
another student and they commute from the urban area to the rural campus where they are
both pursing the electrical construction trade program of study.
Lynn spoke extensively about her faith and membership to the Jehovah’s Witness Church. Specifically she wants to use the training and coursework in the program to go to “Bethel” a residential training facility designed to prepare people spiritually to do mission work in the United States and abroad. The example she used, was going to Haiti to help the people there. However, in order to be eligible for this type of work within the church you are better off to have a skill according to Lynn. This concept appears to be supported by the Jehovah’s Witness website, which stated Bethel is…

**A unique place where family members give of themselves.** At every Bethel facility, there are Christian men and women who are devoted to doing God’s will and serving Kingdom interests full-time. (Matthew 6:33) Not one of them receives a wage or salary, but all are furnished with room and board and an allowance to assist with personal expenses. Everyone at Bethel has an assignment, whether in an office, a kitchen, or a dining room. Some serve in a printery or a bindery, or do housekeeping, laundry, maintenance, or other things. (Retrieved from https://www.jw.org/en/publications/books/jehovahs-will/what-is-bethel/)

Lynn shared should she be allowed to go to Bethel, she would be assigned to things like cleaning, cooking or laundry if she does not bring a skill. Lynn feels her skill with electricity will get her an assignment with the maintenance department at Bethel.

**Mary Jane**

Mary Jane is 24 years old and is from a small town (rural). Her family moved several times among small towns in the region while she was growing up. Her father is part of the Laborers Union and her mother works in a factory. Mary Jane is a first-generation college student. Mary Jane’s parents were married when she was growing up and are currently in the process of a divorce. She stated that everyone in her family is in support of this divorce. She discussed their marriage and its impact on her: “They got married before I was born and they were together like 25 years, but they’re in the process of divorce right now. It was not a fun
25 years. Not at all.” Mary Jane further shared: Nobody is upset about the divorce. In fact, we’re throwing divorce parties for both sides of the divorce, you know.”

Mary Jane characterized herself as smart and good at science. She said she rarely needed to attend class to be able to get decent grades. As a very young child, Mary Jane got into fights with other children. When asked why she said she is unsure, but at a point, she believes other kids picked on her because she dressed in shabby clothing and she “smelled bad”. During this same time, the family lived in a trailer with holes in the walls and floors and the only running water came from the kitchen faucet. This made it challenging to bath and have clean clothes to wear.

Mary Jane shared that the first time she was intoxicated she was eight years old. She drank with her brothers and enjoyed smoking marijuana. She described her father as a “raging alcoholic” when she was growing up. Her mother was not a drinker. Mary Jane spoke little about her mother except to explain that mother worked full-time in a factory and her mother was expected to be responsible for all household related duties. She described the living environment as sexist: “I wasn’t allowed to do shit because I was a girl. Literally, my dad was so sexist. I don’t know. Girls had to do the dishes and cook. We had to. Guys, their only jobs were taking out the trash and cleaning their own damn rooms.”

Mary Jane’s fights escalated as a teenager and extended to fighting with her parents. This escalation led her to assaulting several police officers as well as an acquaintance in the community. Because of the frequency and severity of the assault, the justice system chose to try Mary Jane, age 17, as an adult. She went to prison for several years. While waiting to go to prison, Mary Jane worked hard to complete her high school diploma at the local alternative school before she went to prison. She said she wanted the diploma not a GED certificate.
She feels like the GED is perceived as less than a diploma: “A GED doesn't look that good. Might as well not have a diploma anyways. On the job application, GED, high school diploma, high school diploma's getting the job, you know?” She classified an alternative school diploma as less: “It's like it's a diploma but from the alternative school. It's a Knoxville Alternative High School diploma. It's not a Knoxville High School diploma. It might be a little lesser but still, it's a diploma.” She described her lowest point was when she was “in the hole” for the second time for a sexual offense. She knew she was not getting out early, and that point she knew something needed to change: “It was just my rock bottom and I knew that I had to change something otherwise I'd just be stuck.” Sometime after Mary Jane was released, she married a woman she dated in high school. They both attended a campus of Midwest Community College in an urban location. There course work focused on liberal arts subjects. Neither did well academically due to sporadic attendance.

Mary Jane shared that she now knows she has an anxiety disorder and likely always had one. She takes medication now. At the time of the last interview with Mary Jane reported she was sober for more than 100 days.

After a break from school, Mary Jane returned to the same community college, but at a rural location. She is currently studying Welding Technology and has a job working in the industry. She will complete her diploma program in spring 2019 and plans to move to Las Vegas. She feels this is a good location because then she and “Uncle Sam can walk hand in hand” because marijuana is legal in Nevada, according to Mary Jane. She plans to join the pipefitters union upon relocating to Nevada.
Monique

Monique is 36 years old and the mother of two. She grew up in a small town in Bangladesh. She is the youngest of ten other siblings. Monique’s parents were one female and one male. She and her siblings spent most of their time playing outside. She had a brother that died at the age of two and therefore she never knew him. Her parents were married, however, her father died while she was in eleventh grade. Her family struggled financially after his death. Prior to her father’s death, she perceived him as supportive of their local community and would share their food and resources with others in need. She explained:

LIKE IF SOMEBODY DOES NOT HAVE ANY FOOD THEY OFFER FOOD. WE GREW LOTS OF VEGETABLES IN OUR BACKYARD SO THEY OFFER THEM IF YOU NEED ANYTHING JUST COME AND GRAB IT SO THAT WAY THEY WERE VERY GENEROUS THAT TIME. THEN SO WE WERE LIKE AND MY PARENTS ARE LIKE EVERYBODY'S REALLY BROTHER AND SISTER, SO THAT WAY I FEEL LIKE, YEAH WE MIGHT BE LIKE DIFFERENT IN SOME WAY BUT WE HAVE A COMMON SHARED GOAL.

At a very young age, Monique noticed children would become ill with stomach issues and dysentery. She wondered if the water might be the cause. Monique’s mother wanted her to become a doctor, nurse or an engineer. Monique felt the cost of the education for a medical doctor was too high and she did not feel engineering was a good fit for her. Monique studied geography and the environment in her home country. She has a master’s degree in water research management. She worked with several governmental organizations analyzing statistics and data related to water and forestry.

When her first child was born, Monique asked her employer about creating a daycare on site. Her supervisor was not supportive. She tried to demonstrate she was not asking for additional benefits and equated it to the time her male colleagues spent outside smoking. She
explained she does not take this time and but they do. She gave further examples where her supervisor did not want to take the time to negotiate or collaborate with others when there was a difference of opinion. Monique, however, took the time to bring everyone together to discuss things and look for compromise in other business matters. She was successful and her supervisor took credit for her accomplishment. During this time, Monique married, had a son and her husband moved to the United States to pursue a Master’s and PhD. After three years, she and her son were able to join him in the United States. Since being in the United States, Monique and her family have moved twice in support of her husband.

Monique remains bothered by the issues of contaminated water. Monique sees this as a world issue, not just one of third world countries. When she had the opportunity, Monique completed her GED/Hi-SET and decided to go to the community college to pursue additional education. When meeting with an advisor, she was encouraged to study nursing again, however, does not feel this is the correct fit for her. Monique is currently enrolled in the Waste Water Technology program. Monique is taking one or two classes at a time because she must balance her child care responsibilities. She does not have transportation of her own or a driver’s license. She is dependent on a neighbor and other friends to drive her to school. Monique believes it will take her a few more years to complete the program. Monique has not been home to Bangladesh since moving to the United States. She is unsure if or when she will be able to visit or if they will work to remain in the United States on a permanent basis.

**Emerging Themes**

During data collection interviews all participants were asked about their life and learning experiences as well as ability prior to college and afterward. They were asked about
their perception of their ability in comparison to others, their career choice, their perceptions of people in STEM, their confidence in their career choice and their confidence that they will complete their program and be successful in their chosen career. Four themes, consistent among all women, emerged as influencing the women’s lived experience and career choice.

**Theme One: Women are impacted by their family and learning experiences, both positive and negative, providing them with a clear self-perception of their abilities and challenges.**

**Pattern 1a Family connection**

The family influence was evident in each woman’s experience. Each participant was raised in a home with married parents. All participants spoke of their family influence and its influence on their interests. In most instances, the women experienced aspects of their field of study and interests through family experiences. Fathers were often a positive influence or role model as it related to their interests. If their father was not supportive, the experience did not deter the women from pursuing their chosen career field.

Joyce described her family: "We grew up with big families, and we were very close."

When asked if anyone encouraged her to pursue this career field, she said described the influence of her immediate and extended family as well as her personal connection to the family farm: "I was like, oh my gosh, I love this. I love working with animals and all this stuff."

Joyce and Kelsee grew up on family farms giving them long term, hands-on exposure to career field. However, in Lynn’s case, she had only minor exposure to the career field. She recalled: "I was born in Mexico and I came here like five years ago. My Mexico experience was good, my Dad taught me a little bit of electricity, or electricity stuff and that's
Lynn’s exposure to the field blossomed when she was enrolled in an electricity class in high school in error. Lynn stayed in the class despite the error and found she enjoyed the area.

Joyce and Kelsee have many similarities in their background and they both characterized their families as “tight knit”. Kelsee experienced her career field by being involved in the family hay baling business and raised cattle for show at the county fair. She described family saying, “It was in my blood.” While Kelsee ultimately made the decision to follow through with her interest in agriculture, she initially had others plans before college. She had planned on being a nurse: “My mom never saw me as a nurse. So she really didn’t care what I did” instead of nursing. “I think she knew all along that I’d much rather deal with the farmers than have to deal with the general public.”

In Cora’s experience her mother was very influential in her career discovery process. She described the roles her parents play in their family as “reversed”. While her father makes more money that her mother, her mother handles the details of decision making. When Cora shared her interest in Wind Energy, her mother helped Cora step by step to connect with resources to investigate the field. This reversed relationship dynamic between Cora’s parents was further characterized by Cora discussing her father’s involvement in her career exploration: “Jim [Cora’s father] likes the idea of like, he’ll romanticize it like, "Oh like this is your passion and you’re doing something cool and productive. I don’t need to know the rest about it, but like keep me involved.”

While Cora’s family trusted and support her decision, Lynn did not have the same support from her family. Lynn said, “That semester of electricity by accident brought me back to electricity.” Conversely, Lynn’s stepfather, who is a welder, was resistant to her
career choice. He preferred that Lynn become veterinarian. She first asked about being a welder and his reaction:

_When I asked him about his [job], 'cause I was kind of interested about his job, he was like no I don't want you to become a welder 'cause I don't think it's a job for you. I wouldn't like you to be here and getting all your hands dirty and you know, having your eyes damaged for the light, for the fire, that thing._

Lynn’s drive to pursue electrical construction trades in also influenced by her church family. Lynn is a Jehovah’s Witness. In this faith, mission work is important. She felt she wanted to be able to help when there are natural disasters with skilled work. She inquired about her options to contribute with this type of mission work:

_Like, if you're going to go build some houses again you have to know, you have to have at least a little bit of knowledge and I want to go and I don't like building, like construction, and I want to do something a little bit fancier. So I asked them if they needed electricians and they said yes. So I was like, okay I'm going to become an electrician so I can go help those people that have just been struck by this tragedy._

Monique is unique in this study as the only participant with dependent children. In addition, Monique has advanced degrees in geography and environmental science. While in high school Monique consider her educational and career options. While in this process, Monique discussed things with her mother. Like Lynn, Monique’s family felt she should pursue something in the medical field. Her teachers also encourage her to pursue medical profession: “_You are perfect for being a doctor, because you are good at this._” And biology dissection-wise, “_You could be a surgeon._” Despite her mother’s desire, Monique chose to pursue geography environmental engineering. Monique’s family tried to influence her career choice but also where she would study. She felt frustrated by her family’s influence in her program choice as well as her university choice: “_It's like a family decision. I said, "Why?" It's my life. I should be able to choose which university I should go._”
Like Lynn, Mary Jane also did not have a positive experience with her father when telling him she was enrolled in a welding program. She had hoped for his help and support which did not happen: “When I told him I was gonna be going to school for welding. ‘Mary Jane, you don't want to do that.’ I’m like, ‘Dad, can't you just say congratulations or I'm glad you're doing something with your life?’ Like why you can't do that?” Mary Jane further described how family gender issues impacted her growing up. She explained she was interest in male-dominated activities and jobs. She was frustrated by the lack of family support. She shared she wanted to get a job de-tasseling corn and she was not allowed to take a hunter’s safety course despite her interests. She questioned her father’s decision:

Why? Because you're a girl. Girls can't do that. Well, yes I can. Like that was always my biggest battle was I can do whatever the fuck I want. Just because I'm a girl doesn't mean shit. I can still go hunting or freakin’ whatever.

The power of Mary Jane’s connections to her family were evident throughout all three interviews. She spoke passionately about her desire and how he felt her father did not support her. Even though Mary Jane often has often felt a lack of support from her father, she spoke of his support of her during her incarceration and since being released. Her response to her father’s denial may have laid ground work for her to willingness to put herself in a male-dominated environment. She shared her father’s response and her reaction to him denying her access to certain activities and jobs:

"Mary Jane, you’re gonna be out in the hot sun. That's man's work. You can't do that." It's like fuck you, fuck you. No, I can. I can do that. I can go shoot your gun. I can do whatever the hell I want.

**Pattern 1b Pre-college and college learning experiences**

All participants described some positive learning experiences prior to college and in college. These experience have been influential to the women. The women spoke positively
about the teachers that took extra time, were approachable, pushed them or saw their struggle. In all instances, the participants sought out college level learning experiences that “fit” their interests and learning style. Discovering they have a desire for applied learning experiences was derived from both positive and negative pre-college learning experiences for the participants. In all instances, the participants reported feeling comfortable in the educational environment. They also reported they felt supported by at least one teacher or instructor at the post-secondary levels.

Cora does not consider herself to be a conventional student at either the secondary or post-secondary level. Cora’s parents allowed her to focus on things she cares about: “I've never not felt supported.” She lamented not being offered the option of technical education at the secondary level:

*A lot of people from our small town, they went to ... Hillyard's was were you can go take classes and instead of doing high school classes, you take high school credits that apply to a career field so you can skip college. There's autobody, mechanic, repair and I don't know ... They just all did it 'cause they didn't wanna be in school but now I'm like, I should've, that is ... Their skills are way more useful than anything I got out of high school so.”*

Like the other women, Cora felt supported by at least one secondary instructor. Cora reported she often did not excel academically. Despite this, Cora often felt her high school teachers saw her grades were not a reflection of her intelligence. They supported her by spending time with her and creating alternative assignments when “I wouldn't do theirs because it was not useful.”

Even though Mary Jane experienced behavioral challenges within the secondary education environment, she said she enjoyed several teachers. Mary Jane shared there was a teacher she really enjoyed despite not enjoying the subject. She talked about how he did not
start by teaching a subject from the textbook, but rather by telling stories. She described the teacher saying he taught her in a way she could understand: “He's been teaching it so long, he'd get up there and he'd tell you a story and then later you can read through the textbook and it gives you more details about the story but I learned way more in his class than any other history class ever.”

Mary Jane, now in her 20’s and having a unique life experiences, talked about the desire to apply classroom learning in a hands-on way. She spoke of how learning is hands-on in welding and how she can easily see how knowledge is applied in this field. She reflected on her learning experiences with chemistry and math from an applied learning perspective. She explained how she can now see how her classroom experiences are applied learning experiences:

*Why do I need to know that, you know? Why do we need to know all this math? You're like, "Oh, well, here's why," and it connects it all together. It's like, "Oh, dang, fry's done, light's on." I like how it connects the two.*

Monique expressed she felt she had supportive teachers and instructors throughout her secondary and post-secondary experiences. When asked about her favorite teachers, Monique spoke of how she liked to learn. She explained her teacher would use stories to instruct the class. Like Mary Jane, Monique described how she enjoyed education when it brought something useful that she could connect to in real life. She characterized the lessons she learned from her favorite teacher as “important”. Growing up she said she had several teachers she enjoyed: “*they were kind of like role models to me.*” Despite being pushed toward health occupations by family and advisors, Monique continue to seek an educational program in her area of interest. She described how her interaction with a teacher influenced her enrollment in the wastewater treatment program:
So I kind of ask lots of them [questions] and I said "It does not feel good, me I need more, more." So I was looking that program based and suddenly I found waste water program and I'm like "What is that?" And I just found out with them and talked to the teachers and they say "we are offering a water management program this fall if you’re interested". So I said "Okay, I'll take that" and it opens my eyes and answer all my questions.

