A PHENOMENOLOGICAL STUDY OF FEMALE STEM MAJORS WHO HAVE DECIDED TO BECOME EDUCATORS

by

Porcia Lynn Richardson-Spears

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

The purpose of this transcendental phenomenological study was to investigate, identify, and describe the lived experiences that influence female STEM majors to become secondary educators rather than enter a STEM-related corporate profession. This study was guided by Mezirow's transformative learning theory (TLT) and Lent, Brown and Hackett's social cognitive career theory (SCCT) as they related to self-awareness, which guides and motivates the behaviors involved in choosing a career path. The research questions for this study were designed to investigate the experiences that prompted females to major in STEM majors and to enter the field of teaching rather than enter corporate employment. The 12 secondary teachers from two districts completed a screening survey, a questionnaire, participated in a face-to-face interview, and wrote in a reflective journal. The data were analyzed for recurring key meaningful statements and themes. Three significant themes and eight relevant sub-themes emerged from the perceptions of the participants regarding how they made their final career decision. For the first theme of approaching a corporate career, participants were either unable to find a corporate job, or the schedule flexibility of becoming an educator was more appealing than the schedule requirements offered in a corporate position; however, more practicum programs may have enticed them to still pursue a STEM career. For the second theme, participants indicated sensing a calling to teach, to inspire and empower students. For the third theme, participants reported their early experiences, in grade school, college, and with their parents, influenced their career choices.

Keywords: career choice, education, STEM-field, teaching, female teachers

Dedication

I dedicate this dissertation, the pursuit of my highest educational dream and a true labor of persistence, to the Lord God for proving that all things are truly possible through Him! I dedicate this dissertation to my husband, Freeman Spears, Jr., who never allowed me to give up on my dream and helping me get through all those days when my brain felt like it would fall out of my head! I also dedicate this dissertation to my parents, Joseph Richardson and Marcia Richardson, who put their lives on hold to help me with my son, especially my mother for spending numerous nights at my house, so I could stay up late at night and get up early the next morning! I appreciate and thank God for my son, Freeman Spears, III, who was born in the middle of my journey and helped me to realize why completing this journey was necessary.

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List of Abbreviations

Emotional and Personality Career Difficulties Scale (EPCD)

Institutional Review Board (IRB)

Research Review Board (RRB

School District X (SDX)

School District Y (SDY)

Science, Technology, Engineering, and Math (STEM)

Social Cognitive Career Theory (SCCT)

Transformative Learning Theory (TLT)

CHAPTER ONE: INTRODUCTION

Overview

Advancements in technology has caused a need in nations, including the United States (U.S.) to offer incentives, programs, and other mandates to motivate more individuals to seek an education in the areas of science, technology, engineering, and mathematics (STEM) (Ku & Capolupo, 2014; National Academy of Sciences, 2007; Puffenberger, 2010). This trend of providing additional funding for STEM-related projects provided the impetus for the present study seeking an understanding of experiences that influence future educational endeavors in the areas of STEM. The first chapter of this study includes a description of the background information surrounding the need for research on STEM-related issues. Chapter one also discusses the problem statement, purpose statement, the significance of the study, and the research questions. Chapter one concludes with definitions of key vocabulary and a summary of the chapter.

Background

Historical Context

Executive summaries formulated by the U.S. Department of Commerce reported that STEM occupations are expected to grow more than 15% by 2018 (Langdon et al., 2011). With this statistic in mind, being able to draw more people into programs that produce knowledgeable graduates in STEM-related areas would help the U.S. regain its position as a major force in technological innovations (Drew, 2015; Sadler, Sonnert, Hazari, &Tai, 2012). Even though women make up almost half of the workforce in America, they do not occupy more than 25% of STEM jobs (Beede et al., 2011; Glass, Sassler, Levitte, & Michelmore, 2013). Although the number of STEM-related jobs has increased over the past 15 years, the percentage of women who hold a job in a STEM field has remained the same.

Correspondingly, Beede et al. (2011) reported that females made up 24% of the STEM workforce in 2000 and the percentage had not changed nine years later.

Although this study focused on female STEM majors who have decided to become secondary school teachers, the future economic growth and development of Americans in general depends on an increase in STEM innovations (Gonzalez & Kuenzi, 2012; Puffenberger, 2010). In the past, several researchers have hypothesized about why women do not establish themselves in STEM-related careers. One explanation for women not pursuing STEM careers was the perceived level of male competition within these careers (Kamas & Preston, 2012; Richman, vanDellen, & Wood, 2011; Smith, Lewis, Hawthorne, & Hodges, 2013). Other possible explanations include differences based on gender (Ceci & Williams, 2011; Else-Quest, Hyde, & Linn, 2010), the occupations' perceived level of inflexibility (Bona, Kelly & Jung, 2010), and the need to be more social (Diekman, Brown, Johnston, & Clark, 2010; Diekman & Steinberg, 2013). An additional explanation includes the perceived level of commitment associated with corporate level STEM careers, which may ultimately limit the quality or enjoyment of life (Maltese & Tai, 2011; Perez, Cromley, & Kaplan 2014; Rosenthal, London, Levy, Loebel, & Herrera-Alcazar, 2011).

Social Context

The acronym STEM originated in 1958, introduced by Dr. Judith Ramaley during the Eisenhower administration (Daugherty, 2013). Dr. Ramaley defined STEM as "an educational inquiry where learning was placed in context, where students solved real world problems and created opportunities—the pursuit of innovation" (Daugherty, 2013, p. 10). Since 1996 STEM education has become one of the largest reform movements in elementary, middle, and secondary education in the U. S. (National Academy of Sciences, 2007).

Puffenberger (2010) suggested that the future of the U.S. economy depends on the

ability to be creative and innovative in the creation of jobs and new industries. The concern for current as well as future American citizens is that if a more proactive approach to getting students interested in becoming analytical innovators is not adopted, America will eventually be faced with many jobless people and at the same time, have numerous jobs available that cannot be filled by qualified workers (Gordon, 2014). The potential for sustained economic growth has even reached the Oval Office as President Barack Obama designated $250 million toward increasing both public and private STEM-related endeavors (Daugherty, 2013; President's Committee on the Arts and Humanities, 2011).

Because of this increased funding in STEM-related educational endeavors, many school systems have begun to implement various STEM-focused initiatives to improve the number of students who decide to major in STEM careers once they leave high school (Archer, DeWitt, & Wong, 2014; Hubwiesser et al., 2015; Levin & Schrum, 2012). These initiatives include STEM-related grants, training programs, and the creation of summer camps (Dave et al., 2010; Gonzalez & Kuenzi, 2012; Liu et al., 2014), which can play an important role in raising the number of students who decide to complete degrees in STEM-related majors. The more students major in STEM-fields, the more students have a chance to choose a corporate career in a STEM field.

In February 2017, President Trump also signed two bills that promoted women entering STEM areas and leading STEM-related fields (Arter, 2017). The first initiative was called the Inspiring the Next Space Pioneers, Innovators, Researchers, and Explorers (INSPIRE) Women Act (2017). This initiative directed the National Aeronautics and Space Administration to advance space and science exploration efforts by encouraging women and girls to study STEM. The second initiative was called the Promoting Women in Entrepreneurship Act (2017). This act was an amendment to the Science and Engineering Equal Opportunities Act,

which authorized the National Science Foundation to encourage programs that recruit and support women (Arter, 2017; Promoting Women in Entrepreneurship Act, 2017).

In 2011, the core policy principles of the STEM Education Coalition included four supports. The first support was the inclusion of informal education as a strategy for enhancing and improving STEM education. The second was the expansion of colleges to prepare students for further STEM education and the STEM workforce. The third support was the integration and alignment of K-12 and higher-education programs and initiatives with workforce needs, and the fourth was the public-private partnerships and incentives that promoted business and industry engagement in STEM-related educational activities at every level (Dave et al., 2010).

Sadler et al. (2012) and Carnevale, Smith, and Strohl (2013) reported that by the year 2018, STEM employment is projected to grow by 17% compared to about 10% in other occupations. More recently, in 2017 the Bureau of Labor Statistics (BLS) predicted that STEM job growth will be 8.9% from 2014 to 2024 although half the previous estimate, the level of growth is still a significant (Noonan, 2017). Therefore, STEM-related skills will be necessary to fill over 50 occupational areas. These areas will require some form of postsecondary education or training (Gordon, 2014). National statistics suggest there is a shortage in the number of students in the U.S. who are majoring in STEM-related careers (Carnevale et al., 2013). The numbers of minority and female students are limited. With so few students pursuing majors in STEM disciplines, the United States will not be able to continue competing in an increasingly global environment (National Academy of Sciences, 2007). In a 2007 meeting, the National Academy of Sciences noted:

> The United States still leads the world in many areas of science and technology, and it continues to increase spending and output. But our share of world output is declining, largely because other nations are increasing production faster than we are . ... The

> biggest concern is that our competitive advantage, our success in global markets, our economic growth, and our standard of living all depend on maintaining a leading position in science, technology, and innovation. As that lead shrinks, we risk losing the advantages on which our economy depends. (p. 218)

Consequently, the U.S. has invested a sizeable amount of resources towards expanding its footprint within STEM. This study offers an alternative line of thinking regarding why women decide not to seek a corporate career in a STEM-related field after earning a degree in STEM. Additionally, by focusing on shared experiences, this study allowed women to reflect on those experiences that impacted their career-related choices.

Theoretical Context

At a critical point after a person has graduated from college, a decision must be made as to which type of career to enter (Lent & Brown, 1996; Marmon, 2010). The important variables in this decision to choose a career are the commitment one has for the subject they have mastered and the time it takes to secure a suitable position. The degree of commitment may change over time based on interest levels and previous experiences (Lent & Brown, 1996; Marmon, 2010). The graduates must ask themselves how they would like to utilize their skillset and which type of environment would be most comfortable for them. Understanding the specific experiences that lead to a fulfilling career is important.