Monique further shared how this experience with the instructor connected with her interests:

“So, he explained, we touch everybody. The way we treat our water every day. We take the pathogens out, so you don't get acute disease.”

In high school, Kelsee had hand-on learning experiences. Kelsee explained she doesn’t like to learn from textbooks and would rather help and connect with others. When asked about her favorite high school subject she described her home ec. class: “I was in charge of feeding 300 people. That's how many people I signed up for my meal, so the community people can sign up, kids can sign up, so it was very hard, very a lot of work but super rewarding at the end, so it was fun.” Coupled with enjoyment of the subject matter, an association to the community, and deep caring for other, Kelsee connected with her home economics teacher on a more personal level. Kelsee had several classes with this instructor which allowed her to develop a relationship with the instructor. She felt she could count her instructor to help others:

We just got along; easy to talk to if there was issues going on at school, but not necessarily with me. If there's another kid, like, "Hey, I think this kid you might want to watch. Kids are really picking on him," she would watch and take care of it right away, so that was good.

Joyce expressed having positive relationships with her high school and college instructors. She shared how she told her instructor how she felt she was behind in physics compared to her classmates: “I talked to my teacher and he's like, I know, that’s how I was. And he related to me and he’s like, you have to put in that extra effort. And I'm like, okay I'm
willing to do that if it's going to help me better understand it.” Joyce further explained her feeling of relief when she realized her instructor was willing and able to help her in the way she needed to be helped. She explained her relief when the instructor broken things down in a way that worked her: “He's like, yeah we'll get through this together, it'll be okay.”

Lynn described her favorite teacher: “She always made us look for the bright side and she was like, there's no mistakes, you just have a chance to fix it or make it even brighter.” Lynn perceives her post-secondary teachers and the learning environment as similar. She described the learning environment and the instructors:

*Then I go to the class and it's really chill. The teacher's always making bad jokes. He's really nice. He makes every single one of us laugh. It feels, like with the teacher and stuff, it feels close. With the classmates, there's always the one who's always answering this or there's the clown, there's the shyest one or the one that never shows up. So it's just like a normal classroom.*

**Pattern 1c1 Self-perception of ability**

All women were asked to assess their own ability and they were asked to compare themselves to others. Assessing their own ability was not comfortable for them. They assessed their own ability at different levels, however, they all were confident their ability is compatible with their career choice. Each of the women was confident she has the ability necessary to complete her program of study. Further, they often a perceived weaknesses as their strengths.

Regardless of each woman’s assessment of her intellectual ability, they all perceived people in STEM as smart: “*STEM projects or majors were for really smart people.*” She further explained she sees herself as “kind of average.” This perception carries even if the woman assessed herself as smart. Lynn described herself as earning “*Straight A’s*” in school. Lynn sees electrician as being in a STEM field. She felt that STEM fall within a
wide spectrum of career fields. She described what she sees as traditional STEM fields:

“When I imagine people working for Google, it's like really smart, and technicians, and they know, like, a lot of stuff, that we cannot even understand.”

This perception of intelligence as connected to STEM can also be perceived as a gendered concept. Joyce explained she perceives men are more likely to be in STEM fields because they are depicted as such in the media: “You always see those people, like on billboards.” She further saw men as “The smart ones and the ones that take over everything.” Cora had a stronger sense of STEM identity and connected science and technology as the backbone of the curriculum in her program. She also discussed CTE STEM as a male dominated, and lamented the fact she was unaware of options for hands-on technical learning in CTE STEM fields:

I just didn't know that it was such an accessible option, and that it would lead directly to the job force. I just, I thought I had to go to a four year school and I thought I had to do all this directionless, generalized education. I just thought you had to do that.

Joyce did express a connection to STEM fields, but did struggle to determine if nursing or agriculture should be her career path. She expressed concern about the difficulty of the course work and the time commitment she perceived related to the nursing field:

Doing nursing, a lot of people talk about, "I had the best nurse in the world." I thought that would be pretty neat, but I don't know. I guess I didn't feel smart enough, was one of my main concerns. I was like, I don't know if I can go through with all this schooling and boards.

Mary Jane reported she feels intelligent in certain areas. Growing up, Mary Jane reported she enjoyed chemistry: “Chemistry, in general, is my thing. It intrigues me. It makes sense. I could see myself being some sort of scientist.” While she feels an affinity for chemistry she doesn’t want to be a pharmacist. She explained that when she was younger
she used prescription drugs to get high and has known too many people to that have overdosed to feel comfortable working in this industry. Mary Jane shared that a lot of the time she feels she understand academic content “faster than other people.” She remarked, “All through school, despite all my trouble, I was actually in advanced classes during all that and barely showing up as is. I get it. I understand the concept. It was the environment that I couldn't do.”

**Pattern 1c2 Pattern physical ability**

The women not only needed to address the perception of their intellectual ability in their career choice, but they also talked about their physical issues typically associated with women. Joyce gave an example of this assessment and her plan to address this issue in her career:

> My brothers, they would always be like, "Joyce, do you even know how to run the skid loader?" And I'm like, "Yes, I know how to run the skid loader." I'm like, "I can do this. Don't doubt me." There's physical parts, but then with all the machinery, it's really capable, I guess is what I'd say.

Cora also recognized the physical differences between herself and he male counterparts. She thought about it and sees her small size as an advantage in her career field. In this industry, people often in pairs. She explained the advantages by describing how she and her partner might divide up work tasks:

> So, I'll categorize components that I'd be good at and what I could get really good at within my physical capabilities, so that I would have that to offer. Like, "Hey, if you specifically torque this two-hundred pound thing, I can get in this tiny crawl space and do an electrical panel and clean a lot.” And like, it's not just I'll do the cleaning and you do the hard work, but there’s other, it's just a bunch of ... there's so many different things, and like some things the guys aren't going to be able to do. Like they’re always complaining, they’re like "We get back issues 'cause we don't fit here, we do not fit here". I was like, "I fit there." So I'll do that.
Cora provided another example of physiological concerns related to females in her chosen field. This is not something that is part of the curriculum. Cora is hopeful that someday she will be able to discuss these physical concerns with other women:

_I know that I will work them out. But, there’s some stigma and, how I’m gonna have to use the restroom, the fact that I’m gonna have to deal with a period somewhere where you can’t climb up and down a lot. You don’t wanna do that climb twice a day if you don’t have to. Yeah, no one climbs down to use the bathroom, yeah. So, I’m just gonna have to figure out, and I just hope that people don’t treat me differently because I have to do those things.”_

When asked how she felt the career field might be different if it was dominated by women, Kelsee explained her thoughts on the physical nature of the career field. She sees women as more caring as men and believes there are physical issues but also differences among men and women:

_Personally, I think some of the jobs for agriculture just aren’t for women, necessarily. Like we can’t think that women and men are created equally, ’cause it’s just physically not true. Men are stronger than women. Women are made to take care of people, like more caring than men are. So when it comes to building a grain bin or building something heavy and very treacherous, yes, women can do it but you’re gonna always see men more willing to do those jobs._

In a more general way, Mary Jane referred to physical dominance between men and women. She acknowledges the physical difference, but does not see these difference should preclude women from entering their field of interest:

_It's not, but life's not fair. It's not fair at all, but unfortunately they are scientifically the stronger, dominant of the human race. They're the stronger more dominant bull crap. There’s not a lot we can do about it, but there is something that we can do about it. We just have to wriggle it. We can’t just come in ... well, now we can kind of come in demanding._
Theme Two: The women made their decision to enroll in male-dominated programs with the knowledge that there is inequity in the field and in society.

Pattern 2a Gender inequity in the field

Each woman acknowledged there are fewer women in their chosen career field. They provided examples of inequity in how women are perceived and treated differently by men, and by other women. The women also described how they experienced gender inequity in their learning experiences and in society.

Cora described being precluded from technical education and other opportunities, because they did not think to ask if girls would be interested. She sees that as a small-town mind set: “Nobody pushed for girls to go to Hillyard’s. Nobody. No one came to our classes and talked about it. They'd have a Boy Scouts rep and then no Girl Scouts.” Cora spoke positively about the classroom environment: “Actually, this is one of the places I feel least gendered.” However, she went on to say she feels a feminine appearance is a factor in how women are treated: “And I don't know if it's because I'm kind of ... I wear gender neutral clothing or what? Is it that I don't present myself in super feminine ways? I think presentation is a lot about how women are treated, unfortunately.” Cora expressed her frustration with the situation: “I shouldn't have to strategize that [her appearance] but I've had to practice and learn things that make men either take me seriously or at least not discredit me upon seeing me.” She explained how she tested her theory explaining she believes dressing in a feminine changes how she is treated. She shared time when she dressed more feminine than she typically does to test her theory:

*I went in to get my car fixed one day, these guys gave me a ... They wouldn't explain anything to me, they gave me a totally different estimate than when I went in at a different day dressed, you know, more masculine like I sometimes*
do dress, and they explained things, asked my opinion, gave me options, and I've done this a couple of times just to see how people... If I'm not sexualized or presenting in a super feminine way that day, people obviously, they honestly do give me a little bit, not more time but different time. They give me different responses entirely. It's really crazy actually.

For Lynn gender inequity played out more intimately than it did for Cora. Her friends made fun of her decision to become an electrician, they had socially influenced perceptions of the career field and wondered why she would want to be in a male-dominated environment. When she told her friends she was staying enrolled in her the electricity class, Lynn’s friends said to her, "Why do you want to be there?" And when I told them that I wasn’t going to take it out of my schedule. They [friends] were just like "You're crazy. With all those boys." She shared they felt their expectations were related to her gender: “So when I told them that I wanted to be an electrician now, they were just like, "What? No. Why? That's for guys. They were shocked."

When asked to reflecting on her short time in the program, Lynn learned things about herself and revealed her concern about gender inequity in her chosen field and characterized her enrollment as “I’m more ambitious than thought I was.” She further said she has never met a woman electrician: “I never thought that I would be here, and, like, being the only girl in the classroom is, maybe it didn’t hit me as hard in the moment, but like, all the videos, and all the information that the teacher gives us, there is just men in the picture. Like the movie they showed us, there was only men.” Lynn discussed her excitement about the field of electricity and explained her disappointment in not seeing other woman in the field. She imagined she would be “surprised” to see another women in the field because she has never met a women electrician, or see one in print ads, books, or movies. She went on to describe how meeting other women in the field would make her feel: “I would feel kind of supported
or more comfortable, I don’t know. Like right now, I’m kind of feel alone in the way that there’s no more women.”

As the oldest participant in this study, Monique has several years of professional work experience in her home country to call on. She was asked to reflecting on the male-dominated work environments she experienced in the past:

There was one female officer, and I was the second, so they were thinking like, you know, I need their help. But, actually [Monique is] there to help for me because I was the junior officer, so my boss said, "You do your work." They [men] think like my work is nothing.”

Monique felt the she was treated differently at work. She explained her experiences where the role typically related to her gender impacted her work and family life. Monique asked her employer for a space for her and her colleagues to nurse their children or bring their children to work. She was unsuccessful in her request when one of female colleagues had to stop nursing her child because the work environment did not support this need. She shared the experience and why she felt it would benefit everyone:

I actually offered my ... I asked my boss, "Why can’t we have a room." Something like, in a spot. They're just like, "What?" Because they [men] don't think about that [nursing]. Because, not only me. Male colleagues, they might bring their kids, too. Like that, they don't have to. Better not think about that. It will be good for future, too. It's not for me.

Mary Jane explained the inequity between men and women she observed growing up. She described her dad: “My dad is sexist, he won’t admit it, but he’s kind of sexist. He just doesn’t see it. Double standards. “sexist”. Mary Jane feels this way because she witnessed her mother working 40 hours a week at her factory job and she was still required to take care of all other household chores: “My mom was always expected to pick up after him as well and still cook and everything else. Even though she’s doing the same thing.”
Joyce shared her perception of gender equity in her field. She described her sibling’s reaction to her desire to have a career in the farming industry as well as her father’s support.

Joyce sees her sibling’s resistance as related to male dominance in the field:

*Because men have always been dominant, I guess, in everything, like farming for example. My brothers are like, "You just can’t do that because you’re not..." And my dad’s like, "She’s going to learn."

Joyce wondered what farm families did in the past when all of the children were female:

“Back then, they used to have kids to help them with the farm. But what would they do if they had all girls, because obviously the girls would have to do something?”

Kelsee is very aware of the gender inequity in her field of choice. She sees women as an asset to the industry. Kelsee further reflected on male-dominance in agriculture and felt women have a different skill set and perspective which can be beneficial to the industry just as males bring a different perspective the teaching field:

*I mean, yes farming 20 years ago was basically males, I get that, but teaching 20 years ago was basically females, but we have allowed men to go into teaching, so why can’t they allow women to go into, and I’m sorry, but men cannot keep an operation going without a woman to help him out, because they are not organized enough to keep it going, I don’t feel like.*

**Pattern 2b Assessing career choice**

In all cases, the participants and their families had opinions of the women’s career choice. In some instance their choice was supported and other were not. In all instances the women assessed their suitability for other careers when traditionally female dominated careers were encouraged.

Joyce described her college visit and its impact on her career choice. She wanted to be learn about both nursing and agriculture. She weighed the things she liked about both fields. She described the process, and said was just more interested in agriculture:
I find the human body interesting and I think it's very unique, but I don't know if I could go on with that. Agriculture, I kind of was like, I could get the best of both worlds in this. I could talk to people, but still do what I love. That led me towards going into agriculture.

Joyce also perceived nursing not only as academically rigorous, but as inflexible and time consuming. Specifically, she perceived nurses as having little personal time and less flexibility when it comes to starting a family.

Kelsee also had considered nursing, but through hands on experience she ruled nursing out as an option even though she enjoyed the subject matter: “Ever since I was a little girl I said I was gonna be a nurse.” Kelsee enrolled in a CNA course and had an experience that changed her directions: “I had some rough patients. Ended up giving a patient a shower and we were in the unit, so they ended up pooping on my feet and I walked out and I was like, ‘This is not for me.’”

Cora knew there were many career fields that held no interest for her. She described her assessment of the wind energy program. She explained her research led her to believe she had found a career that matched her interests and explained her assessment to her mother:

Like mom, I was reading, can't have a fear of heights, like to, have to travel. They all said it as negative things, she's like "These are positive things for you. So like, if I tick off another one like you just have to say yes. Like you're just going down this list". And when I read the list at Midwest Community College, like confined spaces like all this cool stuff that I find fun and interesting. I feel like I can't not do it. And even if I want to do something else, a lot of people pay to do, like keep doing school online. I could just jump ship after five or ten years and do something else.

Mary Jane’s career discovery process was a bit different. While in high school she was interested in earning college credit in a nursing assistant course. While her behavioral issues precluded her from pursuing these courses, she later reflected this would not have worked for her: “I was actually gonna take a CNA class, believe it or not, which is, looking
back is just absolutely silly. I was way out of my field, not my department, any way, shape or form.” She did not have success in her first attempt at community college where was enrolled and was unsuccessful in general education courses. After Mary Jane and her wife moved to a smaller town, she considered community college again and picked a program of study from those available at the local MCC campus. She knew she wanted a change:

I love outdoors. It's a lot of the reason why I went back to school, too, is I miss the sun. As a kid I was always outside playing. There was a lot of us, so we'd have our own little kickball team with all my brother's friends and whatnot. We were always outside doing something and I was always very tan. I'm a quarter Mexican and if I spend my time outside, you can tell because of the tone. I get a pretty complexion when I'm outside. Since I've been released or whatever, I worked indoors and I don't have time to hang out outside. I miss the sun. I don't care what I have to do as long as I can do it outside.