Previous studies have set out to determine the emotional experiences of individuals who have gone from a career in a STEM-related field to a career in education (Duran, Lopez, & Hughes, 2015; Snyder, Oliveira, & Paska, 2013; Williams, 2010), and to document the impact of influential people and events on the career decisions of both science and non-science majors (Jones, Taylor, & Forrester, 2011; Salehjee & Watts, 2015). There has also been speculation on the experiences that can affect a person's economic status (Archer et al., 2014)

or religious beliefs (Fulmer, 2014). Consequently, this study was viewed through the lenses of two theoretical perspectives to ensure the important principles and concepts regarding career decision-making are addressed. These two theories were the transformative learning theory (TLT) and the social cognitive career theory (SCCT).

Situation to Self

During high school, I decided to major in psychology due to my experiences with an aunt who lived with my family from the time I was about eight years old. This aunt had been diagnosed with paranoid schizophrenia. I often wondered why she behaved oddly, even though she was raised by the same parent who had raised my father. At that time, I did not understand how the mind of a person with a mental disorder could process everything that happened in the world around them in a manner different from those who did not have a mental disorder. For this reason, I set off to gain a better understanding of the way her brain worked. Thus, I graduated with a double major in Psychology and Sociology.

In college, I excelled in many of the science-related courses I was required to take, so much so that I was offered through the university I attended a two-year scholarship, called the National Institute of Mental Health Career Opportunities in Research Education (NIMH-CORE). This scholarship allowed me to engage in thought-provoking experiences that opened my eyes to a multitude of ideas regarding possible career options. Through this scholarship, I was given an opportunity to travel, network, conduct research at other larger colleges and institutions of higher education, and present my research as I participated in colloquia.

After I graduated from college, my husband and I became the guardians of my cousin, the daughter of the previously mentioned aunt. My cousin was like a sister to me; she was eight years old and had a Mild Intellectual Disability. I was overwhelmed by all the meetings, rules, and requirements that educating a child with special educational needs entailed. I took

so much time off from work to go to these meetings that I decided to become a Special Education Teacher. I felt this would be the best way to help my cousin and to make sure I was getting the correct answers to all my questions.

My epistemological beliefs, which are grounded in constructivism, are derived from this experience. My belief is that people have different experiences that shape how they choose to view and interact with the world around them. The same or similar experiences may be interpreted differently depending on a person's background and previous encounters. As humans, we all make sense of other people, places, things, situations, and events based on our own historical and social perspectives that have been formed over our lifetime (Lent & Brown, 1996; Marmon, 2010; Mezirow, 1991). These experiences can lead to what Mezirow (1991) refers to as disorienting dilemma. A disorienting dilemma can be a result of encounters, thoughts, and feelings that require difficult choices to be made. It is important to note that certain experiences can influence or become a catalyst for changes in making important decisions such as career choice.

The school system in which I work began to offer several workshops and grants focusing on STEM-related issues. For one of these workshops in which I participated, both science and mathematics content area teachers and special education teachers who co-taught in the content areas received free summer training and other bonuses. This training included small group work sessions, interactive lesson ideas, additional teaching materials, the opportunity to network with other science teachers across the county, an additional stipend, and paid time off to attend the annual state-sponsored teacher workshop for those content areas.

Because of my participation in this training, my excitement for the content was stirred up. My newly acquired excitement led to opportunities to attend more STEM-related programs and conferences. I believe the activities and information added to my teaching tool box, along

with my enthusiasm, helped to spark the interests of many of my students. I also believe that for governmental STEM initiatives to successfully increase the number of people who major in STEM-related fields, the U.S. needs to have a good understanding of the experiences that both ignite and stifle the interest of future STEM majors.

I was brought up with two parents in the home. However, my mother was and continues to be my greatest role model. She was a super woman to me and considered a domestic specialist by others. She had a job both inside and outside of the home. Despite the outside job, she still did all the cooking and cleaning inside the home. She helped my two brothers and me with our homework and attended school functions. Internalizing the traditional roles of *mother* and *caretaker* served as the axiology from which my research interests grew. As a young woman entering college to major initially in psychology, I embraced the idea that I could have multiple roles as a *woman*, and that I did not have to forego one to maintain the other. I then wondered what experiences guided others like me, to choose their college major and eventual career path.

Problem Statement

Many school systems have begun to implement various STEM-focused initiatives to increase the number of students choosing to major in STEM-related careers when they leave high school (Daempfle, 2003; Scott, 2012; Wang, 2013). Several studies have discussed influential events impacting the decision of students who major in STEM fields. Some of these studies identified specific influences, such as socioeconomic status, during elementary years (Archer et al., 2014), and taking advanced placement classes in high school (Ackerman, Kanfer, & Calderwood, 2013; Rask, 2010). Other studies discussed barriers and obstacles women face when entering STEM fields. These studies included the gender gap in STEM fields (Leslie, Cimpian, Meyer, & Freeland, 2015; Woodcock, Graziano, Branch, Ngambeki, &

Evangelou, 2012), the perceived compatibility of the career with religious beliefs (Fulmer, 2014), and inclusion of people from various ethnic groups (Hill, Pettus, & Hedin, 1990).

However, a limited amount of literature focused on the shared experiences that cause women to choose to enter the field of education rather than pursue a career in a STEM-related field, even though these women have already earned an initial degree in a STEM field (Valla & Ceci, 2014). Additional research is needed to identify influential experiences to which female STEM majors have been exposed between the time they decide to major in a STEM-related field and the time they graduate with a degree within the field. Therefore, the problem of this study is the lived experience of female STEM majors who become secondary educators rather than enter a STEM-related corporate profession. (Beede et al., 2011; Glass et al., 2013).

Purpose Statement

The purpose of this transcendental phenomenological study was to gain an understanding about the lived experiences that influenced female STEM majors to become secondary educators rather than enter a STEM-related corporate profession. In phenomenology, the research attempts to understand conscious experiences, such as judgments, perceptions, and emotions (Connelly, 2010). Creswell (2014) noted the phenomenological approach focuses on the meaning of different life experiences of individuals, which is a descriptive and interpretive process.

For this study, a female STEM educator is defined as a woman who has an undergraduate degree in a STEM-related field but has chosen a career as a secondary school teacher. The theories guiding this study are the social cognitive career theory (SCCT) (Lent & Brown, 1996) and the transformative learning theory (TLT) (Mezirow, 1991). These theories provided a framework for investigating how experiences shape the way female STEM majors develop their career interests and eventually lead them to make a change in their career

decisions.

Significance of the Study

As technology improves, so do educational options (Coley, 2000; Hussar & Bailey, 2014; Maltese & Tai, 2011). Colleges are currently able to offer several different formats for students to be able to attend classes. These options include campus-based learning, online or correspondence learning, and hybrid formats that offer varying degrees of both. With increased flexibility and the availability of online classes, many colleges are reporting that female students are outnumbering male students (Lindsay, Taylor, Woodward, & Milligan, 2016). This flexibility, coupled with the knowledge that women are both interested in and capable of working in the fields of science, technology, engineering, or math, raises the question of why the percentage of women entering the field is not parallel (Gonzalez & Kuenzi, 2012; Maltese & Tai, 2011). Contradictory data suggested that women are refraining from entering these STEM-related fields at similarly increasing rates (Else-Quest et al., 2010; Makarova, Aeschlimann, & Herzog, 2016; Seymour & Hewett, 1997). Instead, many of those females choosing STEM majors opted to enter teaching on the secondary level instead of finding positions in STEM-related fields.

National statistics suggested a shortage in the number of students in the U.S. who are majoring in STEM-related careers (Dika & D'Amico, 2015; Maltese & Tai, 2011; Sadler et al., 2012). The number of minority students and the number of female students is both limited as well. With so few students majoring in these areas, there is a concern the U.S. will not be able to continue competing in an increasingly global environment, that America is no longer a leading force in the areas of STEM (National Academy of Sciences, 2007).

Through this study, I hoped to identify the thoughts and feelings of female STEM major's regarding the experiences that influenced their decisions to obtain a position in a

corporate STEM-related field or another field immediately following graduation. On a practical level, the results may offer an alternative line of thinking regarding why women decide not to seek a corporate career in a STEM field and may identify events that precede the retention of women in STEM-related occupations. The results may also offer a catalyst for the formation of ideas, programs, and procedures that serve as motivation for women to follow through on their initial intentions of securing a position in a corporate STEM-related field (Branch, Woodcock, & Graziano, 2015; Dave et al., 2010; Dika & D'Amico, 2015; Woodcock et al., 2012).

More specifically, because the U.S. is made up of a very diverse population, this study is important for all women regardless of culture, religion, or ethnicity. By conducting this study, I hoped to offer women an opportunity to reflect on those experiences that have the most dominant influences on their career-related choices (Archer et al., 2014). Interviewing a diverse group of women to explore these influences allowed me to analyze which experiences had the strongest influence on these women as they made their final career decisions.

The transformative learning theory (TLT) and the social cognitive career theory (SCCT) were used in this study to identify and describe the influential experiences that female STEM majors had when making a decision regarding the boundaries that are tolerated or compromised when choosing a career (Clement, 2016; Coley, 2000). Both the TLT and the SCCT aided in identifying the influences of family life and other responsibilities that must be weighed in determining both the benefits and drawbacks of a STEM career. Understanding the specific experiences that lead to a very fulfilling career is important, especially regarding a career in which a woman can potentially invest the next 20 to 40 years of her life, or until she reaches retirement age.

Several explanations have been offered as to the limited number of women pursuing

STEM-related careers. Gender difference is a reason that has been consistently mentioned as a contributing influence for these small numbers (Ceci & Williams, 2011; Else-Quest et al., 2010; Makarova et al., 2016). Previous studies have also set out to determine the emotional experiences of individuals who have gone from a career in a STEM-related field to a career in education (Duran et al., 2015; Snyder et al., 2013; Williams, 2010). Other studies have further documented the impact that influential occurrences and people have made on the career decision-making process of both science and non-science majors (Jones et al., 2011; Salehjee & Watts, 2015). Additionally, some speculation on the topic includes the effects of a person's economic status (Archer et al., 2014) or religious beliefs (Fulmer, 2014). However, the results are varied. Therefore, the specific question remains largely unanswered. The current study helped determine the experiences that influenced female STEM majors to pursue a career in the field of education, even though this was not their initial career goal.

Research Questions

From possible effects of gender differences to the effects of a person's economic status, speculation on the topic of retaining women in STEM-related fields provides the basis for further exploration (Makarova et al., 2016; Salehjee & Watts, 2015; Snyder et al., 2013). The current study seeks to describe, in the words of the women themselves, the experiences that influenced females, who have majored in a STEM field, to enter the field of education instead of seeking a career in a STEM-related profession. The two research questions that guided this study were:

Research Question One

What experiences prompted female STEM majors to enter the field of secondary education rather than enter corporate employment after graduating with a STEM-related degree?

Research Question Two

What personal background factors influenced female STEM majors to choose a career in a filed other than a STEM profession?

The first research question was important to this study because the events individuals encounter throughout their life may play a role in how individuals make their career decisions. Likewise, the processes in which individuals form their ideas and opinions may also play a role in how individuals make their career decisions. In two previous studies, the researchers suggested there are some personal cognitive events that take place in the lives of STEM career changers (Snyder et al., 2013) and among scientists and non-scientists (Salehjee & Watts, 2015), which leads to their transitioning into non-corporate careers such as secondary teaching.

The second research question was important to this study because both internal and external experiences that are a part of a person's background can shape the views of an individual and may serve as either a catalyst or hindrance for the career decision-making process. For example, an external experience that may influence a woman's career choice may stem from the perceived mindsets or beliefs that arise because of a stereotype (Spencer, Logel, & Davies, 2016; Steele, Spencer, & Aronson, 2002). Another example of influence may result from the internalization of a social role to fit a specific expectation (Diekman & Steinberg, 2013; Lewis, Stout, Pollock, Finkelstein, & Ito, 2016).

Additional research has suggested that emotional components (Diekman & Steinberg, 2013; Leaper, Farkas, & Brown, 2012) or emotionally transformative events (Snyder et al., 2013) may serve as either a catalyst or a hindrance for the career decision-making process. Both positive and negative internal and external events, such as encountering stereotypes (Cundiff, Vescio, Loken, & Lo, 2013; McGee, 2013), or the influence of a person's peers (Ingram, 2013; Renouf et al., 2010; Wasylkiw & Williamson, 2013) may play a role in the

formation of career expectations. Either social or emotional events may have a powerful effect on career choice, which is reflected in both the TLT (Mezirow, 1991) and the SCCT (Lent, Brown, & Hackett, 1994). These findings suggested that both the thoughts and feelings resulting from a certain experience may guide the decision-making process.

Definitions

The following terms are pertinent to this study:

1. *Anxiety* – Anxiety is an unpleasant feeling of worry or unease. "There is wide disagreement about its definition . . . [because] it is discussed as being such a complex experience as to make scientific investigation difficult or impossible . . . an unpleasant emotional state or condition marked by apprehension" (Sarason, 1986, p.19).
2. *Corporate* – The word *corporate* pertains to a corporation, a large company, or group. Corporations are basic business organizations that are chartered and have legal rights as a separate entity from its owners (InvestorWords, 2017).
3. *Experiences* – Experience is contact or observation of a fact or event. "The philosopher John Dewey . . . viewed experience as the intertwining of human beings and their environments" (Brakus, Schmitt, & Zarantonello, 2009, p. 54).
4. *Pessimism* – Pessimism is a bias in perceptions and experiences, which is in favor of negative features of life (Dember, Martin, Hummer, Howe, & Melton, 1989).
5. *Self-Concept* – Self-concept occurs when individuals seek out consistency and stability, and actively resist any information that challenges their prevailing view of themselves (Markus & Kunda, 1986).
6. *Self-Efficacy* – Self-Efficacy is the belief of one's own capabilities. Self-efficacy refers to "people's judgments of their capabilities to organize and execute courses of

action required to attain designated types of performances" (Bandura, 1986, p. 391).

7. *Social Cognitive Career Theory (SCCT)* – The SCCT describes the factors that facilitate patterns of thought people experience as they develop basic career attributes and make important career decisions (Lent et al., 1994).
8. *STEM* – STEM is the acronym that stands for Science, Technology, Engineering, and Mathematics, originating in 1958 (Daugherty, 2013).
9. *Stereotype* – Stereotype is a perceived belief and expectancy about a group. A stereotype is a term that is defined in several different ways. One of the broadest definitions available is "a cognitive structure containing the perceiver's knowledge, beliefs, and expectancies about a social group" (Hamilton & Trolier, 1986, p.142).
10. *Transformative Learning Theory (TLT)* – The TLT is a theory for learning, which originated from both developmental and cognitive psychology. It involves 10 concepts that result in a transformation in learning (Mezirow, 1991).

Summary

Chapter one discussed the U.S.'s need for an increase in the number of graduates entering STEM-related professions. The United States requires an infusion of innovative and creative individuals to generate ideas that help maintain its status as a world leader (Puffenberger, 2010). The current study is designed to gain an understanding about the experiences of female STEM majors who decide to become secondary teachers rather than enter a STEM-related corporate profession. The intent is to present the participants' decision-making process as they transition from a college graduate in a STEM-related major to full time employment in the field of education.

The increased funding for STEM-related activities and programs has inspired many

institutions to look at new ways to integrate STEM into the primary and secondary curriculum in an effort to motivate students to enter STEM-related careers (Dave et al., 2010; Gonzalez & Kuenzi, 2012). Therefore, there is a need for educational and industry leaders to attract and retain individuals who are motivated and committed to becoming employed in STEM-related professions after college. This study can serve to inform these stakeholders of the possible challenges and obstacles that are faced before and during the decision-making process.

CHAPTER TWO: LITERATURE REVIEW

Overview

For several years, the topic of how to best increase participants in programs that focus on science, technology, engineering, and mathematics (STEM) has been at the forefront of discussions surrounding education and the future of the United States (U.S.) (Basile & Lopez, 2015; American Chemical Society, 2012). These discussions have led to an increased interest in the exploration of STEM-related topics and activities in the United States, including circumstances that may influence the career choices of individuals who earn degrees in STEM fields. This chapter includes a description of the two theories establishing the frameworks supporting the necessity for the study, a brief history of women in teaching, a brief history of STEM, an examination of previous research related to the study, and a chapter summary.

Theoretical Framework

Several guiding theories may explain a woman's career choice. The two most applicable to this study are the transformative learning theory (TLT) (Mezirow, 1991), which has a 10-step process, and the social cognitive career theory (SCCT) (Lent et al., 1994), which focuses on three main ideas. Both TLT and SCCT provide a rationale of how internal and external influences shape the way individuals develop their interests and eventually make career decisions as they go through the stages of development and mature into adulthood (Lent et al., 1994; Mezirow, 1991).

Transformative Learning Theory

The TLT originated from both developmental psychology and cognitive psychology (Mezirow, 1991). The theory involves several important concepts that can influence career decisions. One key concept of the TLT is transformational outcome and lends the theory its name. Transformational outcome is defined as a process of learning experienced by a

learner, and an educational program or event designed to foster learning experiences that result in a catalyst for a transformation to take place (Mezirow, 1991).

Transformative education is defined as a planned educational program, experience, intervention, or set of practices that are designed to enable people to experience transformative learning (Marmon, 2010; Mezirow, 1991). Based on Stevens-Long, Schapiro, and McClintock (2012), "Transformation as an outcome refers to a deep and lasting change, equivalent to what some people term a developmental shift in worldview" (p. 184). Life occurs in 10 stages and as we learn and encounter new experiences, our views may be transformed (Mezirow, 1991).

The first stage of the process is critical reflection through disorienting dilemmas. Critical reflection relates to the meanings and premises of a situation and is considered as a trigger. As a person transforms, he or she moves through the other nine phases. Progression through these stages may not necessarily occur in order. The other phases are the following: (a) self-examination, (b) recognition of discontentment, (c) exploration of options, (d) planning, (e) acquiring knowledge, (f) trying new roles, (g) building competence (h) confidence in the new roll, and (i) reintegration based on a new perspective. To experience a transformation, people must reflect on their current ideas and opinions, and ultimately be willing to make a change and accept that change as something that used to be part of their being (Marmon, 2010; Mezirow, 1991).

Adults encounter something new (information, experience, situations, feelings, thoughts, etc.) every day, maybe even multiple times each day. A person reflects on the newly encountered items by talking with others about the accuracy and adequacy of assumptions and the attitudes, behaviors, and beliefs that accompany them. The person then decides what was believed in the first place and why that belief has transformed and therefore does not fit into

the new frame of reference anymore. Adults change their minds all the time concerning the type of experience that would lead to a change in faith, value, or spirituality. Therefore, the TLT can apply to one's faith as well as to career development or reconciliation of spirituality.

The TLT is applicable to the current study because of the possibility of personal experiences shaping career decisions when a person is choosing between teaching or full-time STEM-related positions. Women seem drawn toward the STEM field as evidenced both by their choice of major and their commitment to completing all classes required for their degrees (Goldin et al., 2006; Fulmer, 2014). However, something changes, causing some of these women to reject a career in that field, when the time comes to decide regarding the next 20 to 30 years of their lives.