Mary Jane further assessed her fitness for her career choice by comparing herself to a friend that struggles academically. Mary Jane shared she feels she cannot work as a nursing assistant as her friend does. Mary described how she knows a nursing work environment imaging a patient would bite her: “I feel like if they bit me, my natural reflect is I would just pop them. Not hard, but my natural instinct is just be like, ‘Don't do that,’ you know? I wouldn't be able to deal with that.”

Lynn was interested in veterinary medicine. In assessing this pursuit, she spoke with her mother and also her uncle, who is a vet. They shared she would have to help people decide whether or not to euthanize an animal. Lynn said of the experience: “I don't think I would be able to make those types of decisions. With myself, it's okay, but when it involves someone or something else, it's way harder.” Lynn’s choice was clarified by accident. She shared:

I took an electricity class by accident, they put me in a semester of principles of electricity for one semester and I was going to take it out of my schedule
because I didn't like it but we have to go to the first day. We're forced to go to
the first day of any classes that we have and just that first day it made me like
it. I loved it after that first day and I just stayed.

Monique described how she assessed her career choice for her first post-secondary
experience as being rooted in family influence and financial concerns. After Monique
rejoined her husband in the United States she found she wanted to continue her education.
Since coming to the United State, Monique completed her Hi-SET/GED. When discussing
her future educational plans with her husband, she said:

I learned that I need to do something very hands-on thing. And, I did like the
vocational. You know, that family decision did not let me go [in Bangladesh],
so I talked to my husband, and he said, “Yeah. Go for it.” But, he was saying
go for Nursing. I said, “Yeah. Nursing is good.” But, not everybody can do
that.

Pattern 2b1 Socially influenced perception of career choice

Among all women in the study, there were social elements influencing their
perception of their career options. In Joyce’s case, she struggled to decide between nursing
and agricultural studies. She felt like she wanted to be part of a caring career field and felt
this did not apply to agriculture. This perception influenced her career choice. She shared
her concern with her parents: “My dad was like, "Well, you can still care about people and
be in the agricultural field. It's just a different view on things." So he kind of put that view
into perspective for me.”

Lynn’s stepdad encouraged her to pursue another career and suggested she become a
veterinarian. Her father characterized Lynn’s curiosity as not appropriate, saying: “It’s not a
lady’s job. When he questioned her career choice, she explained how this made her feel: “I
felt that he was protecting me. I know that he loves me, 'cause he's my father now.” She
explained how her assessment of the career field included an assessment of the risk in the
context of her gender. She said she is glad her stepfather wants her to be safe, but saw
difference between men and women when it comes to safety issues:

So, even if I’m a male and I go into that, into those fields, it’s the same level of
riskiness. So, even if I was a boy, even if I was my brother, I was in the same
... If I was my brother and I was ... How can I explain this? If I was my
brother and I go into this electricity field, he wouldn’t have been more safe
than me.

Mary Jane’s shared that her father was not supportive of her choice to pursue
welding. He too said the field is too dirty for women. Mary Jane agreed that the field is dirty
and sometimes dangerous. She shared she believes women think welding is dirty and
dangerous. She feels this an accurate reflection and therefore is not for every woman. Mary
Jane further elaborated on her perception for welding: “I’m going to say that women can do it
if we want to, just most of just don't want to.” She related to how women are socialized
growing up:

Not all girls are meant for welding. Right now girls have been raised as the
weaker of the two. They get burnt or something and they have a blister they're
going to be crying for the next week. But in welding, sometimes I have four
blisters on my arms, one from each day of the week so far.

Lynn was also undeterred by the physical concerns and perception of her ability
based on socially influence gender roles related her career choice. To overcome the physical
concerns, Lynn shared she is “working out.” Lynn shared her experience investigating the
electrical career field by speaking with a master electrician. She shared her conversation
with an electrician out in the field. Lynn asked him if he had worked with women in the
field. She shared how he explained women cannot do the work required of an electrician:

And the way he said it, it was kind of mean or discriminative. He was like,
"They shouldn’t have been there. They’re females.” I didn’t say anything
about that ’cause I didn’t want any problem, but I ... I don’t know. I still
remember how he said it and it makes me kind of angry 'cause I felt like he felt
superior to them 'cause they weren't as strong as him. Like, you have to do a lot of bending, conduit, and all those metals. And he was like, "No. They couldn't do the job, so why are they there?"

Kelsee explained her feelings about the social perception of her career field as still being very sexist. Kelsee’s family farm is a century farm. While at the century farm presentation and celebration at the state fair, her younger brother was going to take over the family farm. She shared her reaction to hearing this:

And I wanted to turn around and be like no, actually I am, just to see his reaction, because he was stereotyping that my brother was gonna go back, which is completely honest, he is gonna go back and farm, but I just sort of wanted to see his reaction to me saying actually no, I’m going back to take it over, because I don't think they expect girls to take over farms. It's not common to see a girl running an operation like that.

While Kelsee was aware of the stereotypy of male run farms, she also hold this same stereotype. She acknowledged how rare it is to see a women running a large farming operation, but shared she would be skeptical of a women’s competence in running a crop farm:

If a girl told me yeah, I completely run an operation, I'd probably second guess her honestly, like you run a crop farm? I just, I don't see that, and I mean it's not that it's not out there, there's girls all around doing it, but it's just not what I expect, like you don't expect a girl running it.

Cora discussed how the social perception of her career field includes an expectation of male-domination. She would like to change this socially influenced perception. She explained this held appeal for her in making her career choice:

But, I would just like for them to not be as like surprised when they see a woman or act like, think that they have to treat them differently just 'cause they're not used to having them around. Like there is always that initial, I'm very forgiving about it, when a teacher is like "Okay guys", and then they like catch themselves and apologize, I'm like "It's okay, I know you meant like folks, or like in general, like you're used to seeing like twenty-five men instead
of like us three girls". I don't know. But they still need to not [treat say guys], it needs to lose its shock value soon. I hope.

**Pattern 2b2 STEM identity in career choice**

There was not a consistent perception connecting the women to STEM fields; however, with all participants there was a positive connection to hands-on or applied learning. Some of the women had issues with general education or the tools used to provide instruction. For example, Kelsee does not see a textbook as a useful tool for learning: “I hate looking at the textbook, I have many that I haven’t opened yet. They're still in the sealed package. I don't learn well with the textbooks.”

The application of knowledge based on hands-on learning was important for the women in the study. For Mary Jane she wanted a more than memorization. She explained her thoughts: “You don't need to think... Welding connects the dots. It brings stuff together.” Cora had similar feelings about education without application. She shared how happy she has been with her current educational experience:

> Now my school experience is just a lot more rewarding because it's not just going and doing homework and turning stuff in. It's all applied skills that I need to develop and perfect. I have to talk and ask questions to get the right information. It's not just searching something out of the book. It's, don't electrocute yourself, know how to do this safely and efficiently.

This affinity for application of knowledge extended to Monique. She was clear about her goals: “I learned that I need to do something very hands-on thing.” When asked about teaching and learning in her program Joyce also found hands on learning helpful. She understands the need to learn definitions and terminology for the trade. She connects classroom based instruction with knowledge application for better understanding she likes “doing it [applying education] with hands on so I get an understanding.”
Lynn came to the Unites Stated five years ago and spoke no English. With intense effort she learned the language and successfully completed five AP courses in high school. Lynn explained that she felt like STEM careers are difficult and that is why “no one is in them.” Lynn explained she enjoys applied knowledge and enjoys applying her skills in a hands-on environment even in high school. She explained her experience in her art class and her favorite teacher:

_I didn't know how to draw, not good at drawing and then when I had her she brought me from zero to ten 'cause I passed her class for the maximum grade so she made me do stuff that I would never thought that I could do with my hands and she introduced me to chalk pastel and I just loved it._

Theme Three: Women compensate for a perceived deficit of technical skills or knowledge through determination and a willingness to work harder to achieve success.

Pattern 3a Skill competence

The women’s perception of skill or a deficit in skill took several forms. In some cases, the women felt they were not given the opportunity to build skill through secondary informal and formal educational experience. In other cases, they felt they did not have the social capital to make informed decisions about tools of the trade.

Lynn’s related these feelings of deficiency as it related to the tools she chose for the program. She explained her several of her classmates have parents with knowledge of the career field and therefore they chose their tools more wisely that she did. She shared that her stepfather is a welder, not an electrician, and he helped her select her tools:

_He took me to buy the tools, but he was just following the instructions, so I didn't feel a lot of ... Like, I felt like he didn't really care about the tools and I see that my classmates have parents who's like, "Okay. Don't buy this drill. Buy this one 'cause this one's better and this one's better for electricity," or I don't know. They have a better support._
Cora also discussed feeling like she was at deficit in skills. She explained over the years she has worked to increase her social confidence and how she now feels socially competent. When coming to the program and seeing others have a background in technical areas, she struggles to maintain that confidence:

*But this one [lack of prior experience] is just shaken me sometimes, it just makes me have to work really hard ’cause I haven't been in a tech field. I haven't been to night classes. I didn't take three years of computer or maintenance or car, like automotive. I didn't do technical stuff until now. It's not like crazy to learn, but just starting like two steps behind people educationally.*

Cora further expressed concern about using the tools of the trade and a lack of exposure to technical education opportunities at the secondary level. She relies on her intelligence to overcome her lack of experience using the tools of the trade. She compared herself to her classmates: *We're pretty evenly matched because we're all learning this stuff new.*

**Pattern 3b Determination**

All participants expressed a determination to complete their program. They have a passion for the work and were willing to work harder to improve and achieve competence in their field. This need to achieve was coupled with the idea the women must prove they could do the work. Some wanted to prove it to themselves, to others in the field, or to family members.

In Mary Jane’s case, she wants to prove her competence not only to her father, but also the judge who decided to make “her an example” by trying her as an adult. Mary Jane shared she is not angry with the judge, saying going to prison: *“It messed with my whole freaking childhood, not childhood, but adolescence. It probably saved my life so I should thank her by all means.”* She does want the judge to know that even though prison made
Mary Jane’s path to career success very difficult: “I’m okay”. She said about her career and life in general: “I’m hard headed, stubborn. When I want something, I’m getting it.”

Kelsee shared that she felt people have doubted her choice: “It's proving that women can be successful in agriculture, we can do what the guys can do.” She explained she is confident she will be successful and demonstrated her determination in her efforts to gain an FFA chapter at her high school. According to Kelsee, some teachers at her school did not want to support a chapter at their high school. However, the teachers supported a chapter of FFA if was combined with one in another town about 20 minutes away. Kelsee worked together with other teachers, and adults that were supportive: “We just made the presentation and put key points about like why we would want it and how we could really make it worthwhile this school [Kelsee’s high school] doing it.” She explained they persuaded other adults to support their work: “We had an old FFA advisor on the school board, we had my best friend's mom on the school board, we had lots of people that were within ag.”

Joyce, who is in her first semester of the program, felt fairly confident she will complete her program. She feels her “work ethic” is her biggest asset. She discussed an experience that she felt demonstrated this work ethic. She shared a time in high school when she was “benched” by her basketball coach. When Joyce asked the coach why she was benched and what she could do to improve, he told her: "It's not that we're benching you because you're bad. It's because you could take it better than what the seniors could take it.” She shared there were times while she was benched at she just wanted to give up and was encouraged to do so by others. There was just times when I just really wanted to give up. There was just people who were like: “You can't do it. You won't get your starting spot
Joyce found the determination to continue: “I just kept working and I just tried to prove people wrong.”

While Monique’s husband moved to the United States to pursue his education, she was left in Bangladesh for three years caring for her husband’s parents and her infant son. She has been encouraged to pursue another field of study by her husband and an academic advisor, but feels passionate about clean water and always has: “So I also care about other things but water is for me, it's kind of like no civilization exist to start with. So, also from my childhood I had lots of people, and also I think I have area of this interest and I said 'Why those things?'” She explained she is determined to understand waste water management but has to manage three children with little help from her husband: “We've had two kids born here and I'm alone raising them so it's kind of hard to find some time.” She struggles with the English language, but through determination has complete a GED/Hi-SET. She feels confident she can complete her degree but it will take more time because of her childcare responsibilities.

**Theme Four: The women want to prove their competence to help themselves and others with their skills and as role models.**

**Pattern 4a Desire to help**

Joyce described that she sees her course work and gaining competence in her field as important in a larger context. She described how her competence within the field connects with helping: “Just learning about how much we [agricultural fields] actually do impact the world and how much we impact people, and just the importance of trying to keep everyone safe, but still provide for everyone was still a huge impact that we are trying to work on and excel in, I guess.”
Lynn is also interested in helping in a larger context through mission work and explained how her desire to help others in a non-traditional way. She explained her goal to help: “So I always had a big heart for those who cannot speak for themselves or act for themselves.” She elaborated on how her career choice as an electrician connects to helping others:

*Electricity is kind of a need, but today it's not more of a need, but a privilege, no, not privilege. It's more like having the latest phone. It's not a need but a, I cannot find the word. It's just kind of like a privilege, because you don't really need it. If you want it, you just have it. So I would like to be able to give people comfort, or making their life easier. Like cars. We don't really need cars if we have horses. So cars are not a need, but they are here to make our life easier. So it's a way different approach.*

From a very young age, Monique was concerned about water pollution: “I feel like I should do something about nature, natural things, but back then I did not know what to do.” Monique noticed at a very young age, that many students would miss school: “Lots of students have diarrhea, dysentery so that makes me think, they have stomach ache you know, at school.” While Monique has had a career in another field. Her concerns about clean water remained. She described the feeling saying, the continued feeling and need to fit into the bigger picture it: “Like I said, I am patient, I can get a bigger picture.” In the Waste Water Treatment program at MCC she is learning how she can be part of efforts to protect and ensure there are clean and healthy water sources. She expanded her scope and thinks about water safety as a global issue which will impact future generations. Monique feel she chose the career field well and wants to help and share her knowledge with others:

*I think I'm in the right position. I like science and STEM area. I also wanted other people to know the importance of the natural resource, too. So, I took the STEM area, but also the natural resources, so I might want to educate people or maybe get a skill in the city and explore more opportunities, like*
that way, and also, teach the next generation that how important [it is] to be [understand] whatever you are using.

Mary Jane’s first focus and connection to larger context is to be a law abiding member of society. This is currently a challenge as Mary Jane enjoys smoking marijuana but does not want to participate in activities illegal in this State. To do this, she and her wife are making plans to move to the western United States. Mary Jane further sees this as the correct move and wants to make a difference and be an example for others in the future. When asked about her future career goals she said she may pursue engineering. Mary Jane perceived engineers as helpful: “I don’t know, just being able to build something. You know, engineers, they build things. They make things better.” She further expressed a desire to be a role model for other that have made mistakes. She sees completing the welding program as a first step:

I want to do something to set an example or prove a point because I feel like I kind of got tossed away and I want to come back and I want to freakin’ show Judge Mertz, like hey, even though you’ve made this a really difficult road, I still did it. Even though I did all this stupid stuff growing up and I was such a freakin’ heathen, I’m still doing it. There’s still hope.

Not only is Mary Jane concerned for her own well-being, but she also feels compelled to support national issues of equality for women in the workplace in pay. She also feels passionately about gay rights. She thinks there is more equality in the western United States and wants to help others by adding her voice to a larger group:

I feel like I’m not quite standing alone, but people standing next to me don’t quite see the big picture because they’re so old, they’ve been putting up with the same bullshit year-after year. They’re at the same point that I am, but what do I do? We need more people to stand together, that’s the way I see it.

Cora wants to be part of change in her career field. She wants women to be taken seriously. She feels how a women presents herself will lead to different treatment: “I think
presentation is a lot about how women are treated, unfortunately.” She further explained, "I shouldn't have to strategize that but I've had to practice and learn things that make men either take me seriously or at least not discredit me upon seeing me.” Cora also talked how more women in the industry would change workplace culture. She described how she imagines the current culture in the field as hyper-masculine. She feels she will be challenged to learn how to operate in that environment:

If they're not super managed but they are really bad about reprimanding. And this is, I don't know it's not locker room talk. But, guys respond to things ... They punish each other, they call each other out and they will yell at you in front of a group of people and they think a punishment is making your peers think that you're not good at what you ... I don't know, I've heard a couple really harsh situations and I just don't know how I'm gonna respond 'cause that's not how I learn from things. I would like to be told what I did wrong, or fix it. Not, I don't like public embarrassment. A, it doesn't embarrass me and then B, I would just scale it. I don't know. So the male culture that I will have to probably learn a little bit more.

Cora shared there is a “locker room” talk among the men in the program at times. She said she ignores it and suspects her classmates think she must be tired: “I put my head down. Everyone thinks I'm tired all the time. But, I just put my head down 'cause I don't wanna talk about it.” She feels the men in her program say a lot things that are” insensitive” to women. But I'm just like, "Do you hear yourself?” Cora gave several examples and characterize them as “hurtful” and related them to how women “present” themselves:

I think that men, they say a lot of opinions about those trials for all the women who are, you know ... They just said a bunch of really hurtful things that didn't have anything to do with the circumstances. It was to do with her and her personality and why they didn't trust her because how she presented herself. I was like ... That is not what you need to be taking from [the trials] ... I don't know.

Mary Jane is currently working in her career field while she completes her degree. She acknowledged the environment is not one of support but rather one of criticism and a
pecking order. The environment has similarities for what Cora imagines might be the case for her. Both women discussed how their presence in the workplace can make change. Mary Jane discussed wanting to be part of change for women on the workforce and asked why it was important she shared: “For the world, I don't know. Mankind.” She described her frustration:

_I feel being a lady in the workplace, my new boss, he's given me a new perspective on how women get treated in the workplace. He's kind of a butt hole. He's always got something smart to say. Little snide comments like, "I'll do it like this, but you can't do it like that." Rah, rah, rah. I'm, oh, okay, am I not good enough? I even said that to him last night. "So I'm just not good enough?" Why can't I do it like that? He just acted like he couldn't hear me and walked away._

She expressed her frustration in her current workplace experience. She feels like she must keep quiet and not complain. Despite her scarcity of women in the field, Mary Jane feels there is hope for change, warns those in her industry: “There's still some of those people out there [like her boss], and unfortunately they are kind of concentrated in the construction area, because there's not a lot of ladies there so who's going to correct them? Here we come!”

**Pattern 4b Agents of change**

All women saw opportunity for change within their chose career field and the social world as well. Each woman saw herself as part of the change they wish to see in their field. How they imagine or perceive their role in the change took on different forms.

Lynn explained she wants to see change and increase the number of women in the profession. When she passes the test to become a residential electrician, she wants to help other and teach other about her profession:
Like, if I get to be a teacher for the apprentices, I would love it, because I'm maturing my knowledge, and if they are, like, females, it would be even more willingful to teach them, and to show them that it's a really nice field, and that if you're careful, it's going to be fun.

Cora also spoke of teaching others how to do rigging and climbing someday when she “gets tired”. When asked how her experience would be different if she had female role models, she shared, she wanted to be inspirational like she had been inspired by a video of a women working on a wind turbine. The woman in the video was the first woman Cora had ever seen working on a wind turbine. It was very impactful and she said described how she felt:

She's the one, she was the only girl and she was the only person doing it, she was just down, hanging on these 80 meter blades by one rope, just painting, sanding. And just an environment that you're like, "Whoa. A person should not be there." And so obviously I was like, "I wanna be there."

While Cora wants to inspire change, as a mother, Monique feels she needs to model the change she wants to see. She wants to inspire her children to keep learning. She called on her own experience with her mother who had dropped out of college. As a child, she thought her mother was not out of touch. She does not want to stop learning and wants her children to persistent in pursuing their interests. She described a pivotal moment with her son when was deciding whether or not to persist with her educational goals:

So then I thought, "Should I stop learning? Right now, I have options. I can go or I can stop." But then I saw my son was saying, "Mom, you don't know this thing. You are so old." I said, "Yep. That happened to my mom, too. I told her the same thing." I said, "No, I shouldn't stop." So that's why I keep going, to give them a better role model and then right now, like my son, at least, there's always a way if you are stuck, it's not you are stuck. You might not find the way you are looking for. You will have to look hard. And there's always solution for everything.
Social Cognitive Career Theory

The data collected in this study was analyzed to understand the lived experiences influencing the women in the study and their decision to enroll in a male-dominated field of study and career path. Three questions were utilized to frame the study. Questions one and two were addressed in the presentation of the theming data discussed in Chapter 4. Framing question three sought to determine if the elements of Social Cognitive Career Theory (SCCT) influenced each woman’s career choice.

Social Cognitive Career Theory is derived from Bandura’s (2002) Social Cognitive Theory which posits self-efficacy, outcome expectations, and personal goals impact human behavior more than genetic pre-disposition. Self-efficacy, simply restated as confidence in one’s self, is a key element of social cognitive theory. Levels of self-efficacy can be influenced by a mastery of experiences, observation of others, the verbal persuasion of influential people, one’s emotional or physiological state and one’s imagined positive or negative outcomes (Bandura, 1997). Social Cognitive Career Theory’s three segment model is concerned with development of academic and career interests (Interest) the formation of education and vocation selection (Choice) the nature and results of academic and career performance (Performance) (Lent, Brown, & Hackett, 2002). As outlined in Chapter 2, self-efficacy is a factor in all three segments of the model. As a result, this third question examined the three segments looking for elements of self-efficacy, outcome expectations and personal goals. The findings reflect common connections for all three segments for all women in the study.

Figure 3 illustrates family influence, sense of self, and a tolerance to be different. This tolerance could also be considered a risk tolerance or a willingness to stand out and
Figure 3. SCCT in decision-making
embrace a unique identity. The lower portion of the figure demonstrates the complex negotiations the women encountered when making their career decision. They balanced the influences of their family, and their own sense of ability and risk tolerance with their interests. Next, the women made choice actions to support their interests. Their performance in their chosen actions were learning experiences that either fueled their decision or helped them rule out certain career options. In all instances the model is based on their personal perceptions of their ability, desire to make change, prove others wrong, demonstrate competences, or simply ensure safety by being the best in the class.

**Interest Model Self-Efficacy, Outcome Expectations, Personal Goals**

The interest model within SCCT suggests that exposure to occupational related activities as well as relevant cultural norms can impact self-efficacy in personal performance in a related activity which, in turn, results in more or less engagement in the activity. Interests are malleable and can change over time. Perceived capability is connected to outcome expectations and provides another link to personal interests (Lent et al., 2002).

In different ways, each of the women was exposed to her career of interest or components in the occupational area. Not only were all of the women exposed to components of the occupational field, but each woman also expressed partiality toward applied, hands-on learning. The interest model of SCCT posits patterns of like and dislike which develops as a child and impacts self-efficacy and outcome expectations and, ultimately, personal goals (Lent et al., 2002). This study supports the interest model of SCCT. For example, Kelsee and Joyce had direct informal experience with their career field having grown up on farms and, thus, choosing agriculture as their future occupation. Both Kelsee and Joyce were also the president of their high school FFA chapters. When asked to
describe her family farm, Joyce indicated she enjoyed the farm, her knowledge of the farm and curiosity about farm operations.

Social Cognitive Career Theory postulates interest in a field is malleable (Lent & Brown, 2013). This was with the case for Kelsee. While she was exposed to her current field of study on her family farm, she had always assumed she would be a nurse. This was based on her early work experience with child care and as a life guard as well as her enjoyment of a course in human growth and development. Her sense of self-efficacy and outcome expectations were deeply impacted while completing her clinical experience in her Certified Nursing Assistant course in high school. She had further experiences that did not support her interest. She had a bad experience with her clinical rotation as she pursued her Nursing Assistant Certification. This negative experience was pivotal in her career choice. While she enjoyed the course content, when faced with the hands-on duties related to the job, she had to determine if the parts of the intellectually-based skill set required for the job were a good fit for her physical skill set. She learned practically about her gag reflex and other physical responses to the job which were not a good fit. At that point, she refocused her interests to agriculture.

Lynn also had early exposure to her intended career field: “Dad taught me a little bit of electricity, or electricity stuff and that's when I got interested... I took an electricity class by accident... forced to go to the first day of any classes...I loved it after that first day.”

Monique had exposure to her field of interest and wondered how she could help. She did not know how to pursue her interest, and had a lack of support, however, the desire and interest never faded: “Those things was in my head and is sticking there and I feel like I should do something about nature, natural things, but back then I did not know what to do.” Even
though Monique did know initially know how to pursue her interests, she continued with her education in building related skills and pursuing related interests.

While Cora had many interests growing up and described herself as "outdoorsy." She believes that working in the Wind Technology industry will enable her to be outside to perform her job. This an environment she enjoys and has been exposed to while growing up. This industry often requires travel as well. She shared her interest in the outdoors and love of travel was influenced by her parents. Cora was challenged by her perception of what she thought college was supposed to be. Cora, like Monique and Mary Jane, had already been to college. She pursued Marine Biology at another community college, without success. Despite having an interest in the topic she was unsuccessful. Her interests needed more direct application. When she discovered Wind Energy, she was able to bridge her interest in the outdoors and the environment with her other interests. In addition to having an interest, she found a connection between the curriculum and safety. Application of interest was key to all of the women. Elements of the need or desire to apply knowledge was found in theme 1. The women sought application of knowledge and sought competence in the application of their knowledge as outlined in Theme 2. Furthermore, the application was important to the bigger picture goals outlined in Theme 4.

While Mary Jane shares other similarities with the other women in the study, she did not indicate she was exposed to her career field at an early age. Certain experiences during adolescence may have been influential factors in her decision to pursue welding. For example, Mary Jane described her father was "really strict" and "he had lot of rules." These rules did not let her be out of the house very often. Further restricting Mary Jane’s access were her father’s influence on what are appropriate activities and pursuits for girls and
women. Now an adult, Mary Jane shared she wanted a job where she can be outdoors. This response may also be influenced by Mary Jane’s incarceration which also restricted her access to the outdoors. In another way, anxiety can restrict one’s access to certain spaces. Mary Jane further described how interests had changed over time. With the help of a therapist she remarked: “I’ve redirected my entire way of thinking.” She changed her interests: “I can control my environment if I start by myself. And that's what got me into welding. I'd rather be able to pull a fuckin’ hood down and just do my thing and not have to talk or keep a conversation.” Mary Jane is farther along in her program than the other women in the study. She has worked in the industry but still is unsure how her interests will play out in her career. She feels confident if she can be outdoors when she works, she will be happy.

Social Cognitive Career Theory’s triadic segments suggest there are feedback loops which create a complex negotiation between interests, choice goals and action that impact self-efficacy and performance for people. “Self-efficacy plays an especially important role in determining how people employ their abilities” (Lent et al., 2002, p. 279). This complex negotiation and feedback loop was present for the women in this study. The women’s interests were influenced by their family connections, their learning experiences and the perception of their own ability. Whether positive or negative, the women contextualized their interests with family feedback, and information gained from their learning experiences which impacted their perceived ability.

Choice Model Self-Efficacy, Outcome Expectations, Personal Goals

The Choice model in SCCT is impacted by the interest and performance segments of the theory. The theory further suggests interests impact educational and occupational goals
which are influenced by a person’s beliefs or self-efficacy and outcome expectations (Lent, Brown, & Larkin, 1984). For example, a person may assess whether they are well suited for an occupation; if they can perform in the occupations, will they be compensated appropriately, or the obstacles they might face as they relate to their occupational choice and determine if the reward is appropriate for the effort. This segment of the model also allows for consideration of environmental factors as influencing educational and occupational choices and actions. Environmental factors may include issues of access and support both financial and emotional according to SCCT (Lent, Brown, & Hackett, 1994).

In this study, SCCT’s choice model was evident in the first three themes. The assessment of occupational or career fit is a multifaceted negotiation for the women. The women in the study all chose educational paths leading to male-dominated occupations, knowing their choice is unusual and they may face social and cultural challenges. The women had an interest in the field that was influential in their decision, however, their choice was also influenced by environmental issues. Their decision was also influenced by accessibility, program availability, and financial concerns.

Joyce, Kelsee, Cora, Monique, and Lynn investigated their occupational choice using tactics of self-assessment of ability and exposure to formal and informal learning experiences. In all instances the women were aware of the social cultural issues related to their choice. Lynn not only had early exposure and learning experiences related to her occupation with her father in high school course work, but she also conducted informational interviews with professional working in the industry to better understand the field.

Joyce and Kelsee had considered other programs and colleges. Their decision-making process was influenced by financial issues. Specifically, both of them were awarded
a full-tuition scholarship related to their program of study. Kelsee discussed receiving her scholarship. She shared that to be eligible for the scholarship, she had to be President of her high school FFA chapter. Because her school did not have a chapter of FFA, Kelsey worked with a friend to get one started: “I created the chapter, so I had a little but more to do than just running a meeting. I had to go out and get the community, get the school involved, really had to make the foundation to get this.” She said her career goals became clear when she learned she would receive a full-tuition scholarship. She also had to have a financial plan that coupled with her interest in the field of study. Kelsee further discussed how she felt as well as how her occupation and educational decision became clear when she learned she had received the scholarship. She talked about being uncertain about her choice and her financial concerns. She had solidified her interest but needed the scholarship to increase her sense of efficacy from a financial standpoint, and receiving the scholarship was the catalyst: “Cause for a while I didn't know how I was gonna make it all work with financial stance for me and that just cleared it that I was gonna be okay for my first two years.”

Unlike the other women, Mary Jane had little exposure to her chosen program and, instead, chose primarily based on the available programs at her preferred campus location. Mary Jane had enrolled at another MCC campus and took general education courses. She had limited success in the past due to poor attendance. When she decided to return to school she described her process: “So I was like, ‘Well, I'm right here. This is what they offer. I want that one.’ It was like an ‘eeny, meeny, miny, moe’ thing.” Mary Jane shared that her process did include elements of assessment to determine what would be a good fit. When she was deciding on an educational path, she was working in a large factory environment. Rather than assessing her interests and likes, she weighed options based on her past
occupational experiences. She spoke about what she did not want in a career and analyzed cost benefits of her career options. Despite a lack of knowledge regarding welding, Mary Jane knew she needed financial stability and observed welders were paid better than she and others in the factory setting. This assessment, the accessibility of the program, and her confidence in her intellectual and physical ability led her to choose welding at MCC.

All instances, the women were aware of the social cultural issues related to their choice. Despite choosing a career path that differed from social cultural norms, Cora, Joyce and Kelsee enjoyed exceptional family support for her choices. Joyce explained her father’s support and how he directed her to consistently pursue course work in the agricultural field. Joyce further explained she believed women are perceived by men as less intelligent because they “have always been dominant.” She further she hopes this perception will change and people will keep an open mind. Women considered the career field: “Okay, you're like, they're smart enough to do this. But it might just take us a little bit, an extra step or two is what I'd say.” This statement suggests Joyce does not believe women are less intelligent but, rather, they have not been given the same opportunities because they have not been dominant. In several instances, Joyce’s father was an important influence in her self-efficacy. Certainly, Joyce made a decision to receive support, and made a choice to move forward at each step in her educational journey.

While family connections where impactful for all of the women, they were not deterred by a lack of support or by their deviation from dominant occupational roles for women. Lynn’s stepfather and Mary Jane’s father did not support their occupational choices. Mary Jane felt her father’s lack of support was based on occupation choice because her father was rooted in antiquated social cultural roles. She explained her father’s reaction to her
occupational choice: “My dad had his heart set against me taking this class. Every time I bring it up, no, you don’t want to weld, you don’t want to weld. Rah, rah, rah. And you should do something else.” When asked how this resistance made Mary Jane feel, she said: “It was kind of expected. Like I said, my dad is sexist; he won’t admit it, but he’s kind of sexist. He just doesn’t see it.”