Two significant studies reflect how the TLT can influence why and how a specific career decision is made, although these studies presented two different ways career choices are transformed. In the first study, Langley-Weber (2012) interviewed eight teachers who taught in classrooms that served Texas English language learner (ELL) students from pre-Kindergarten to the 12th grade. Each of the participants detailed personal dilemmas that led them to the realization their struggles were meaningful. The time, effort, feelings, and relationships that were formed through their struggle empowered them, in this case, to strive to help and continue to help ELL Students. These teachers were vulnerable in that they empathized with many of the emotions that their ELL students went through and as a result were compelled to continue their course of helping these students. An additional study reflected a similar change in the beliefs and practices of teachers as they developed a sense of agency for the advocacy of ELL students (Brooks & Adams, 2015).

In the second study, Salehjee and Watts (2015) interviewed 12 men and women who were based at a university. Salehjee and Watts detailed how the life journeys of the

participants transformed their views and led them to choose between a science or non-science profession. The study included three female scientists, three male scientists, three female non-scientists, and three male non-scientists. The results of this study indicated three of the participants had incremental or wavering experiences that caused mild transformations into or away from science, and two participants had experienced events that caused a more defined or classic transformative transition away from science. Another study reflected a similar perspective shift in the disposition of pre-service teachers when choosing course activities for ELL students (Forte & Blouin, 2016).

These two significant studies, as well as others, suggested certain life experiences can cause vulnerability in the process of making a career choice. Both depict how personal experiences shape the decision-making process. Additionally, the amount of struggle a person goes through may influence a decision that is headed toward a specific direction of continued employment in the future.

Social Cognitive Career Theory

The second theory framing this study is the social cognitive career theory (SCCT), which originated in 1994 and was based on constructivist principles. These constructivist principles were grounded in Bandura's Social Cognitive Theory (Lent et al., 1994). The SCCT theory describes the circumstances that produce patterns of thought as people develop basic career attributes and make important career decisions. The framework of the SCCT centers on the interaction among three variables and how they interact with environmental and personal variables. The three variables are self-efficacy, outcome expectations, and personal goals (Lent & Brown, 1996; Lent et al., 1994; Lent, Hackett, & Brown, 1999).

The first variable in the SCCT is self-efficacy, which develops over time. Self-efficacy refers to "people's judgments of their capabilities to organize and execute courses of action

required to attain designated types of performances" (Bandura, 1986, p. 391). As people strive to accomplish certain objectives, their successes or failures reinforce and strengthen their self-efficacy. Self-efficacy may also occur vicariously or second-hand through observing the success or failure of others. The more people feel their contributions are valued and meaningful, the more likely they are to continue to perform the same or similar tasks. Self-efficacy is linked to a person's perceived expectations (Bandura, 1993).

The next SCCT variable, outcome expectation, refers to the consequences that occur based on the performance of a certain task (Lent et al., 1994). People exert more effort and are more persistent about doing certain things, effectively changing their behavior, based on what they think the consequences will be. A change such of this can also occur because of what people have seen happen to others. Lent et al. (1994) suggested, people "who doubt their ability to affect organizational change . . . may be less likely to mount active efforts to modify their work environment; instead, they may be more likely either to pursue reactive (self-change) strategies or to change environments" (p. 116).

The third SCCT variable is personal goals. Personal goals consist of two types of goals: choice and performance goals (Lent et al., 1994). Choice goals are made based on what people aspire to become and causes them to pursue specific goals to accomplish this type of goal. Performance goals are decided based on a person's choice goals. These are made specifically as one determines which abilities, traits, and tasks one needs to have to successfully complete and obtain the goals that have been chosen.

Conklin, Dahling, and Garcia (2013) surveyed 200 students from a small public college in a Mid-Atlantic area of the United States. The participants represented a wide variety of majors and class levels. The survey was designed to measure the emotional commitment to the area of study, perceived academic major fit, career self-efficacy, and outcome expectations for

career performance and career satisfaction. The results indicated that self-efficacy is a moderator when it comes to the relationship between career outcome expectations and commitment. Other authors reported similar results relating to self-efficacy and outcome expectations for Latino students (Ali & Menke, 2014), for the role of time (Imbellone & Laghi, 2015), and for career choice and calling (Kaminsky & Behrend, 2015).

Both the TLT and the SCCT discuss issues that relate to career entry or life periods associated with preparation for and implementation of career choice. Both are in some way relevant to academic and career behavior and may continuously be repeated as individuals encounter certain experiences. Both theories intertwine when dealing with self-reverent thinking in that self-knowledge and self-control are the ideas that guide and motivate people's behavior as they go through life and attempt to fulfill what they feel they are called to do (Lent & Brown, 1996; Marmon, 2010).

The two theoretical viewpoints suggested individual interests are shaped and molded over time. What may interest a person one day may not interest the same person the next day. Similarly, personalities develop over time because of what people experience and are exposed to over time. As a person transitions out of young adulthood and the number of responsibilities increases, different life paths can emerge (Lent & Brown, 1996; Marmon, 2010). When deciding a career, there are many choices individual's make; personal interests and experiences can shape or guide these decisions.

Understanding specific experiences that lead to a fulfilling career is important, thus the TLT and the SCCT discuss issues that relate to career entry or life periods associated with preparation for, and implementation of, career choice. Both theories intertwine when dealing with self-reverent thinking in that self-knowledge and self-control are the ideas that guide and motivate people's behavior as they go through life and attempt to fulfill what they feel they are

called to do (Lent & Brown, 1996; Marmon, 2010). The TLT and the SCCT provide a framework for how powerful internal and external experiences affect the way women develop their interests and eventually make career their decisions.

Related Literature

A review of topics in the literature related to women's STEM career choices contributes understanding of the issue addressed in this study. The problem of this study is the lived experience of female STEM majors who become secondary educators rather than enter a STEM-related corporate profession. Topics related to this problem include investigating the historical trajectory of women as teachers, an examination of STEM, the need for females in STEM professions, and the influences affecting women's career choices particular to STEM fields.

A Brief History of Women as Teachers

At the beginning of the 19th century, children were primarily educated at home by the parents (Boyle, 2004; Spring, 2015). Schooling was unregulated and had no set term limits. Churches also operated schools for the poor for charitable and moral reasons. Upper-class and some middle-class families sent their male children away for schooling or hired tutors. Female students usually did not receive a formal education. Additionally, teachers during this time were ordinarily males who primarily taught for a supplemental income as they studied for their actual careers.

During the 1840s and 1850s, industrialization led to an increase in the population. In addition, the common school movement was the prevailing discourse of that time. The common school movement indicated every child should have proper schooling for the country to remain stable and healthy (Kaestle & Vinovskis, 1980; Slater, 2016; Spring, 2015). The common school movement may have been the impetus for current legislation ensuring all

students receive a free and public education. During this time, girls and boys were also being taught together in classrooms, and women began teaching younger children even though men were still responsible for teaching older children. Thus, state and the federal governments took a greater role in the regulation of schools and there was a need for more teachers (Slater, 2016; Strober & Lanford, 1986).

By the end of the19th century early childhood education had been established as an activity classified as women's work (Weiler, 1989). Women were then being employed as the dominant teaching work force. However, the shift from men being the dominant school teacher to women outnumbering men in the teaching field was welcomed relatively slowly and structural sexism helped prevent its acceptance (Boyle, 2004). Structural sexism during this period barred women from most professions; besides mill and domestic work, there were not too many options for women to work outside of the home. Because teaching was a relatively low-status occupation and the new demand for teachers, a more open-minded view of women's work was established to justify the employment of women (Boyle, 2004; Spring, 2015).

According to Weiler (1989):

> One of the key ways in which teaching for women was made acceptable in this early period was to define the school as a continuation of the family. In this construct, the nurturing and guiding role of the parent was simply to be continued by the woman teacher. The child was viewed as developing first within the context of maternal care in the family, and then moved naturally to the care of the woman teacher . . .. The argument that the schoolroom was a continuation of the family also could be used to justify the experience of teaching for young women who would teach for a few years before marrying and beginning a family of their own. (p.17)

Additionally, an industrialized economy led to women having more leisure time

because they were no longer required to do chores such as making clothes and other homemade household items. Household necessities were then being produced in mass by machines. The mass production of household goods opened a door through which young, educated, and unmarried women could provide a suitable pool of potential teachers. Consequently, the perception of education changed and the employment of women as the predominant teacher workforce became accepted (Slater, 2016; Spring, 2015).

More than 150 years has passed and the number of women who enter teaching remains high. As stated by Boyle (2004), teachers today come from all socio-economic classes and backgrounds and they usually hold their teaching positions throughout their lives. The teaching field is still a relatively low-paid occupation and brings little respect to the people employed in the field. Snyder and Dillow (2013) presented statistical data that showed a steady increase in the percentage of female elementary and secondary teachers between the 1987-1988 and 2011-2012 school years. Female teachers comprised 70.5% of the teaching force in the 1987-1988 school year and 76.3% in the 2011-2012 school year. The percentage of females teaching in private schools during the same time frame revealed a small decline. Female teachers made up 78.2% of teachers in private schools in the 1987-1988 school year and 74.8% in the 2011-2012 school years (Snyder & Dillow, 2013).

Increased numbers of female teachers in public schools occurred despite the numerous other occupations and professions that have been made available as an employment alternative for women. The number of men entering the teaching field has grown 22%, but the number of women entering teaching has grown over twice that amount (Ingersoll, Merrill, & Stuckey, 2014; Snyder & Dillow, 2013). One reason for the increase in the number of women entering teaching may be due to additional opportunities in the field of education, such as becoming a principal (Ingersoll et al., 2014). If this educational trend continues, eight of 10 teachers in the

nation will eventually be female (Ingersoll et al., 2014).