Lynn’s stepfather’s also subscribed to similar views on appropriate occupations for women. When asked what her family thought about her chosen program of study at Midwestern community College, she shared that her stepfather preferred she would not pursue welding as a career field. He told her: “I wouldn’t like you to be here and getting all your hands dirty and you know, having your eyes damaged for the light, for the fire, that thing.” Lynn further described her feelings about his reluctance, saying his resistance was less about sexism but rather an issue of safety: “So he just wants me to be safe, I guess.” The concept of safety was important in Lynn’s sense of self-efficacy. She explained how she needed to be the best in her class to prove she is safe to herself and her stepfather. Lynn was determined to pursue her interest without initial support. Monique’s choice was also questioned but her own sense of self and self-efficacy based on her interest, and belief of her ability, she went forward anyway. When making the decision to continue her education, her husband encouraged her to pursue a female dominated profession. She explained her husband supported her education but thought she should pursue nursing. She told him: “Yeah. Nursing is good. But, not everybody can do that.”

Whether supported or experiencing resistance, the women in the study, chose to pursue their area of interest. This choice is likely influenced by their confidence or self-
efficacy and their expectation that their occupational choice is appropriate for their personal needs.

**Performance Model Personal Goals**

The third segment, the Performance Model further connects interest and choice with performance. Performance combines ability and motivation. As all segments of the SCCT, the performance model is also concerned with motivation in connection to self-efficacy, outcome expectations and performance goals. The women in the study related negative experiences associated with their career choice or when they are in the learning environment. Despite meeting resistance, the women were motivated to persist. They assessed their ability and it was doubted, and they often sought to conceal their own doubt about their ability until they could prove their competence. According to SCCT, those with lower self-efficacy are likely to have lower outcome expectations and goals. It seems this concealment is an attempt to increase self-efficacy until they can prove or apply their skills. This may seem like a departure from the elements of SCCT’s performance model which suggests when there is a perceived deficit in ability, people are likely set lower goals for themselves. Each of the women in the study were asked about their confidence in their choice and their confidence they will reach their goals. All of the women were very confident but looked to conceal their own doubts. Cora explained that she feels deficient in the technical areas. She would rather struggle and work harder before asking for help. There was a sense of self-reliance impacting their self-efficacy and an unwillingness to let themselves down. Furthermore, the women wanted to prove their intelligence, their skill competence and, in many respects, that they achieved their goal using their own methods.
Lynn had similar thoughts. She explained even when she is confident in her knowledge, she rarely answers questions in class, saying: “I don't answer. I'm just doing my stuff. If I understand it, it's okay, but if I don't understand it then I have to wait until someone asks a question or I have to wait until the lecture is done to ask the teacher.” Lynn felt self-conscious about her accent and did not want to let anyone know she didn’t know the answer because she would be embarrassed. Because of this, she said, “I prefer to be quiet and just know everything, but be quiet than to speak up.”

Similarly, Joyce felt inadequate in certain areas compared to her peers, and said she “felt kind of stupid” about in class. She explained she felt confident in some areas but not in animal anatomy. She said, “And so when I got to the class and everyone was like, well, yeah, that's the ... and they knew like the structures and the muscles and stuff. And I'm like I just eat the meat, like ... I don't know anything about this.” Joyce further elaborated on her perceived difference among her peers and how it extended and applied to the learning experience. She felt women need more details compared to men. She described a group learning experience where she had to work with a group of men. She told herself, “I live with boys so I might as well go. I'm like I live with brothers, I can put up with them. It's fine.” She further shared she thinks, communicates, and learns differently from men. She described it as something she can handle and tolerate because she had patience. Despite feeling a deficit at times, Joyce, who was in her first semester of study, felt fairly confident she would complete the program. She imagined that completing the program will boost her confidence. The concept of self-reliance continued with Joyce. When asked to reflect on how she might feel when she said, “I would say, just because ... and a relief to myself,
knowing that I did it and ... the feeling of fulfillment as well. Just because I did it myself and no one else did it for me, and that I put in the work that needed to be to get it done.”

Lynn also expressed feeling behind her peers. However, she was very confident she would complete the program and be the first in her family to obtain a college degree. She is in her first semester of her program, however, her goal is to be the best. She said, “I have to get better at it and I told myself I have to be the best and I hope I can be, but at the end of the semester ... at the end of this program.” She further explained, “I don't think I'm the best one yet. Yet. But I will try to study even harder, trying to understand and not just memorize the stuff.”

Feelings of being behind were prevalent among the woman whether right out of high school or having several years of experience. Ability and competence was a concern and motivation for the women in this study. Cora was no exception. She described her deficit, feelings, and motivation. She felt others knew what they wanted to do for career as teenagers and, a result, they were ahead of her. She described how this affected her: “It does affect me sometimes I don't want to ask questions, and I have to go out of my way to like research something, because I don't want to, like, I don't want to admit I don't know something basic.” She felt the curriculum builds on itself which created a fear within. She was afraid she will master the required skills and would prefer to avoid outing herself and experiencing embarrassment and rejection. She said, “I'm scared people won't help me, and I'd rather help myself if I can.” Cora felt an even greater pressure beyond a skill deficit. She felt she was representing all women with her physical and academic performance. She felt the dichotomous nature of our social structure put greater pressure on women in male-dominated fields. She described the pressure to represent women in general. She further shared her
feelings of deficiency and self-imposed tokenism, saying: “Sometimes I do get scared 'cause like I don't wanna be the one who messes up, and I also don't want to be the woman who messes up.” Cora shared how her representation in her program related to her intellectual ability and her reticence to ask questions in class. She said, “I, there's not a lot of us right now, like, so if seen as someone who's like not behind. I don't want to misrepresent us, I'd rather just like, yeah, go seem less intelligent after class.”

Determination or motivation to complete was prevalent in among the women as it related to competence and skill development. The application of this competence was important for all participants. Joyce shared her irritation when her way or learning, interests or abilities were discounted, saying “They're just boys.” She said didn’t understand why she should not be supported when she takes risks and is “adventurous”, which is a typically male trait according to Joyce.

Kelsee was questioned about her skills and preparation for her chosen occupation. She felt confident that growing up on a farm, and her experience with FFA prepared her to understand the requirements of the career field. She felt particularly irritated when a family friend questioned her interest and ability and suggested she was not prepared; did not understand the requirements of the field. He questioned her fitness for the field using a gender-loaded example. According to Kelsee, he said: “I couldn't just go shopping on the weekends if I wanted to, I might have to work, the long hours would get to me, I just wasn't fit, 'cause I didn't understand all the things that went in to agriculture.” Kelsee explained she hung on to this as motivation stating, “I'll be sure to prove you wrong.” She further explained why she was upset by his comments. She explained how she understood the field yet she was prepared for the sacrifice because she grew up with it. She used the example of
how her father often missed her activities because the work load and schedule in agriculture is dependent on weather. She shared how she understood the circumstances, “I mean my dad was like, the machines aren't rolling, we aren't making money, and I 100% agree with that.”

Mary Jane was also motivated to prove her competence to others including the judge who tried her as an adult. She felt she was making a good life for herself and the welding degree is a good start. Mary Jane planned to write a letter or speak to the judge who tried her as adult to tell her she had completed the welding program. She spoke of completing her program study and her motivation: “Even though I did all this stupid stuff growing up and I was such a freakin' heathen, I'm still doing it. There's still hope.”

Joyce was just starting her program of study, and talked about how her earlier experiences were preparation that helped her to develop motivation and resilience. She explained a time in high school she felt the basketball coach was picking on her. She explained she was a starter as a sophomore and, by the time she was a junior, she was “benched”. She felt that despite having all the required skills, her starting position on the team was being taken away. Rather than being dissuaded Joyce chose another path despite pressure to quit the team. She explained her determination. At times, she felt like giving up but, instead, she kept working to get back her starting spot on the team. She said, “I just kept working and I just tried to prove people wrong. People were like, ‘Well, I would quit.’ I don't like that perspective.”

Like the other women in this study, Lynn wanted to prove her competence and was motivated to be the best in the program. Coupled with her connection to her church and her desire to help other with her skills, Lynn was deeply motivated to demonstrate competence to her stepfather. She wanted to tell him, “Okay. I didn't get electrocuted. See? I'm safe and I
can do it.” When asked why she wanted to “be the best”, she shared her competence and motivation were connected to her stepfather. She didn’t want her stepfather to worry about her. To alleviate her stepfather’s worry, Lynn felt she must be the most skilled person in the program.

Even Monique, who has the three dependents, felt confident she would complete the program, although she felt it would take her longer than her colleagues. She wanted to “keep going” to be a good example for her children. She also felt like she was not able to pursue the program of study she wanted when she was in Bangladesh. Now she knew she wanted to make an impact by understanding waste water treatment through vocational education by providing clean water for the world. She said she felt clean water is taken for granted and shared we should all care, “…because, without water, nobody's gonna survive.” She was confident she could manage her education while raising children, stating: “If you know how to run a household, you can run every single organization.”

Cora was motivated and confident she would complete her program of study not only for herself, but also she wanted to do it for her parents. She wanted to achieve financial stability for herself and she also desired to be able to take her father to Europe. When Cora was asked how her confidence was different now compared to her first unsuccessful attempt at community college, she said:

"I didn't have this confidence last time 'cause I didn't have a picture in front of me of what this was all for. I had ideas, and I thought it'd be fun to learn about this, this, and this. But this is, even when it's not fun I'm like, “Oh I need this. I need this to not get hurt or to perform my job.”"

Overwhelmingly, the women were confident in their ability to complete the programs of study. Rather than using others’ doubt to deter their efforts, each woman took the
questions and doubts and used them as motivation, it fueled their choices, determination and efforts to succeed. The women were aware of the socially driven perceptions of female intelligence, perception of female motivation and female ability. While it impacted the women’s decisions and efforts, it was surprisingly a positive motivator. The women accepted the larger issues and found ways to move their interests forward despite the things they could not control. The challenge they imposed on themselves was an unwillingness to speak up with their questions and doubts in a classroom setting. They worked harder and were more self-reliant without wavering in their goals. With varying degrees of family support, the women were accessing programming on their own terms.

**Summary**

Chapter 4 provided an outline and summary of the experiences of women enrolled in male-dominated STEM career pathway programs. Data collection using phenomenological techniques and the analysis procedure were outlined. A detailed profile of each of the participants was provided to honor the stories of the women and provide rich contextual information. Four themes were identified and described to explain the lived experiences influencing the women’s decision to enroll in their occupational program study a Midwestern Community College. In Chapter 5, Social Cognitive Theory is used a tool to further analyze the experiences of the women. Chapter 5 will include an analysis of the elements of social cognitive career theory present among the participants, limitations, implications for policy and practice as well as recommendations for future research. The chapter will conclude with a reflexivity statement.
CHAPTER 5. DISCUSSION

This exploratory study examined the lived experiences influential to women’s enrollment in male-dominated STEM CTE programs at a large multi-campus community college. Chapter 1 introduced the topic, definitions, and research questions. Chapter 2 outlined the literature related to the topic and the theoretical framework explored in the context of research questions one and two. Chapter 3 presented the methodology utilized in this exploratory study. The findings were presented in Chapter 4, and Chapter 5 will provide recommendations for future research, policy, and practice. A reflexivity statement will conclude Chapter 5.

Limitations

This study has some important caveats to consider. The study was limited to students who identified themselves as female on their application for admission to MCC. Gender is a significant consideration because female students are underrepresented in STEM programs and career fields. Recognizing other factors could deepen the data pool and provide educators, policy makers and administrators additional insights about women in CTE. For example, race/ethnicity, socioeconomic status were not considered in this research study. These parameters were not included as part of the study due to time constraints. Should this study be replicated, adding a quantitative component exploring factors such as socioeconomics, race/ethnicity and familial college experiences may further enhance the information that can be known about this population. Expanding the participant pool to include a wider range of programs within STEM CTE may further deepen the understanding of this population. Perspectives of faculty were not considered in this study and could also
expand the perspective and further contextual relationships among the students’ educational experiences.

**Research Questions**

Each chapter was framed by the study’s research questions:

1. What are the influences that shaped participants’ decision to enroll in a male-dominated STEM career pathway program?
2. What are the lived experiences of women enrolled in a male-dominated STEM career pathway program?
3. How might social cognitive career theory explain these influences and experience?

**Analysis of the Themes**

As discussed in Chapter 4, several themes emerged regarding the lived experiences of women in male-dominated CTE programs. The first and second research questions are comingled with themes of family, learning experiences and social traditions that were impactful in the participants’ lived experiences and career choice. Application of learning in a hands-on environment and the use of skills to create a meaningful experience were common among each of the women and influential in their career choice. Each of the women was determined to overcome deficits or challenges and act as role models for others. Gender inequity in the field was assumed and normalized among the participants. The women in the study felt everyone was working toward a common goal. Tolerance of inequity and, in some instances, macroaggression was normalized and perceived as typical. Connection to a greater good or larger context was of most importance to each woman in career choice; however, the manner in which each women perceived this connection varied. There was also a sense the women were precluded from knowing what careers could be
sought because they were not exposed to typically masculine interest areas with more technical hands-on educational experiences in their field of interest because of their gender, such as those provided in shop class or boy scouts. This led the women to perceive they had to “catch up” in their field. Nevertheless, they felt deeply connected to their personal desire to have a meaningful profession that helps others.

Elements of SCCT within the interest, choice and performance models, were present among the women in the study and were directly connected to framing the 3rd question: How might social cognitive career theory explain these influences and experiences? As supported by SCCT, the women all had an interest in their career field based on past exposure and mastery of the related tasks. They all followed the choice model. Their self-efficacy played a role. Their outcome expectations coupled with their interest development, over time, led them to make their career choice. Performance connection was slightly inconsistent among with the women. Most had experienced success within their area of interest to varying levels, with the exception of Mary Jane. Mary Jane can be seen as an outlier due her incarceration before reaching adulthood.

Figure 3 illustrates the tenets of SCCT at play as the women navigated the complex negotiation of career choice. The figure depicts a funnel stacked on top of a moving circle. The funnel represents each women’s assessment of her career options. The funnel contains the variables of family, self-perception of knowledge or ability and tolerance. These were prominent in each women’s assessment of her options. The variables in the funnel swirl as the participants considered and assessed their options. Issues of accessibility further influenced their goals as did issues of accessibility.
The funnel in Figure 3 is stacked on top of a moving circle. The moving circle depicts how the each woman’s interests influenced her career choice. Her performance was fueled by the connection she felt her a larger purpose in the career field or the world and her performance drove her to achieve competence and fueled her determination to complete the program.

Self-efficacy and outcome expectations, including learning experiences and knowledge influence interests, human choices, and performance behaviors. The stacked funnel appears above the 4th quadrant circle to demonstrate the sort of essence of the women’s career choice. This indicates the influences in the broadest sense. Family (experiences both positive and negative), coupled with self-knowledge/self-efficacy (based on their perception of their ability) with tolerance for risk, inequity, environmental challenges, instructional issues, and sexism were all assessed. Tolerance is coupled with a drive and determination for success for a wide variety of reasons rooted in their past experiences. All of the women had experiences that required them to persist in the face of obstacles. Their decisions were filtered to consider goals and accessibility. Their goals also had variety but, in all instances, the women wanted not only to find the correct fit for their day-to-day goals but also considered how their career choice made connections to larger goals. Their goals varied. For example, one woman wanted to produce food for the world, another desired to work toward solutions to ensure the world has clean water, and a third wanted to use her skills to rebuild communities devastated by natural disasters.

Accessibility assessment also varied among the women and played a part in their career choice and assessment. For example, Kelsee and Joyce had full-tuition scholarships which were influential in their decision to enroll at the community college. For Mary Jane,
location was most important in her decision to choose her program of study. Accessibility for Monique was also related to the location; however, her personal commitment to understand water contamination and treatment has been nearly life-long goal which had deeply influenced her decision to enrollment at MCC. Cora was similar in that the location worked for her but, most important, was the kind of education she would receive. The hands-on learning experiences the women craved were evident in their program choices and there performance.

The bottom half of the model in Figure 3 addresses the connections to the tenets of social cognitive theory. The women had exposure to their career field or an aspect of the field or environment appealed to them enough to move them to the Choice element of the model. They sought hands-on learning experiences. They had goals to perform well and reach their “bigger picture” goals. The final quadrant is the performance connects to their day-to-day goals, which was where they often felt a deficit. Despite feeling a deficit, they concealed their feelings and worked harder to complete the goal. Each woman was confident she would reach her goal. Monique was the most hesitant to commit to a time frame. She expressed the most concern, and she was the only participant with children. Despite having this additional responsibility, she was determined to be a good example for her children. She wanted her children to see learning as a life-long endeavor and show them determination in seeking a career that is meaningful for them.

Overwhelmingly, the women were confident in their ability to complete the programs of study despite have doubts about their skills. Rather using the doubt of others to deter their efforts, each women took the questions and doubts and used them as motivation, and it fueled their choices, determination and efforts to succeed. Self-efficacy theories and SCCT
postulate that a person’s belief in her innate ability to achieve or complete a potential course of action is influenced by the feedback loop. The feedback loop is fed a person’s interest, their choice goals, and their choice actions and performance. Social Cognitive Career Theory further suggests that interest is a greater predictor of choices people make, but under supportive conditions. Social, cultural and practical choices are often made in unsupportive environments. This was not the case with the women in this study. The persisted when faced with obstacles. They provided examples from childhood through adulthood that demonstrated their willing to make decisions with knowledge the decisions may not be supported or be the most pragmatic choice. This behavior is not consistent with the tenets of SCCT.

The women were aware of socially-driven perceptions of female intelligence, perception of female motivation, and female ability. While it impacted the women’s decision and efforts, socially-driven perceptions were surprisingly a positive motivator. The women accepted the larger issues and found ways to move their interests forward despite the things they could not control. The challenge they imposed on themselves was an unwillingness to speak up with their questions and doubts in a classroom setting. They worked harder and were more self-reliant without wavering in their goals. With varying degrees of family support, the women were accessing programming on their own terms.

Theme One: Women are impacted by their family and learning experiences, both positive and negative, providing them with a clear self-perception of their abilities and challenges.

Within Theme 1 three patterns emerged. Patterns related to family connections and learning experience were both positive and negative among the women and, in all cases, provided the women an opportunity to assess their own ability. Positive support from family
or the learning environment was not necessary for the women to choose a male-dominated STEM CTE career pathway program. What was more impactful was exposure to their area of interest or environmental task-related characteristics of the area of interest. Whether through formal or informal experiences, the women assessed their ability and their interests through the lens of their family and learning experiences in their decision-making process. Some of the women perceived they were smart, in general; however, all qualified their perception of their ability as more applicable in some areas rather than others. This suggests self-efficacy plays a role as they negotiated their perception of their ability. Social Cognitive Career Theory allows for connection to family and other influential experiences. Kelly and Hatcher (2013) supported self-efficacy as a factor in career decision-making for males and females. Using a mixed methods approach, Amelink, Artis, and Liu (2015) understood factors leading to increased self-efficacy among a group of California community college students. They found mentoring and a collaborative environment (social persuasion) to have a positive effect on community college student’s self-efficacy levels. If one can broadly consider self-efficacy, as found in SCCT, as an assessment and confidence level in a person’s sense of ability, then this research supports the findings. Each of the women in the study had a level of self-efficacy enabling them to make a decision to enroll in a male-dominated program based on their interests.

While Amelink, Artis, and Liu (2015) found mentoring and a collaborative environment were influential for community college students, the women did not discuss formal mentoring; rather, they discussed influential relationships with family as impactful to how they perceived themselves. They were more concerned with how their family relationships related to their individual identity, the things that were important to them, and
how this perception of identity translated into a career that supported them and their goals. This lack of concern for mentoring could be further explained by socioeconomic status. Socio-economic status was not examined in this study. However, MacPhee, Farro, and Canneto (2013) found women in STEM fields with low socioeconomic status as benefitting most from mentoring interventions. When asked about mentoring, the women all spoke about how they would like to connect with other women. When asked about what advice they would give to women considering the program, they were all very positive and said women should do it and not doubt themselves. Cora said it in a way that speaks to the societal perceptions of male-dominated careers. She stated, “Do it. It’s not that weird.”

Exposure to learning experiences and careers not considered traditional for women is impactful for women at any age or stage of life. Social Cognitive Career Theory, based on Bandura’s Social Cognitive Theory, postulated that interest and exposure can be connected (Lent et al., 1994, 2000). If there is no exposure, interest cannot develop. While most of the women in this study were curious about their program area at a young age, for some their personal and family circumstances precluded early exposure or they lacked clarity of how their area of interest is applied to a career field. Each woman spent time considering her options, including reflection on past educational experiences. All of the women had prior experience with college. Two women had taken community college courses while in high school, one had advanced degrees from an institution outside the United States, and two were enrolled in community college in the past but were not pursuing transfer programs of study. Social Cognitive Career Theory suggests levels of self-efficacy are malleable and can change overtime (Lent et al., 1994, 2000). This again supports the idea that exposure to a wide range of career opportunities should be presented continuously throughout childhood and
adolescence. Providing opportunities to take the exposure and demonstrate how the skills, knowledge and learning is applied will increase self-efficacy or decrease based on their personal performance or evaluation of the experience.

**Theme Two: The women made their decision to enroll in male-dominated programs with the knowledge that there is inequity in the field and in society.**

As theme two was emerging, it became evident that gender and awareness of personal and societal ideas of gender became a significant pattern. Connected to this pattern was the concept of finding a career that fit. A final pattern under this theme was STEM and the inconsistency of a perceived connection to STEM in their career choice. The women in this study experienced the pressure of societally-driven expectations for them as women. In all cases the women were pushed to consider traditional helping or caring types of career fields. Despite their awareness of societal perceptions and the inequity within the career field, the women chose to enroll in a field not considered by many as appropriate for women. Most research on STEM has focused on STEM and transfer and, therefore, conclusions about STEM and CTE must be framed in the literature that is peripherally related. The in this study women found their interests and desire for applied knowledge and skill outweighed societal perception and concerns.

Another constant in their process was a desire to see how learning was applied. The women were not interested in regurgitating information that would not be helpful to them in their career. Learning experiences show application and knowledge useful (Brush, 1985; Scholfield, 1982; Sherman & Fenema, 1977). They focused on making their education work for them. They all felt some level of deficit in skills, social capital, physical strength or contextual knowledge. In all instances they pushed forward past success or experiences to
drive their passion to succeed. They felt their career field was the correct fit for them at this time.

While the women did not consistently identify their field as STEM or themselves as scientists, technologists, engineers or mathematicians, they all perceived that people in STEM fields are intelligent. Each woman acknowledged that technology was part of her career field to varying degrees. Several also saw technology at the conduit to compensate for any physical limitations as a result of their size and lack of strength.

The lack of connection to STEM suggests there is opportunity to educate future students and families regarding STEM fields in the context of identity development. Rodriguez-Jones, Cunnigham, and Jordan (2016) took an intersectional approach to explore identity theory with women of color in the sciences. Findings of their study recommended further additional intersectional research on science identity development would be helpful to community college women and specifically women of color. Trauger, Sachs, Barbercheck, Keirnan, Brasier, and Findeis, (2008) examined the educational needs for women farmers using an intersectional identity based approach accounting for the seriality of their identities. Specifically, they sought to understand how women experience different identities in different places and time. While this study did not focus on identity, Trauger et al. (2008) discussed the perception of women’s bodies as lacking masculinity and how this perception impacts the perceived value of work women perform on farms. The women in their study reported gaps in their knowledge and lack of education on equipment maintenance due to a socially-constructed, gendered division of work tasks.

The concept of women as more caring than men was present among all participants in varying ways. For example, Cora talked about her parents having reversed gender roles.
When Cora wanted to be comforted she went to her father, whereas Joyce and Kelsee perceived women to more nurturing and caring. The importance of caring and being helpful as was prevalent with the women. They all wanted to see their career choice a helping profession. Joyce’s father explained that agriculture was just as caring as nursing, and Cora cared about helping the environment as did Monique. Mary Jane cared and wanted to help make change. Lynn also perceived her career choice as one of care and helping. She wanted to help others through her skill and mission work, and to teach others her skills. Their perception or interpretation of a caring or helping profession is not socially supported.

The concepts of gender difference was present in the way the women thought about their career choice, their chosen field, and their classroom environments. All talked about when they felt upset by insensitive comments related to gender; nevertheless, they made positive statements about the current learning environment. They seemed to ignore or accept insensitive behavior and microaggressions as the norm. Many of them also expected this will be the case when they are working in the field. They felt proud of their contributions and future contributions to the field and, in some cases, their contribution to the world planet. Yee (1977) found that in this westernized patriarchal society, women want equality in career opportunities rather than focusing on cultural change. The women in this study understood and acknowledged the socially constructed parameters affecting the world’s perception of their unusual career choice. However, in varying degree and ways, each woman wanted to help others and the world. They perceived themselves as making a difference by their simple presence in the field rather than overtly fighting for cultural perception of the field of study.
Theme Three: Women compensate for a perceived deficit of technical skills or knowledge through determination and a willingness to work harder to achieve success

This theme closely aligns with the performance model within Social Cognitive Career Theory. The performance leg of the model is concerned with persistence in the face of challenges. The women in this study each faced challenges. The data provided evidence that each woman faced her challenges with determination and a willingness to work harder to achieve competence and future success. Literature in SSCT suggests experiences or achievement may increase self-efficacy (Lent, Brown, & Hackett, 1984, 1994, 2002); however, in this case the women perceived they had less exposure to knowledge required in the field. These perceived deficiencies led them to be quiet about their doubts. They did not want to be outed as less competent or knowledgeable. They most often remained silent about their questions. They chose to do additional work or ask the instructor for help outside formal class hours. Cora was very clear about why she chose not to speak up when she felt deficient. She said she felt she was “...speaking for all women and she doesn’t want to be the one that screws it up.” Lynn wanted to be the best in her class regardless of gender; thus, she felt self-conscious about her accent and preferred to ask questions outside of class. Mary Jane wanted to be told by her instructor how to improve her welds one-on-one. Joyce was interested in learning from others, after she felt socially comfortable with her classmates.

The women did not report others judged their ability, background, tools or performances to be deficient. This was self-imposed. Lester (2010) discussed the “chilly climate” for women in science classes. Lester noted faculty can be sexist and have low expectations and disparities regarding their interaction with female students. For women, the environment can “...lead to feelings of isolation, intimidation and loss of self-confidence” (p.
This finding was not consistent with the experiences of the women described in this study. If there was isolation the women reported it as self-imposed and not related to faculty mistreatment. They shared isolation related to incongruence with their classmates’ based on age, different interests, and opinions. One of the women was vocal about the sexist behavior in the classroom. She reported she rarely chose to speak out but, rather, tried to remove herself from the environment.

Hughes (2014) studied women in STEM fields to understand the participants’ perception of gender roles, lack of role models, overt and subtle discrimination. Hughes also described the environment as “chilly” based on the participants’ descriptions of sexual harassment, unfriendly environments and isolation. McGrayne (2005) reviewed the literature and research regarding women in science and technology fields from 1990-2005, and confirmed the fields to be discriminatory and sexist for women. Findings in the current study confirmed sexism in male-dominated fields, while often not perceived or acknowledged as happening in the classroom environment. While the women in this study did not acknowledge it as sexism, or chose to remove themselves from the environment or conversation, this option was not seen as possible if they were going to be successful in this field. The failure of women to report isolation and sexism does not remove the occurrence from the reality of the situation. The current study supported Toglia’s (2013) assertion that, despite legislation enacted to combat discriminatory behavior more than 30 years ago, gender equity in career and technical education has only slightly improved.

Despite feeling some deficit and having a desire to prove themselves as competent, the women in this study were confident they would finish their program of study. They cited their passion and determination as motivation to complete their program of study. Blackwell
and Pinder (2014) examined the motivation of first-generation women pursuing higher education. Their findings revealed factors related to school and family life along with an intense internal drive to succeed as most influential to motivation. This is congruent with family connections identified in theme one outlined in Chapter 4. This determination is evident in the decreased time it takes women to obtain a degree. Deutsch and Schmertz (2011), and Andreas and Adamuti-Trache (2008) found women attained post-secondary degrees at similar rates as men, or they completed their awards more quickly.

**Theme Four: The women want to prove their competence to help themselves and others with their skills and as role models.**

Previously it was suggested that K-12 students be exposed a wide range of STEM related career fields. The women in this study experienced different levels of support for their career choice. Those with positive support for their choice experienced their career field as part of their family business. Others did not have this constant and direct exposure to their career field. Regardless of the level of support and exposure, each of the women felt a deficit in knowledge, skills, or tools, or physical strength to varying degrees. While exposure is one measure to improve these deficit feelings and increase self-efficacy, role models can also provide support. Social Cognitive Career Theory suggests role models are influential in career choice, and can increase levels of self-efficacy (Lent, Brown, & Hackett, 1994). Community colleges typically provide small classes and supportive faculty. The women in this study shared positive experiences with both male and female instructors in high school. While there was not an equal amount of female instructors represented among the faculty in CTE programs of the women in the study, they all expressed comfort with their male faculty. The women did not report having a mentor, male or female, to guide them as they pursue
their education and career. To varying degrees and often in different ways, the women in the study expressed comfort and trust among women but did not see the lack of women as a deterrent strong enough to impede their goals. Conversely, most of the women expressed a desire or willingness to help others, support others, or teach others. This would suggest mentors and role models can be effective whether they are male or female.

Each of the women expressed they wanted to be part of the change in their field. They wanted to contribute to something larger themselves. This took on different forms. Each women further spoke of teaching and acting a role model for others interested in her career field. Community colleges are well-suited help close the STEM gap, with female enrollment at more than 50% (Wickersham & Wang, 2016). Women like the women in this study who are looking be make change in their field and for women in general can be a vital resource of mentorship for future students. Community colleges continue to be asked to play a larger role in STEM initiatives (Van Noy & Zeidenberg, 2017). Supporting community college women must be considered when looking to increase gender equity in STEM fields.

**Implications for Practice and Policy**

This study was conducted to explore the lived experiences and career choice decisions of women enrolled in male-dominated STEM CTE programs. The results of the study are intended to inform community college administrators, faculty and staff about this understudied population of students. Understanding these women can assist in the development of appropriate practices and policies related to CTE programming and State economic growth efforts.
Practitioners

Community colleges are on the front lines of CTE education. Community colleges are an accessible and affordable avenue for all populations to gain access to higher education. Women are choosing community colleges more often than men. Nevertheless, there is great disparity between men and women enrolling in CTE programs. While this study focused on the lived experiences and influences of women in CTE STEM programs, community college administrators and faculty have a huge opportunity to support discussions about the role of gender in all types of education. The women in this study were acutely aware their gender was impactful in how they navigate not only the classroom but also the world. They acknowledged the perception of differences as well as the physical difference between men and women in the workforce. Because faculty teaching in CTE programs most often come from the workforce, faculty are uniquely situated to understand gender issues in CTE education. While they may have transitioned to an educational role in their career, faculty bring the perspective of having experienced the field and its gender-related disparity. All of the women in the study discussed feeling they were deficit in skills, but they chose not to hide their feelings. Creating a community that understands and works to remedy or bring it out in the open is essential to attracting more women to the programs. Using task forces and focus groups of faculty, staff, and students can help illuminate the issue and create a dialog and support.

Faculty in community colleges often play an integral role in curriculum development and delivery. Career Technical Education programs typically include communication skills, but they generally do not address how gender impacts communication in the field and how people learn can have a distinct difference based on a wide range of background factors.
including gender. As the workforce continues to change and diversify, issues of gender must be addressed in pedagogy. All women in this study explained they wanted to be taught using instructional methods that create a deep understanding and application rather rote memorization. Faculty should seek to address these issues, and administrators must lead the charge in supporting faculty and staff development to retain and support students.