The job outlook for teachers is expected to grow even more in the next ten years (Bureau of Labor Statistics, 2016); however, this growth is not necessarily a reflection of better wages. In May 2015, the *Occupational Outlook* handbook identified the median annual wage for all workers was an estimated $36,200 (Bureau of Labor Statistics, 2016). The field of education is very broad, and although certification does require a college degree, for many of the disciplines taught, the degree can be in any number of related subject areas (Feistritzer, Quelle, & Bloom, 1986; Ingersoll et al., 2014).

Many college graduates are attracted to the field of teaching whether they have a degree in education or not. Some of these graduates feel that by becoming a teacher they will have the time and opportunity to choose their long-term career, while also earning a secure paycheck (Feng, 2014; Watt et al., 2012). Perception coupled with the wide variety of courses available to teach, adds to the initial desirability of the field.

Snyder and Dillow (2013) reported the percentage of teachers by subject between the 1987-1988 and 2011-2012 school years. This report represents data for public schools at both the elementary and secondary school levels. Despite the increased efforts to expose elementary students to more STEM activities, these students remain underexposed (DiFrancesca, Lee, & McIntyre, 2014; Lachapelle & Cunningham, 2014). Although each area of STEM is not individually delineated for each level, teachers who teach STEM courses are represented within these statistics.

For public schools at the elementary school level, the number of teachers in science decreased from 0.8% in the 1987-1988 school year to 0.5% in the 2011-2012 school year (Snyder & Dillow, 2013). The number of teachers in mathematics decreased from 1.3% in the 1987-1988 school year to 0.9% in the 2011-2012 school year. The number of teachers in

technology and engineering was not listed individually but was included within the category for other subjects (Snyder & Dillow, 2013). The category for other subjects for the elementary level increased from 2.4% in the 1987-1988 school year to 3.1% in the 2011-2012 school year.

For public schools, these same subjects gradually increased at the secondary level. The number of secondary teachers in science increased from 4.9% in the 1987-1988 school year to 6.2% in the 2011-2012 school year (Snyder & Dillow, 2013). The number of teachers in mathematics increased from 6.0% in the 1987-1988 school year to 7.4% in the 2011-2012 school year. The number of teachers in the vocational/technical subject decreased from 7.1% in the 1987-1988 school year to 4.3% in the 2011-2012 school year. Engineering was not listed separately, but the category for other subjects for the secondary level within public schools increased from 3.3% in the 1987-1988 school year to 4.6% in the 2011-2012 school year (Snyder & Dillow, 2013).

What is STEM?

To better understand the problem of female STEM majors becoming secondary educators rather than entering a STEM-related corporate profession, literature detailing STEM was reviewed. The acronym STEM stands for science, technology, engineering, and mathematics, and has been in use since 1958 (Daugherty, 2013). These four areas, driven by their specialized subject matter, have become a national priority in the United States (Landivar, 2013). The occupation code list of the Census Bureau consists of 23 major STEM occupational groups and 539 specific vocations. A brief description of each area of STEM follows.

According to Landivar (2013), there is a lack of consensus when classifying STEM occupations because there is some overlap when it comes to what STEM professionals do in the workforce. The lack of consensus is due to the interrelated and sometimes complex nature

of the field (DiGironimo, 2011; Graham, 2014). The STEM classification has three domains. The first domain includes science, engineering, mathematics, and information technology occupations. The second domain includes occupations related to science and engineering. The third domain is made up of non-science engineering occupations (Landivar, 2013).

Science. Workers employed in science, the first area in STEM, have multifaceted jobs. Science workers use techniques of observation and experimentation to answer the how and why of the natural and physical world. The area of science includes conducting research using the scientific method, a process which involves repeating experiments, producing observable data, and presenting findings.

Technology and engineering. The second and third areas in STEM, technology and engineering are closely related. However, according to Graham (2014), technology focuses on application and implementation while engineering focuses on theory and conceptual design. In technology, the goal is to connect people through faster and less expensive modes of communication (DiGironimo, 2011). As stated by the President's Council of Advisors on Science and Technology (PCAST, 2012), technology is science related to computer and information systems. The type of work classified as technology may include designing, testing, and improving communication systems and networks. Workers in engineering solve real-world problems in a variety of products, materials, and structures (Vilorio, 2014).

Mathematics. Engineers use math, science, and technology to create things for the benefit of society, to explore what makes them work and to figure out how to make them better (Stern, 2010; Vilorio, 2014). In mathematics, the final area in STEM, the goal is to solve problems using numerical and logical relationships. The type of work classified as mathematics may include improving efficiency and finding patterns in data (National Academy of Sciences, 2007; Vilorio, 2014). According to Graham (2014), mathematics as a discipline

can be abstract in nature, as both a field of study and the foundation of the other STEM fields.

Employment in STEM occupations. The growth in opportunities for employment in STEM occupations has been on a steady incline over the past few decades. In 2016, the Bureau of Labor Statistics reported that STEM jobs made up almost 13 % of the total national employment, a figure that is steadily on the rise. According to Langdon, McKittrick, Beede, Khan, and Doms (2011) STEM workers on average earn more money than many other occupations, even if they do not have an advanced level of education. In some cases, STEM workers were making an additional $9 per hour working in their field and $4.50 in non-STEM occupations, which included occupations within the areas of healthcare and education. Even in a climate of economic recession, STEM workers were less likely to experience job loss and have a lower unemployment rate than non-STEM workers (Langdon et al., 2011; Rothwell, 2013).

The belief that the U.S. is facing a shortage of individuals majoring in fields related to STEM has forced industry leaders as well as policymakers in the United States to focus on bringing its citizens out of the high-tech talent slump (National Academy of Sciences, 2007; Salzman, 2013). Therefore, the future of the U.S. economy may depend on the ability of its citizens to be innovative in the creation of jobs in new and unique industries (Ku & Capolupo, 2014; Puffenberger, 2010). Additionally, employers must be able to attract capable employees with rewards that outweigh the challenges of becoming proficient in STEM-related careers (Tadjeh, 2013; Vilorio, 2014). With this important issue affecting the way the U.S. can compete in a global economy comes the obligation to find ways to encourage individuals to aspire to seek and obtain careers in STEM-related fields. Initiatives have concentrated on increasing the number of students who declare an area of STEM as a major and have even been successful in improving the number of women and minorities who enter college in areas

related to STEM (Ceci & Williams, 2011; Leslie, Cimpian, Meyer, & Freeland, 2015; Leslie, McClure, & Oaxaca, 1998; Piotrowski & Hemasinha, 2012).

According to Gonzalez and Kuenzi (2012), the publishing of the report entitled *Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, by the U.S. House of Representative's Committee on Science, enhanced congressional interests exponentially in 2007. This report noted there were over 200 bills with the term *science education* in Congress, and between $2.8 and $3.4 billion was spent on them. A budget this sizeable was allotted in hopes that by the time high school students graduated, they would be heading off to college with aspirations of majoring in one of the underrepresented STEM majors necessary for the U.S. to successfully compete in the ever-changing global market.

Even with emphasis on STEM training, the proportion of women going to college and graduating with a degree in a STEM-related field has not increased significantly in relation to the focus that has been placed on sparking student interests and recruitment in the area. Even among women entering STEM training programs, there is no guarantee they will enter STEM careers after graduation. These women obviously have the skill, aptitude, and desire to obtain a degree in a highly skilled STEM area, as evidenced in their acceptance into highly competitive institutions of higher learning. However, despite both governmental and industry enticement, many women who have earned degrees in a STEM field still decide not to seek employment within these fields (Makarova, Aeschlimann, & Herzog, 2016; Salehjee & Watts, 2015; Snyder, Oliveira, & Paska, 2013).

The Need for Female Representation in STEM

In 2012, the National Science Foundation reported women made up a virtually equal percentage of graduates receiving science and engineering degrees (American Chemical

Society, 2012). However, once these women received their degree in a STEM field, 20% of them ended up leaving the labor force prematurely compared to less than 10% of men (Landivar, 2013). The trend of higher percentages of women leaving the STEM labor force lends understanding to why the percentage of women who work in STEM occupations has increased no more than 4% and has even decreased in the areas of the workforce utilizing computers and mathematics (Beede et al., 2011; Glass, Sassler, Levitte, & Michelmore, 2013).

Salary discrepancies. Salaries are not always equal between workers of different genders with similar job descriptions (Landivar, 2013). However, gaining employment in a STEM field can be very lucrative. In many of these STEM areas, the gap between the salaries women make compared to men's is less than in many other skilled areas. Although, the statistics varied, in 2013, organizations such as the National Partnership for Women and Families reported women received salaries that were between 78% and 91% of men's salaries in comparable positions. In addition, Landivar (2013) reported STEM employment boosted earnings more for women than for men, and women in these areas earned over $16,000 more per year when compared to women who had the same training but were not employed within the field. According to the U.S. Department of Commerce this wage gap has been as much as 33% in some areas (Langdon et al., 2011).

According to Jones (2014), the business sector employed the largest percentage of graduates who earned a science or engineering degree. The business sector, which includes both for-profit and non-profit businesses, employs about 70% of graduates, followed by 19% in education and 11% in government sectors (American Chemical Society, 2012). Of these occupations, the number of women employees entered very different areas of work than those of men. At 58%, the highest-level of women entered into the area of social sciences, and life sciences followed with 48%. There were lower percentages of female workers in the areas of

mathematics and engineering, having a representation of 25% and 13%, respectively.