Related to the issues of pedagogy are issues of inherent bias. The lack of gender diversity among CTE faculty, may deter students from enrolling and persisting. This bias can further inhibit the instructional process if instructors are not attending to diversity among learning styles and needs of the students in their classrooms. For example, the women in this study all discussed how they would have liked to have learned differently as they wanted to understand why they needed the knowledge and how it was applicable to their goals. The women shared that they rarely, and some never, saw a women depicted in classroom instructional materials or promotional materials. This persisted despite a lack of attention to their learning style and role models.

Community college administrator, faculty and staff can also help shape perceptions of STEM and CTE programs in the way they present women in programs of study and career choices. A comprehensive review of promotional materials and images on campus can illuminate the institutions’ implicit bias. By including images of women succeeding in the CTE fields, there is opportunity for all students, faculty, staff, and administrators to challenge their socially driven perception of these career fields. Future students considering these careers will see someone that looks more like them. There is a key need to identify women in STEM CTE fields to positively support and provide mentorship for women considering entering these fields. The women in this study sought connections to large issues. They
wanted to see how their career helped others. Adding this element to how CTE STEM programs are discussed is essential to attracting and retaining women in these career fields.

There is little diversity in the workforce in CTE STEM fields, thus it is crucial for community college CTE advisory board members to be diverse and provide the bridge in the recruitment of professionals from the fields to serve in this capacity. Ideally, advisory boards would have gender equality in representation. Gender equity did not exist in the programs for the women in this study.

Practitioners and administrators at institutions should examine hiring and instructional policies to determine if there are barriers to increase diversity and inclusion among program faculty. Lester’s research (2008) suggested male or female dominated academic departments experience more gender inequity. If there is inequity among the faculty, this might naturally extend to the students in these programs. Because the women in this study reported a macroaggression as normalized in the classroom, making a focused effort to increase diversity in the faculty. Furthermore, then diversity cannot be achieved providing all faculty with diversity training is essential.

It would seem faculty are the greatest asset in providing women with a safe classroom environment wherein women can thrive without feeling they must be perfect or act as a token representation. This safety should extend to women teaching in male-dominated fields. Cora expressed concern about her femininity. She felt when she dressed more masculine she was received on a more equitable level when working with men. She further noted she felt pressure when she was speaking in class as if she was “...speaking for all women and she doesn’t want to be the one that screws it up.” This inequity and pressure likely extends to female faculty. Women must also be relieved of the negative aspects of tokenism, and
faculty must resist the urge to classify work tasks and classroom works tasks in terms of masculinity or femininity of the task.

Faculty are the key for women in the classroom. Not only are there fewer women students in CTE programs and fewer women faculty, but also gender norms in the classroom can be subtle with interpersonal communications among faculty and their students. As social cognitive theory supports human behavior as learned, then gender dynamics in the learning environment are aligned with socially driven perceptions of what is feminine and what is masculine. Because the male perspective is dominant, the classroom is a biased atmosphere. Examining how these norms creep into the workforce, curricula, how courses are taught and the method of delivery is the responsibility of the faculty and administrators overseeing program education. Lester (2010) further suggested gender norms among female faculty in male-dominated vocational academic departments have to combine masculine and feminine traits to be successful. The inclusion of both gender traits will aid in acceptance of male-dominated CTE programs and prevent resistance from male students. Female faculty and students also have to strategize how they dress and speak to ensure they assimilate into the STEM field. Faculty should also change their behavior to try to “fit in” which speaks to the male culture that judges women, which will require cultural change in both academia and the workforce.

Administrators and Policymakers

Most of the women in this study lacked a sense of connection to STEM. The reason for a lack of connection varied among the participants. However, each woman reported she perceived people in STEM fields to be highly intelligent. This findings suggests there is
opportunity to educate future students and families regarding STEM fields and what career fields are related to STEM that can be pursued at the community college.

As part of this study, I observed a K-12 STEM festival for the South Central Region of the Governor’s STEM Council. The festival was very well attended and designed to engage children in hands-on activities related to STEM career fields. The enthusiasm and engagement of all children was evident in the way they lined up for each exhibitors booth waiting to get their turn to try it for themselves. Opportunities like this provide early exposure and engagement related the skills, tasks and tools related to STEM career fields.

Several women in this study felt they did not have a wide range of exposure to typically masculine formal or informal learning experiences while growing up. At the K-12 STEM festival, I observed, an equal number of boys and girls at most booths regardless of typically gendered professions. For example, there was an equitable amount of boys and girls at the nursing booth. The line to work with robotics had as many girls and boys. This suggests that self-efficacy as part of SCCT in career interest, choices, and performance is malleable (Lent et al., 1994, 2002). People are influenced by the behavior they observe (Bandura, 1977), and we can help them by exposing people at a young age to many career fields regardless of their perceived masculine or feminine societal norms. Numerous state and local efforts are being made to educate students on STEM career fields and provide them opportunities to experience tasks related to STEM fields. At the state level funding must support these efforts. Community colleges and their business and university partners must support early educational efforts.

Women are not achieving equity in STEM CTE programs. This suggests the work of deconstructing socially driven notions of gender must continue. The women in the study
were aware of gender perceptions within their chosen career field. With either support or resistance, they took a risk anyway. They all felt strongly they had chosen the correct field. The research on STEM transfer programs suggests the social perception of the field often precludes women from entering educational programs. This would suggest there are many women also self-selecting out of CTE STEM programs. The literature further suggests the chilly atmosphere does not support women and indeed assists them in self-selecting out of many STEM related fields. (Blickenstaff, 2005; Cheryan, Jiang, Montoya, & Zeigler, 2016; Lester, 2010; McGrayne, 2005; Packard et al. 2011; Rosser, 2005). Lester’s (2010) research finding on women in male-dominated CTE programs concluded that women experienced a lack of support as well as a hyper masculine classroom culture. The women this study had past experiences that required they build strength and resiliency. Exposing girls and women to typically masculine career fields is only the first step in developing avenues for women to enter CTE STEM career fields. Policy must be enacted that removes the need for strength and reliance and paves the way for barrier free learning.

These findings suggest we have much work to do with gender norms and the learning opportunities afforded to women specifically in Iowa and the United States. Changing society’s perception of designated appropriate careers for women will require time and social evolution. Community colleges can continue to work on diversifying the faculty in CTE programs, and recruit and advertise specifically to women. Accessibility or location and affordability was an issue for all of the women in this study. Two women received full-tuition scholarships which aided their decision-making, whereas the rest utilized financial aid and outside employment. This writer suggests there is a need to provide monetary incentives for women to enter fields where there is a gap in equity. As mentioned previously, women
are completing CTE programs faster than male counter parts, which will continue to improve their rate of community college completion as well as diversification of the workforce.

**Future Research**

The work of Lester (2010) was a catalyst that peaked my interest in this topic and broadly served as a guide to how I approached this study. Because the topic has not been well researched, I recommend replication of this study. The participants of the study were diverse in many aspects. Replication of the study in other parts of the country might be beneficial. There are many variances such as population demographics, cultural dynamics and workforce that could add depth to the understanding of what motivates women to choose male-dominated STEM CTE programs. While phenomenological techniques were used in this study, using a case study approach would allow for exploration of the classroom experience through observation, examination of program marketing materials and other media and instructional material related to these programs.

Exploring this population using more variables like socioeconomic status, first generation, age, and ethnicity would add to the complexity of the data. Understanding the data using a mixed methodology may allow for comparisons to national data sets or allow for additional generalizability. Another approach would be to follow the incoming students through their program of study and into the workforce. Statistics and research suggest women in STEM fields have a high rate of attrition in the workforce. It would be helpful to understand attrition of women in STEM CTE career pathways as well. If there is a similar attrition, it will be important to understand the conditions or circumstances women experience in the workforce. Examining longitudinal data about women in CTE STEM is important to understand their attrition as well as their success.
The women in this study all expressed a desire for hands-on learning experiences. Some lacked exposure to their experiences earlier on whereas others grew up immersed in their chosen career field as part of their family business. Not only did they seek hands-on learning, but they also expressed they often did not enjoy or wished the instructor taught in a way that worked for them. They did not enjoy memorization without understanding why the information was important or how it was applied. A study examining perceptions of instructional techniques from a gender standpoint may lead to a deeper understanding of women who choose CTE STEM programs and the influences that lead to their decision.

Schunk and Dibenedetto (2015) provided a simple definition of self-efficacy that fit the women in this study very well: “Self-efficacy also helps determine how much effort students expend, how long they persist when confronting obstacles, and how resilient they are in the face of adversity. Students with a strong sense of self-efficacy approach difficult tasks as challenges to be mastered rather than threats to be avoided” (p. 516). While this study found the SCCT did not fully explain the participants career choice, much was learned about the women, their self-efficacy, and their ability to persist in the face of challenge. Nevertheless, I posit the most compelling area for additional research on women in male-dominated CTE programs would be in the area of identity development. I found the research of Trauger et al. (2008) and Rodriguez et al. (2017) to be quite impactful. Women often negotiate multiple identities over time and in varying settings. The concept of strategizing and negotiating multiple identities is more complex for women than men. The family experiences of the women in this study were influential in both positive and negative ways. It impacted the women’s perceptions of their ability, their interests, and their choices. I also recommend examining family connection as it relates to identity development using a
feminist lens. Understanding the development of identity from formative years through workforce entry may hold clues for how to increase women in STEM career pathways.

**Conclusion**

The results have implications for those connected to statewide workforce development efforts. Chapter 2 outlined the literature regarding community colleges, women in community college, STEM at community colleges. The research indicated that women are reaching equity in the numbers of women enrolling at community colleges. According to the Nations Center for Statistics (2004), 55% of full-time, enrolled community college students are female with part-time at 49% female. Community college teaching faculty are also achieving balance in aggregate, with 49% of full-time faculty being female and 50% of part-time being female. (Cataldi, Fahami, & Badburn, 2005) However, there is still a disproportionate number of men teaching in science (National Center for Statistics, 2009) at community colleges leaving much work to be done. This imbalance narrows the scope of perspectives and voices in the field, in some cases leaving women out of the conversation. Furthermore, social cultural perceptions of career fields remain highly gendered resulting in a dilution of the Nation’s ability to fill future jobs. As a nation we need to consider our options to expand the number of people with degrees from community college and universities. The United States is competing in the global economy but needs to improve. Currently, the United States ranks sixth globally in the number of persons with an associate degree or higher (Handel, 2013; Price & Tovar, 2014). This rank illustrates a need to improve to remain an economic force in the world.

Women are achieving equity in aggregate community college enrollments, but they are not achieving equity in STEM CTE programs. This suggests the work of deconstructing
socially driven notions of gender must continue. The research on STEM transfer programs suggests the social perception of the field often precludes women from entering educational programs. Reframing the perception of CTE STEM programs to demonstrate the connection larger goals or needs. The women in this study made their own connections to how their chosen field related to caring and helping. Women want to feel their career is meaningful and impactful as well as align with their own interests.

Lester’s (2010) research on women in male-dominated CTE programs concluded women experienced a lack of support and they experienced a hyper masculine classroom culture. While this led women to demonstrate strength and resiliency (Lester), the literature further suggested the chilly atmosphere does not support women and, indeed, caused them to self-select out of many STEM related fields (Cheryan, Jiang, Montoya, & Zeigler, 2016; Lester, 2010; Packard et al. 2011; Rosser, 2005). This researcher posits we have much work to do with gender norms and the learning opportunities afforded to young women in the United States. While changing society’s perceptions of what are appropriate careers for women will require time and social evolution, there are things community colleges can do to impact enrollment in STEM CTE programs.

**Personal Reflection**

Beginning this project in the summer of 2017, I did not know what to expect from the process. Taking a project of this magnitude was daunting as I was unsure what to pursue aside from being interested in women and education. It was suggested I explore women in STEM. As I began to explore STEM issues, I learned more about the overt and sometimes covert discriminatory atmosphere experiences for women STEM career fields. I also discovered that higher education was not immune to this type of discrimination which led me
to consider the unique role community colleges are asked to play in economic development. As a result of President Obama’s push and support for community college and other organizations like Lumina, there has been progress in increasing the number of women entering in STEM fields. However, there are fewer women in computer sciences, physics and other non-biological sciences and technology fields.

My exploration of STEM led me to an article written by Lester (2010) which became the inspiration for this study. Lester explored women in male-dominated career technical programs at community colleges. As a long-time, higher education professional dedicated to the mission of access for community college students, I wondered if Lester’s findings were unique. I further wondered about the women in the study. What were their “stories”? What led them to choose a field that is male dominated? With this in mind, I began to pursue this study with an open mind without preconceived notions of what I would find. To aid me in keeping an open mind, I put away Lester’s article and did not read it again until completing Chapter 4.

What I found in my investigation was I was deeply impacted by the women in this study, their words, and their experiences. When each interview was completed, I would reflect on their words, looking at them from all angles, discovering how they connected to their experiences, and making notes of concepts and my perceptions. Despite the diversity of their backgrounds and experiences, the women in this study were bound by common threads of womanhood and the othering that are part of our male-dominated social world. I was surprised by the confidence of these women and sense of self despite a recognition of being perceived by some as less than men. It was the acceptance of the circumstances as normal that seemed shocking, coming from people a couple of decades younger than me. I found it
so shocking that Carol Yee (1977) found women were less interested in cultural change than they were in having equitable opportunity. In 2018, this is still the case in many ways. This has led me to ask, What we are missing? Why is it that we as women do not naturally look to change a socially-driven culture that is discriminatory to the point that women too often accept conservative male dominance and often judge other women using male defined standards! It was quite telling when Kelsee said she would question the ability of a woman running her own crop farm. I also wondered how Mary Jane could make peace with a father who did not give her the same support as he provided her brothers? Joyce talked about boys being boys and how they cannot help how they act, and I wondered why would she think this was okay? Why was Monique resigned to working for unsupportive bosses? Why did Cora keep quiet about her classmates’ insensitive comments about the media coverage of women accusing men of sexual harassment, misconduct and rape? I asked myself: Is there a power differential even if it is just one that is socially perceived? Is there a willingness to make change, but change by being present? While presence is important, will increasing the number of women in these fields help equalize the power differential?

Each woman faced a variety of challenges. Their willingness to share their stories was powerful and moving for me. This put my own background and story to context to enable me to see my own privilege and give me pause. I felt an obligation to tell their stories and represent them well. This obligation was acute as I acknowledged my background as a white female, happily married to the same man for more than twenty years with two children. One of our children struggles with significant physical and intellectual disabilities. I have earned advanced degrees, live in an affluent suburb, and have a career I enjoy that supports my family financially.
Growing up my family was less affluent, but we always had what we needed and then some. Despite the stability of a loving home, I often felt I was perceived as less than males having grown in a male-dominated environment. In this environment, males were the head of the household, the church, and the parochial schools where I was educated. Male children were treated differently, but I did not realize the impact on my sense of self until I was in high school. My parents were engrained in this life but never asked me to limit my aspirations based on my gender or any other difference among people in their background or beliefs. My parents were supportive in most every way and consistently told me I could do whatever I set my mind to do. They allowed me to speak my mind and find my own path in life.

Before taking on this study, I did not realize this conservative male-dominated background fueled my passion to give the participants a voice. While I had family support growing up, I did not always have the confidence or courage to seek out things that interested me personally or professional. The social cues of what was appropriate for girls and what was not was socially communicated to me every day for the first 20 years of my life. This began to change when I began my junior year of college at Augsburg University, then a college. The campus is located in a highly diverse neighborhood in Minneapolis, MN. I found the location and the educational environment stretched my view of the world and was exactly what I needed to expand my horizons and begin my journey into adulthood. While focusing on personal growth, I rarely concerned myself with the larger social cultural circumstances facing women in the workplace. I felt glad to be removed from the marginalizing environment or my childhood and left the larger issues go.
With this study, I have found it is important in my current professional role that I cannot let the larger issues go. The women in this study have impacted me and motivated me to give a voice to gender-related issues which impact community college women and their learning experiences. Like the women in this study, I hope other women will take notice and look to stand together, increase their power by being present, and share their voice through scholarship and change at the local level.