Distance education. Technological advancements allow students in general to more easily participate in post-secondary education and training and continue their commitments to their family at the same time. Increased flexibility, along with the U.S. focus on increasing participation in STEM-related activities, may also lead to the assumption that more women study, graduate, and pursue careers in STEM-related jobs. Although the numbers of females majoring in STEM-related areas has increased, it is difficult to understand why the numbers of women who become employed in these same STEM-related career areas are not increasing at similar rates (Acker & Oatley, 1993; Else-Quest, Hyde, & Linn, 2010; Landivar, 2013; Seymour & Hewett, 1997).

Other influences. More information is necessary to find reasons that explain the differences in the rate of females majoring in STEM-related areas and the number of women who obtain STEM-related jobs. Increases in the number of women majoring in STEM-related fields may result in the increase in the number of women who participate in STEM-related activities, in general. Additionally, the ability to observe women who are already employed in a STEM-related area, may also serve as encouragement for female students with similar aptitudes and abilities to pursue careers in STEM fields (Diekman, Steinberg, Brown, Belanger, & Clark, 2016; Perez-Felkner, McDonald, Schneider, & Grogan, 2012). Understanding this deficit is important with several things to consider. Such underrepresentation is a result of both external and internal factors. External experiences occur due to environmental influences and result in learned behaviors and ideas. External experiences may also be considered as extraneous and independent events. Internal experiences occur due to influences that come from within and may be considered a manifestation of biological or innate preferences. Internal events may also produce attributes

or characteristics that are inherent to a person's personality or a part of a person's constitution. In part, experiencing both types of experiences can play a role in decision making to one degree or another, and warrant closer examination.

External Influences that Impact Female Representation in STEM

External influences include perceived gender differences, cultural views of the role of women, and self-esteem. Education and the effects of socialization on aspects of student experiences, and college retention rates also influence female representation in STEM. These external experiences may result in the minimization of extrinsic motivators, which may be a necessary ingredient in the choice to pursue and obtain STEM-related majors (Hernandez, Schultz, Estrada, Woodcock, & Chance, 2013; Smoot-Taylor, Woods-Erwin, Ghose, & Perry-Thornton, 2001).

Gender difference. Although there has been some growth in the employment of women in STEM, science and engineering programs still graduate twice as many men as women (Beede et al., 2011; Landivar, 2013; Smeding, 2012). The Census Bureau Occupation Code List includes 63 specific STEM occupations and 35 STEM-related occupations. These STEM occupations include computer and mathematical occupations, engineers, life scientists, physical scientists, and social scientists. STEM-related occupations include architects, healthcare practitioners and healthcare technicians (Landivar, 2013).

For women, gender difference is a relevant obstacle that regularly deters them from entering STEM-related field. Gender difference is often manifested as stereotypical perceptions or feelings of being out of place in a profession dominated by middle class men (Jagacinski, 2013; Perez-Felkner et al., 2012). Although limited scientific data support female inferiority in STEM-related areas, beliefs along this line seem to be more than just a contributory influence for women matriculating in graduatelevel STEM courses, possibly one

of the principal influences (Fulmer, 2014; Toren, 2009; Tripp-Knowles, 1995). Furthermore, the intersection between gender (femininity) and ethnicity was noted to increase in vulnerability within the academic context (Toren, 2009).

Many women ~~who~~ are capable of earning a degree in a STEM-related field as well as successfully contributing to society when they obtain a STEM-related job (Diekman et al., 2016; Perez-Felkner et al., 2012). If these women did not have the ability, they would not be accepted into these rigorous and often competitive STEM preparation programs (Chen, 2013). However, when looking at the role of gender differences, research suggests women who can compete in a male-dominated career, do not want the added stress that comes with being competitive (Bona et al., 2010; Else-Quest et al., 2010). Many of these women would rather enter a field such as the field of education where they can utilize their knowledge in an environment that is more communal than competitive in nature (Diekman et al., 2010; Diekman & Steinber, 2013).

The change in the attitudes of women regarding the decision to major in STEM fields is of high interest to several groups of people, individual researchers and scholars as well as entities such as governmental officials, economists, and industry leaders among others (Branch, Woodcock, & Graziano, 2015; Dika & D'Amico, 2015). A key that unlocks the reasoning behind why some students are more likely than others to major in certain fields is needed. Bryant (2003) attested that the act of attending college alone can liberalize or broaden ideas based on gender-roles according to how a woman perceives many of the activities that are deemed appropriate for women. In addition, living in an on-campus environment may tend to minimize adherence to traditional gender-roles.

In a 2012 study completed by Leaper, Farkas, and Brown, an ethnically diverse sample of 579 teenage girls in the U.S. determined that perceptions influenced motivation differently

when it came to math and science-related subjects as opposed to subjects such as English. Leaper et al. also reported that experiences such as the exposure to specific gender roles, and the degree to which these teenagers felt pressure to conform, influenced the motivation of the girls in domain specific ways. These domains shaped the processes which were linked to the development of interests in math and science. Additional findings by Robnett and Leaper (2013) also reflected an influence on STEM career interest related to background variables such as gender, as well as other group characteristics.

Cultural views towards women's roles. The cultural environment in which a person is reared may also have an impact on the choices that are made throughout a person's life. Zimmermann (2012) defined culture in the U.S. as:

> The characteristics of a particular group of people, (which is) defined by everything from language, religion, cuisine, social habits, music and arts. Today, in the United States as in other countries populated largely by immigrants, the culture is influenced by the many groups of people that now make up the country. (p.1)

With the added pressures of historically traditional women's roles, cultural beliefs can magnify the already difficult process of career decision-making. Difficulties related to culture can be attributed to familial considerations such as parenting style, the level of family support, the amount of interaction between family members, and level of familial guidance (Bergen, 2006; Ghanizadeh, Eishabadi, & Rostami, 2015). Difficulties related to intellectual-cultural orientation may also affect decision making, especially in cultures that are similar to the Chinese culture, in which there is a strong tradition of family honor (Hou, Wu, & Liu, 2013; Leong, Kao, & Lee, 2004). In essence, the interaction of family members and their levels of socialization can impact the family environment, which may in turn affect the career decisions of the children that each family produces.

Self-concept/self-esteem, peer influence and commitment. In the literature on women and minorities in science, three concepts were closely related: self-concept/self-efficacy, peer influence, and goal commitment (Leslie et al., 1998; Wang, Eccles, & Kenny, 2013). The early development of a woman's self-concept is affected by the influences of her peers, which can include how she reacts to her peers, and how her peers react to her. This is known as her socialization which affects the commitment to one's purpose or path and ultimate career choice.

Although self-concept can be internal, these concepts were discussed in this section because an individual's self-concept and self-efficacy can be shaped by people, activities and experiences outside of one's self, such as peer pressure (Acker & Oatley, 1993; Hernandez et al., 2013). These two concepts are connected because self-concept is how one views himself or herself, and self-efficacy is how one feels about his or her own ability to perform certain tasks or activities (Archer et al., 2014). In other words, self-efficacy is the personal assessment of one's own expectations of what the person can master or perform, which in turn influences the development of the person's self-concept.

At any point in life, whether as a child, adolescent, or adult, what others say and think can have either a positive or negative effect on them. Peers can influence multiple aspects of the psyche, including the way people views themselves (Wasylkiw & Williamson, 2013), how they view others (Renouf et al., 2010), and the decisions individuals end up making (Ingram, 2013). The indirect and direct messages that are received from those around, including family members, play a role in the roads people choose to travel.

Often the lack of ability to obtain a STEM-related career is less important than a person simply having a choice. This choice is related to one's level of commitment. Life experiences can change a person's focus, which can change a person's aspirations, which ultimately relates

back to the individual's level of commitment. For women to remain interested in continuing in a STEM field, they need to have and retain the proper motivation.

Student retention. Fulmer (2014) stated that "having a positive attitude toward science-along with the host of related perceptions and experiences that go into such attitudes contributes to students' motivation for and persistence in school science" (p. 200). This statement can also be attributed to persistence in the other areas that make up the acronym STEM. The key word in this quote is perception, which can also be called a mental impression. Students need to be exposed to experiences that develop their extrinsic and intrinsic motivation for these majors. Otherwise, it will be extremely difficult for these students to develop or maintain the perception or mental impression that a STEM-related major will lead to the right job for them (Byars-Winston, 2014; Smoot-Taylor et al., 2001).

To ensure that a woman receives the proper education in a STEM field, she must first be interested in the subject enough to choose to major in it, then finish her degree, and finally find a profession in a STEM career that is lucrative. The job site must also fit her criteria for a working environment that is kind to women. To retain students in a STEM field, especially female students, they must be made to feel welcome and valued (Richman, vanDellen, & Wood, 2011; Townley et al., 2013).

To establish the retention of STEM majors, the educational environment must be one in which negativity towards women cannot be felt, but one promoting that they are equivalently capable of learning the subject matter. Students should also be able to see others who mirror themselves and can be mentored by individuals who are more like them (Fulmer, 2014). In addition, for them to be retained, women must believe that what they are learning is relevant (Bona et al., 2010; Smoot-Taylor et al., 2001).

Influence of education. As a result of the No Child Left Behind (NCLB) mandates

that became law in 2002, numerous conversations about how to improve the learning of all children, especially those students from homes that are in lower socioeconomic neighborhoods. These mandates include students who have both diagnosed and undiagnosed learning difficulties as well. While at one time in the history of the U.S. educators were drawn from the lower end of the academic achievement curve, now there is a push for attracting educators who are highly qualified, which could be code for *smarter people* (Goldhaber & Walch, 2014).

One of the goals of NCLB was realized by attracting and employing teachers with strong content knowledge to teach classes in STEM. Many gifted and talented educators have been given the responsibility of creating innovative and imaginative ways to teach students to become interested in STEM disciplines (Daugherty, 2013; Ramirez, 2010). Therefore, recruitment incentives such as signing bonuses for certified science and mathematics teachers began to be offered by school districts in order to draw the best, the brightest, and the highly-qualified educator to their area (Hillier, deWinter, & Twidle, 2013).