The majority of the literature on women and STEM has focused on STEM transfer. It seems there is a great opportunity to understand women in male-dominated CTE fields. Giving these women a voice helps us understand how to impact future generations. The women in this study had a strong sense of self. They felt passion for the field they were pursuing and wanted to impact the field and the world. This study confirmed many of Lester’s (2010) findings and took a deep dive into the influences moving these women to pursue a male-dominated field. This study presents a strong case for higher education administrators and policy makers regarding the importance of supporting women and community college programming in these fields.
REFERENCES


Carnevale, A., Jayasundera, T., & Gulish, A. (2016). *America’s divided recovery: College have and have-nots*. Washington, DC: Georgetown Univeristy, Center on Education and the Workforce.


National Defense Education Act (September 2, 1958) Public Law, 85-864; 72 (Stat. 1580)

National Defense Education Act (NDEA) (P.L. 85-864) United States Statutes at Large. Vol. 72 pp. 1580-1605; Title I, Sec. 101


The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- Use only the approved study materials in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.

- Retain signed informed consent documents for 3 years after the close of the study, when documented consent is required.

- Obtain IRB approval prior to implementing any changes to the study.

- Inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have an eligible PI to remain open.

- Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

- Stop all human subjects research activity if IRB approval lapses, unless continuation is necessary to prevent harm to research participants. Human subjects research activity can resume once IRB approval is re-established.

- Submit an application for Continuing Review at least three to four weeks prior to the date for continuing review as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

IRB 03/2018
September 5, 2018

Dr. Janet E. Emmerson
Director of Institutional Research
Des Moines Area Community College
2006 S. Ankeny Blvd., Bldg. 22-N
Ankeny, IA 50021

Ms. Rachel Erkkila
Educational Leadership and Policies Studies Program
Iowa State University
Ames, Iowa

Dear Ms. Erkkila,

As a representative of Des Moines Area Community College (DMACC), I have reviewed your proposal for research at our institution entitled “Women in male-dominated STEM career pathway programs”. Based on the information provided by you, the project appears to meet the following federal requirements for Exemption described in 45 CFR 46.101(b)(2):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement) survey procedures, interview procedures, or observation of public behavior, UNLESS; (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects AND (ii) an disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects financial standing, employability, or reputation.

You have approval from the DMACC IRB to begin your research. This approval is effective until September 5, 2020.

Dr. Joe DeHart, Provost, Newton Campus will serve as resource for your study and will provide any DMACC related assistance you might require.

Use only the approved study materials in your research. All protocol amendments and changes to this approved research must be submitted to the DMACC IRB and not be implemented until approved by the DMACC IRB.

If you or other parties associated with this research have questions, please contact me at the information above or by phone at (515) 964-6476. I wish you well with your research.
APPENDIX B. INVITATION TO PARTICIPATE

Dear Student,

My name is Rachel Erkkila. I am Ph.D. graduate student in the Higher Education program at Iowa State University in Ames, Iowa. As a part of the program, I am completing a research study at Des Moines Area Community College on the academic and social experiences of female students enrolled in Science Technology Engineering and Math (STEM) career pathway programs. Women 18 years of age or older enrolled in these programs are invited to participate. This email is your invitation from me to participate in the research.

Attached to this invitation is the required consent form. You are not required to participate. Your participation is voluntary. You will not be affected in anyway if you participate or if you do not participate. The decision to participate is yours. If you decide to participate, I will contact you to schedule three interviews, each of approximately 60-90 minutes duration.

You will not be compensated for your participation. My goal is to describe the academic experiences of women in Science Technology Engineering and Math (STEM) career pathway programs. Your participation would add to the research and understanding on this topic. If you decide to participate, your identity will be kept confidential. You may stop participating at any time.

If you want to ask questions about this email or future emails you, I would be happy explain. You may contact me to participate at 515-321-0147 or rerkkila@iastate.edu. You also contact me with questions or you may contact my Major Professor, Dr. Lorenzo Baber at 515-294-8374 or ldbaber@iastate.edu. I will call you about this email within one week.

Sincerely,

Rachel Erkkila
APPENDIX C. PROTOCOL INTERVIEWS

Protocol Interview 1

Student and family background:

1. Tell me about yourself growing up.
2. Can you tell me about yourself and family?
3. Do you mind sharing your age?
4. Do you have dependents? If, yes, how many?
5. What is the highest level of education prior to enrolling in this program?
6. Tell me about your pre-college academic experiences?
7. If you have attended college before, tell me about this experience.
8. Tell me about your favorite subjects in school.
9. Did you have a favorite teacher?
10. What were your personal hobbies/interests growing up?
11. What are your personal hobbies/interests now?
12. What jobs have you had in the past?
13. What jobs do you currently hold outside the home?
14. Tell me about what you are currently studying?
15. Follow up: You mentioned ______; could you tell me more about this? You mentioned this ______; can you give me a specific example of this?
Protocol Interview 2

Learning Experiences and Career Goals:

1. Describe your particular interest in the subject (STEM) of your program (computer science, biotechnology, etc.)
2. What influenced your interest in this field?
3. How did you come to the decision to enroll in a degree in a STEM related career program?
4. Tell me about your career goals.
5. How did you come to set this goal?
6. Describe your confidence level in your career goal choice?
7. What is influencing your confidence level on this choice?
8. Describe your typical day in your program classes.
9. Describe your interactions with your peers in the classroom?
10. Describe how you interact with the faculty in the classroom?
11. Describe any interaction you have with program faculty and peers outside of the classroom.
12. Given what you know about the industry of (student program) describe what you think a typically work day will be like?
13. Follow up: You mentioned earlier your interaction with faculty in the classroom was ________. Now, describe how you imagine your interaction with your supervisor might be?
14. Follow up: You mentioned earlier your interaction with your peers in the classroom was ________. Now, describe how you imagine your interaction with your co-workers might be?
15. Follow up: You mentioned ______. Could you tell me more about this? Can you give me a specific example of this?
Protocol Interview 3

Participant reflection:

1. What do you think about when thinking about career fields related to Science, Technology Engineering and Math, often referred to as STEM education?

2. In what ways, if any do you consider yourself to be a Scientist? Technologist? Engineer? Mathematician?

3. Follow up: If not, describe why you do not identify yourself as _________.

4. Follow up: If you do identify as a _____________. Describe how you came to feel this way?

5. Describe yourself compared to your peers in the classroom.

6. Before you enrolled, what did you think your classes would be like?

7. Describe how the courses in this program will prepare you for your future goals?

8. How confident are you will complete the program?

9. What is influencing your confidence level?

10. What opportunities or challenges might impact your program completion goals?

11. Reflecting on your time in your program this far, describe the things you have come to learn about yourself

12. Reflecting on your time in your program this far, describe the things you have come to learn about yourself or others?

13. Describe what completing the program will mean for you.

14. What would you say other women interested in this program/career field?

15. Follow up: You mentioned ______; could you tell me more about this? You mentioned this ______; can you give me a specific example of this?

16. Are there programs or services you feel would help attract and support women enrolling in this program?
APPENDIX D. PARTICIPANT CONSENT FORM

Title of the study: The experiences of women in male-dominated STEM career pathway students at Midwestern community college Investigator: Rachel Erkkila

The purpose of this form is to describe the research project and to help you decide if you would like to participate. Your participation is completely voluntary. Contact the research team to talk about any questions you have about participating in the research study.

Introduction

The purpose of the study is to capture and describe the academic and social experiences of adult female students enrolled in male-dominated Science Technology Engineering or Math STEM career programs at your community college. You are being invited to participate because you are a female student enrolled in a male-dominated STEM career program.

Description of the Procedure

If you agree to participate, you will be asked to:

- Attend and take part in three audio recorded, face-to-face interviews lasting 60-90 minutes in duration.
- The interview location will be arranged on campus or at your preferred location.
- Provide a narrative description with your name and identifying information omitted.
- Names of other people and places will be omitted.
- Grammar corrections and clarifications will be omitted.
- Review the copies of the interview transcripts (audio, hard copies, electronic and otherwise) a week after the interview. Your narrative contribution will also be provided to you as included in the final study.

The goal for this review is:

- Allow for reflection and validity and your thoughts
- To gain an awareness of your feelings when reading the transcripts
Questions in the interview will include:

- Your family, educational and personal background
- Major life events
- Your personal background, career and academic experiences
- Your academic and social experiences as a female student in a male dominated STEM program including:
  - Faculty and peer interactions inside and outside the classroom, expectations and career goals.

**Risks and Discomforts**

It is not anticipated that the questions in the interview would produce discomfort. The research questions asked may cover topics to which you are sensitive. At any time in the study, if you should feel discomfort sharing your experiences, you are welcome to withdraw from the study. You may also request that certain parts or particular comments be removed from the final study.

**Benefits**

If you decide to participate in the study, there will be no direct benefit to you. It is hoped that the information gained in the study will benefit adult community college women in STEM programs.

**Cost and Compensation**

You will not have any costs and you will not be compensated for participating in this study.

**Participant Rights**

Participating in this study is completely voluntary. You may choose to take part in the student or to stop participating at any time, for any reason, without penalty or negative consequences. You can skip any questions that you do not wish to answer during the interviews.

Participants are a no point identified by their real name for this study. Instead, alias names are assigned to participants. You choice to participate or not participate in this student will have no impact on you as a student in any way.
If you have questions about the rights of research subject or research-related injury, please contact the IRB administrator, (515) 294-4566, IRB@iastate.edu or Director, (515) 294, 3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

Confidentiality

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy study records for quality assurance and data analysis. These records may contain private information. To ensure confidentiality to the extent permitted by law, the following measures will be taken:

- All paper interview notes will be kept in a locked cabinet in a locked office.
- All electronic notes will be stored on Iowa State University encrypted account, Cybox.
- All participants will be identified with an alias/pseudonym.
- All collected data will be retained until the project is complete and destroyed after that time.
- All results of this study will be shared in a group presentation format with research committee members, program faculty, and administrators, as well as staff at your college.
- During data collection, recording, and sharing stage, all information containing names of people, places, etc. will be removed from the transcript and presentations.
- You will receive a copy of the interview transcripts and be given an opportunity to make changes to any of your interview answers.

Questions

You are encouraged to ask questions at any time during this study. For further information about the study, contact: Rachel Erkkila, 515-321-0147 or rerkkila@iastate.edu. You may also contact my supervising faculty, Dr. Lorenzo Baber at 515-294-8374 or ldbaber@iastate.edu for further information.

Consent and Authorization Provisions

Your signature indicates that you are 18 years of age or older and you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered.
You will receive a copy of the written informed consent prior to your participation in the study.

Participant’s Name (printed) ________________________________

__________________________________________  ________________
Participant’s Signature  Date

Investigator’s Name (printed) ________________________________

__________________________________________  ________________
Investigator’s Signature  Date
APPENDIX E. LITERATURE MAP

History of Higher Education and the Community College
- Paschal (2016); Loss (2015)
- The Morrill Act (1862)
- Duemer (2007); Rathcliff (1994)
- Gleazor (1994); Gilbert & Heller (2013)
- Boggs (2011); Drucker (1996)
- Cox & Ebbers (2010); AACC (2017)

CC Diversification and the Completion Agenda
- AACC (2017); Matthews (2015)
- Beach (2010); Tinto (2012)
- Dougherty & Townsend (2006)
- Lumina Foundation (2016); Drucker (1996)
- VanNoy & Zeidenberg (2017)
- Thomas & Williams (2010); Kasworm (2014)
- Rodicio, Mayer & Jenkins (2014)
- Gilbert & Heller (2013)
- Compton, Cox & Laanan (2006)
- Bailey, Jaggars & Jenkins (2015)
- Achieving the Dream (2017)
- Deutsch & Schmertz (2011)
- Donaldson & Townsend (2006)
- Brown, Pascarelli & Terrezini (2005)
- Cohen, Brawer & Kisker (2014)
- Handel (2013); Hanson (1994)
- Crisp, Carales & Nunez (2014)
- Price & Tovar (2014); Blackwell (2016)
- Blackwell & Pinder (2014); Mertes & Hoover (2014)
- Maguire, Starobin, Laanan & Friedel (2012)

Women and Post-Secondary Enrollment
- Cawthorne (2008); Cox & Ebbers (2010)
- Ratcliff (1994); Gleazor (1980)
- Baum, Kurose, & McPherson (2013)
- Deutsch & Schmertz (2011)
- Twombly (1993); Townsend (1995)
The Evolution of Women and STEM

- Blickenstaff (2015); Lester (2010)
- Frye (1995); Thomas & Williams (2009)
- Baum, Kurose & McPherson (2013)
- Taylor & Weigand (1999); Blackely & Howell (2015)
- Williams (2011); Hughes (2014); Yee (1977)
- Wertheim (2006); McGrayne (2005)
- NCES (2017); Hill, Corbet & Rose (2010)
- Geldis(2014); Toglia(1994); Rosser(2005)
- Wyer (2001); Seymour & Hewitt (1997)
- Cheryan, Jiang, Montoya & Zeigler (2016)
- Lester (2010); Betz (1978); Armstrong (1985)
- Stage, Kreniberg, Eccles & Rossi-Baker (1985)
- Brush (1985); Schofield (1982); Sherman & Femina (1977)
- Ceci & Williams (2010); Hill (2010)
- American Association of Psychological Science (2010)

The Current State of Women and STEM

- Wang, Chan, Soffa & Nachman (2017)
- Starobin, Laanan & Burger (2010)
- Deutsch & Schmertz (2011); Lester (2010)
- Blackwell & Pinder (2014)
- Andreas & Admuti-Trache (2008)
- Wickersham & Wang (2016)
- Snyder & Dillow (2013)
- Jackson, Starobin & Laanan (2013)
- Baily & Holmaersottir (2015)
- Laursen, Austin, Soto and Martiniz (2015)
- Packard, Gagnon, LaBelle, Jeffers & Lynne (2011)
- Cheryan, Jiang, Montoya & Zeigler (2016)
- Tillberg & Cohoon (2005); Gilbert & Heller (2013)
- Van Noy Zeidenberg (2017)
- Jorstad, Starobin, Chen & Kollasch (2017)

Community College Women and STEM

- Wang, Chan, Soffa & Nachman (2017)
- Starobin, Laanan & Burger (2010)
- Deutsch & Schmertz (2011); Lester (2010)
- Blackwell & Pinder (2014)
- Andreas & Admuti-Trache (2008)
- Wickersham & Wang (2016)
- Snyder & Dillow (2013)
- Jackson, Starobin & Laanan (2013)
- Baily & Holmaersottir (2015)
- Laursen, Austin, Soto and Martiniz (2015)
- Packard, Gagnon, LaBelle, Jeffers & Lynne (2011)
- Cheryan, Jiang, Montoya & Zeigler (2016)
- Tillberg & Cohoon (2005); Gilbert & Heller (2013)
- Van Noy Zeidenberg (2017)
- Jorstad, Starobin, Chen & Kollasch (2017)
### Theoretical Framework - Social Cognitive Career Theory

- Blanco (2010); Albert & Luzzo (1999); Hackett & Betz (1981)
- Lent (2005); Lent & Brown (2013)

### Theory Related to Social Cognitive Theory

- Krumboltz, Mitchell & Jones (1976)
- Super (1990); Gottfredson (1996)
- Rojewski (2005); Duncan & Blau (1967)
- Hotchkiss & Borrow (1996)
- Fitzgerald, Fassinger & Betz (1995)
- Hellenga et al (2002) CHECK THIS

### Application of SCCT to Women in STEM Career Pathway Programs

- Matthews (2015); AACC (2012); NCES (2017)
- Azili, Atkinson, Baughman, Giammarco (2015)
- Liao, Edlin & Ferdenzi (2014)
- Stajkovic & Luthans (1998); Betz (2005)
- Schunk & Dibenetto (2015); Farmer (1977)
- Harmon (1977); Astin (1984)
- Chen & Soldberg (2017); Kelly & Hather (2013)
- Amelink, Artic & Liu (2015); Hanson (1994)
- Sellars, Satcher and Comas (1999)
- Hall (1994); Cheryan, Zeigler, Montoya & Jiang (2017)
- Lester (2010); Blickenstaff (2005); Schunk (1991)
- Inda, Rodriguez & Pena (2013)