Legislation. Incentives and similar practices have continued with grants, programs with stipends and other perks initiated by the Obama administration (Carnevale, Smith, & Strohl, 2013; Gonzalez & Kuenzi, 2012). The focus is not only to interest more students into going into the STEM field, but to persuade the most gifted individuals to go into STEM-related professions. Programs like these will make it possible for individuals to create innovative and groundbreaking technology that ultimately will benefit the United States (PCAH, 2011). Factors such as the aging of current employees and outsourcing have inspired stronger recruiting tactics in an attempt to draw the interests of high school level students towards STEM majors and steer them towards STEM-related careers when they graduate (Tadjdeh, 2013). Depending on what type of transformational experiences female college students have been exposed to, this recruitment could be a monumental task or an uphill battle at the least.

Additionally, in February 2017, President Trump signed two bills that promoted women entering STEM areas and leading STEM-related fields (Arter, 2017). The first initiative was called the Inspiring the Next Space Pioneers, Innovators, Researchers, and Explorers (INSPIRE) Women Act (2017). The INSPIRE initiative directed the National Aeronautics and Space Administration to advance space and science exploration efforts by encouraging women and girls to study STEM. The second initiative was called the Promoting Women in Entrepreneurship Act. The Promoting Women in Entrepreneurship Act was an amendment to the Science and Engineering Equal Opportunities Act, which authorized the National Science Foundation to encourage entrepreneurial programs that recruit and support women (Arter, 2017; Promoting Women in Entrepreneurship Act, 2017). Both of these policies will lead to the increased support of women in the workplace.

Expansion to include the arts. In an effort to deepen student attraction to STEM, some have proposed the addition of an *A* to the STEM acronym. The new acronym would be STEAM. The *A* would create a new acronym that stands for Science, Technology, Engineering, and Applied Mathematics, as a small faction would support (Daugherty, 2013; Pawlowski, 2012). The *A*, however, would stand for *Arts*. The impetus behind this addition is the connection that art has to fostering learning by emphasizing the development of risk-taking behaviors as well as creative problem solving and innovative thinking skills (Adding Arts to STEM, 2012).

The arts can be incorporated into STEM, with examples as follows. Through art-making projects, the Philadelphia Arts in Education Partnership worked with schools to help elementary students understand abstract concepts in science and math such as fractions and geometric shapes (Adding Arts to STEM, 2012). The Dance Theater of Harlem collaborated with the City College of New York's engineering school to design shoes that minimize injuries

and enhance performance. At the University of Delaware, engineering students collaborated with art and theater students to design prototypes for cardiopulmonary training. In addition, several colleges such as the University of Utah, Arizona State School of the Arts, and the Rhode Island School of Design have added degree options that include both a science and an art component, such as Media and Engineering (Daniel, 2015).

Recommendations through the National Academies Press push towards the development of high interest STEM/STEAM activities which are geared for students in the early primary grades, even as early as Kindergarten (Harbowski, 2011; Hogan & Down, 2016). Hopefully, early interventions will not only aid in the development of math-related skills, but also will introduce reading readiness as well as the concepts of discovery and creativity. Early interventions in both STEM and STEAM activities may also increase early participation in community service and volunteer work. In turn, community service and volunteer work can serve as a stepping stone to paths that may not have previously been thought of (White, 2014).

Stereotype affect. Another source of external experiences that may influence a woman's career choice may stem from stereotypes or the perceived mindsets or beliefs that arise because of a stereotype threat. A stereotype can be defined as "a standardized mental picture that is held in common by members of a group and that represents an oversimplified opinion, prejudiced attitude, or uncritical judgment" (Merriam-Webster, 2016). Judgment defined in this way lends itself to a second definition, which is "an unfair and untrue belief that many people have about all people or things with a particular characteristic" (Merriam-Webster, 2016). In keeping with the second definition, the stereotype threat theory provides the reasoning behind some of the research regarding aspects of low performance and decreased career choice among women in STEM fields (Fogliati, 2012; Spencer, Logel, & Davies, 2016).

The stereotype threat theory states that negative stereotypes can interfere with the social

identity of an individual. People may experience a level of pressure and will respond by conforming to the specific stereotypical ideals when performing a certain task (Spencer, Logel, & Davies, 2016; Steele, Spencer, & Aronson, 2002). The pressure of underperforming does not exist for other groups of individuals that are not negatively stereotyped for the task.

Fogliati (2012) conducted a study on how college students responded when faced with a stereotyped threat. The 154 participants included 108 women and 46 men who were enrolled in a large university's psychology courses. When the women were told there were gender differences in mathematics scores, they experienced the stereotyped threat, which was seen when they did not aspire to perform as well as the men and they expected significant gender differences in their performance. The results of Fogliati's study supported the suggestion that people will conform to the threat of inferiority when they perceive there is a difference between groups. Similar results were found in studies of young people and mathematics (McGee, 2013), gender-science stereotypes (Cundiff, Vesco, Loken, & Lo, 2013) and reducing stereotyped threat in engineering students (Eschenbach, Virnoche, Cashman, Lord, & Camacho, 2014).

Cundiff et al. (2013) conducted a study using 1,799 students who were enrolled in various introductory science courses that were designed for science majors. In exchange for course credit, the students answered questions online, intended to measure both implicit and explicit gender-science stereotypes. The stereotypes were assessed in two ways: self-reporting and using a response-latency system that determined the associated strength of specific study related concepts. Findings of the study suggested stereotypes associated with women in STEM fields were influential. The findings also suggested that these stereotypes altered perceptions and women's experiences in a stereotypical environment, both of which influenced women's desire to be persistent toward a STEM-related goal. Additionally, Cundiff et al. noted that

stereotypes interfere with social connections, which could affect performance, initial choice, as well as involvement in a STEM-related field. Thus, stronger gender stereotypes were associated with weaker science career aspirations.

Further research reveals several studies that suggest alternative results. Dissenting views suggest that specific stereotypical ideas have little or no negative effects on whether a female student decided to major in a STEM field in college (McGee & Martin, 2011; Powell, Dainty, & Bagilhole, 2012). Other dissenting research results report little or no negative effects on the performance a female student in related subject areas (Appel, Kronberger, & Aronson, 2011; Lewis, Stout, Pollock, Finkelstein, & Ito, 2016; Smeding, 2012) or the rate at which female graduates seek employment in a STEM or STEM-related field (Deemer, Thoman, Chase, & Smith, 2014; McGee & Martin, 2011).

As an example, a study was conducted by Lee (2012) with 256 participants from an Introductory Psychology class. Of those participants, 157 were female students who were representative of several ethnic groups and had a mean age of 19.33 (SD=2.81). In Lee's study, posters of different images were used to create three intended environments: gender inclusive, gender neutral, and gender exclusive. The participants were instructed to complete a questionnaire, and the results were analyzed. The results of this study contradicted previous studies, which suggested that women were threatened by stereotypes and no evidence of lower rates of achievement, motivation, or persistence were discovered.

Other external barriers for women. For many years, women have faced limitations when attempting to gain and sustain a career in the corporate arena of the STEM-related work force. Two of the limits, which may play a role in the aspirations of women who choose these corporate level careers are flexible work schedules (Bona et al., 2010; Diekman, Brown, Johnston, & Clarke, 2010) and the ability to access and participate in STEM-related activities

while still being able to spend time with their families (Townley et al., 2013). According to Tripp-Knowles (1995):

> The barriers facing women in science academia supports the theory of cumulative disadvantage in showing that there are a substantial number and variety of barriers which systematically limit and obstruct women's entry into science and hinder the opportunities of the few women in science who 'make it' to the upper echelons of the profession. (p.32)

The reason these barriers are considered cumulative is because the wide variety of obstacles accumulate and create a strain, making choosing another less stressful career appear more beneficial. The tension that forms because of these obstacles can lead to lower self-confidence and feelings of powerlessness. These and other barriers, such as cultural differences, are shown to exist in, and limit all stages of the decision-making process (Ghanizadeh et al., 2015; Toren, 2009). For women who are choosing between a corporate career in STEM-related field versus another career, cumulative barriers could have an impact on the number of women represented in STEM-related fields.

Internal Influences that Impact Female Representation in STEM

In contrast to external influences, internal influences include the role of faith, confidence in one's abilities in comparison to others, and changing priorities, which may lead to changing interests. These internal experiences may decrease curiosity and enjoyment in science, technology, engineering, and math related activities, which just may be the intrinsic motivators that women who are contemplating choosing a major in a STEM field need. The challenge of getting more women to embrace STEM education and aspire to enter STEM-related fields on a professional level will remain a difficult task unless more influential life events are addressed.

Influence of faith. A few occupations that fall under the STEM umbrella may pose a problem due to a conflict with a person's upbringing or spiritual beliefs. For example, a scientist who is devout in his or her spiritual beliefs about the sanctity of life from a Christian point of view, may be assigned to do laboratory research on genetic mutations or cloning. In this case, the scientist may not feel comfortable performing these duties because it is contrary to what is taught in the Bible, Qur'an, and other religious texts (Eckert, 2011; Nehm, 2006). Although issues of faith are most likely related to the *science* area of STEM, another example of a faith-based conflict could be that of an engineer who is tasked with the development of blue print plans for a building that will be constructed on or too close to an area that is consecrated or has religious significance. Findings in a study done by Sickel and Friedrichsen (2013) suggested religion does predict acceptance of certain faith-based topics such as evolution. Of the 552 secondary biology teachers in this study, 19% were unsure and 14% were not accepting of evolution, which was a relatively small minority of teachers who were definitively able to reconcile their religious faith with the theory of evolution.

Similarly, the level of religiosity may be very important and may have an impact on long-term goals (Gonsoulin, 2010; Rissler, Duncan, & Caruso, 2014; Wuthnow, 2010). The term *religiosity* can apply to a multitude of religious beliefs and activities. For example, the term can apply to the depth of dedication that a conservative Christian woman has towards her religion. Therefore, religiosity may play a role in determining whether or not a woman decides to find a career outside the home and still be able to fully participate in the activities of her faith. Studies have shown women with a strong religious faith make life choices based on the tenants of their chosen religion (Gonsoulin, 2010; Scott, 2002; Stavrova & Siegers, 2014).

According to a study conducted by Scott (2002), religion shapes the construction of the meaning of work and may have a strong influence on decisions regarding both the family and

work. In Scott's study, conducted in multiple stages, 50 men and women from traditional liberal and conservative Christian churches were interviewed. The churches were located in New Jersey and southern California. The participants of this qualitative study were considered regular churchgoers who attended church on an average of one time each week and were employed at least part time.

The results of Scott's (2002) study also indicated conservative women viewed taking care of their family, especially being home with their children, as meaningful work. In eyes of the women in Scott's study, raising children was more important than any job outside the home. Although both liberal and conservative women felt a sense of calling to their work, the liberal women felt an equal sense of calling towards working outside of the home in a paid job, noting they may not be "a complete person" if they did not participate in both aspects of work (Scott, 2002, p.26). According to Ingersoll et al. (2014),

> Another factor might have to do with negotiating the dual roles of homemaker and breadwinner—the fit between job and family. Historians argue that one factor behind the high proportion of women in teaching over the past century was the relatively workable fit between the job of teaching and the job of child rearing. From this viewpoint, with shortened days and summers off, caring for a family was more manageable for teachers than for women in many other jobs and careers. This workday structure may still be attracting women to teaching. (p.15)

Other research has also discussed views of acceptance which reference concepts which connect family ideology and status attainment (Gonsoulin, 2010) and women in the political realm (Gonsoulin & LeBoeuf, 2010). Comparably, acceptance has also been described in relation to inter-role conflict (Gallagher, Hall, Anderson, & Del Rosario, 2013) and with individuals working in atypical occupations (Treleaven, 2015). In addition, Friedman (2015)

noted efforts to achieve acceptance with women's access to historically masculine roles.

On the theory of evolution. The religious perspective of creationism and the scientific theory of evolution are inherently incompatible. Those who assert that either religion is correct, or science is correct feel both cannot be correct (Levesque & Guillaume, 2010). However, some people feel science and religion can be complementary perspectives (Kaye, 2008; Yasri & Mancy, 2014). Research in this area does not negate religious convictions but simply allows room for those who have had transformative spiritual experiences that lead them beyond science, or those who have encountered scientific innovations that have allowed them to assimilate some scientific data into their core beliefs. The core religious beliefs an individual possesses regarding the origin and creation of life has a powerful impact on individuals' religious and cultural notions as well as their understanding of science and pedagogical practice (BouJaoude et al., 2011; Hermann, 2013).

Society has traditionally placed women in the role of nurturer and care giver. For years, women have had two contradicting problems. The first problem was they were not considered to be independent if they continued to conform to traditional roles, and the second was they were viewed as not feminine enough if they challenged what was expected of them (Eckert, 2011; Olarte, 2000). If it was necessary for a woman to get a job, the less conflicting choice was easily made. In many cases, the less conflicting decision was to choose an occupation that incorporated the more acceptable nurturing role that a wife and mother would already be performing at home (Brown, 2002; Gallagher et al., 2013; Ramirez, 2010). The lack of positions for women during a time when it became necessary for women to work outside the home, made the choice to become an educator very appealing.

A matter of choice. The interaction of more than one experience can affect a person's decision to become a science teacher despite religious convictions (Slovacek et al., 2011; Yasri

& Mancy; 2014). The results of a study done by Mansour (2011) indicated the participants' views of the relationship between science and religion confirm the centrality of thoughts and views concerning issues of science and religion. These findings suggested teachers believe science and religion should be kept separate. Additionally, all participants argued that their religion is the main source of truth. Religion could be a major reason female students do not continue in STEM-related careers. However, as documented by Sickel and Friedrichsen (2013) as well as Taber (2017), findings such as these would also discourage some teachers in their pursuit towards a variety of other STEM-related fields of education.

Impact of social roles. Social roles may make a big difference in the choice a woman makes for her career aspirations (Diekman & Steinberg, 2013; Lewis et al., 2016). They are the part a person plays as a member of a social group. Psychologists define social roles as a role that is adopted in which a person's behavior can change to fit the expectations the person has about that role. Each of these social roles carry expected behaviors. Whether it is how a person wants to be perceived, how they are treated, or how they interact with others in public, the social roles a person subscribes to may be influenced by both internal and external experiences. A social role can be both internalized and externalized because a person's beliefs about their social roles may influence the kind of job they seek out or shy's away from. Choosing a non-compatible career may facilitate or impede progress toward a goal and the maintenance of that goal (Diekman & Steinberg, 2013).

An aversion to the task of conquering the numerous challenges associated with the actual choice, seems to be a more relevant reason for women deciding against pursing a STEM-related career than their lack of ability. Many women are social in nature. Many of these female students are highly capable of succeeding in STEM-related career and also have a high verbal aptitude. Students with this high verbal aptitude, a characteristic that lends itself to

the need to socialize, may find it necessary to explore a wider range of occupations than typically associated with STEM-related professions (Diekman, Brown, Johnston, & Clark, 2010; Diekman & Steinberg, 2013; Rice, Barth, Guadagno, Smith, & McCullum, 2013; Wang et al., 2013).

In a study conducted by Diekman et al. (2010), 333 students from STEM and introductory psychology classes were asked to rate the importance of career interests and career goals. Of those participating in the study, 193 were women. The study concluded that communal-goal endorsement significantly inhibited interest in STEM careers. Examples of communal goals in this study included serving humanity, helping others, and having a connection with others.

In 2013, Wang et al. finalized a national longitudinal study that surveyed 1490 intellectually-able, college-bound U.S. students when they were in their 12th grade year of high school and then interviewed them again when they were 33 years old. The motivational beliefs and values of the participants in the 12th grade was assessed using scales measuring ability, self-concept, interest in math and English, and occupational values. At the age of 33, the participants updated their educational and occupational history. The results of Wang et al.'s study indicated mathematically capable individuals who were also high in verbal skills were less likely to pursue STEM careers.

Studies such as these suggest women who pursue and graduate from programs in STEM-related fields are very capable of obtaining corporate level careers in STEM. These studies also noted a need for many of these women to choose a career that includes a communal or social component. However, there is limited literature on whether women with similar qualifications and goals would pursue corporate level STEM-related jobs if they were presented with career options, which incorporated both the ability to interact socially and the

ability to apply their vocational expertise.

Summary

Research has posed several suggestions regarding why increased numbers of female STEM graduates is not similarly reflected in the number of females who establish themselves in STEM-related corporate careers. Explanations include gender differences (Ceci & Williams, 2011; Makarova et al., 2016) and the need to be more social (Diekman et al., 2010; Diekman & Steinberg, 2013). Female students who can complete rigorous STEM programs do not lack the ability to become successful professionals in whichever area of STEM they choose (Graham, 2014; Piotrowski & Hemasinha, 2012; Wang et al., 2013). Female STEM graduates have an added prerequisite of feeling confident in the occupation they have chosen. Occupational confidence is based on the events that occur in life, which is a requirement of developing both intrinsic and extrinsic motivation. With this intrinsic and extrinsic motivation in mind, female students have the unique capability choosing between several different career options that suit their intellectual and moral beliefs (Gonsoulin, 2010; Stavrova & Siegers, 2014) and their personal and environmental requirements (Conklin et al., 2013; Fulmer, 2014).

The two guiding theories, the TLT and the SCCT, both contribute to the idea of developing intrinsic or internal and extrinsic or external motivators. The beliefs and motivations of individuals transform over time as a function of the things they encounter and the events they observe (Marmon, 2010; Mezirow, 1991). The tendency to transform can shape a person's personality and alter the important choices that are made at certain moments in the person's life (Holland, 1959; Holland, 1985).

Although research has explored the topic of retaining women in STEM-related fields, the results are so varied that the overall picture remains unclear. A thick and rich description of the experiences that influence the choices that these women make is imperative. Whether

their choice is a function of spiritual beliefs, educational attainment, life experiences, or a combination of other events, it is up to the individual to figure out what is more advantageous. Thus, there is a need for the current study to investigate, identify, and describe the lived experiences that influence female STEM majors to become secondary educators rather than enter a STEM-related corporate profession.

CHAPTER THREE: METHODS

Overview

The purpose of this transcendental phenomenological study was to gain an understanding about the lived experiences that influenced female STEM majors to become secondary educators rather than enter a STEM-related corporate profession. The design choice for the study, the research questions, setting, participants, procedures, and the role of the researcher are presented in this chapter. Finally, data collection, data analysis, trustworthiness, and ethical considerations are also addressed.

Design

A transcendental phenomenological approach was used in this qualitative study. A qualitative design was the best approach for my study, as it allowed me to gain an understanding of the experiences that influenced female STEM majors in becoming secondary teachers rather than enter a STEM-related corporate profession. Phenomenology is a distinct qualitative approach that entails describing the essence of the experiences that individuals live through. Creswell (2014) described the phenomenological approach as a descriptive and interpretive process which focuses on the meaning of individuals' different life experiences.

With this approach, the researcher collects data from individuals who have experienced a specific phenomenon (Moustakas, 1994). Through the data gathering process, especially during the interviews, the voices of the participants revealed the experiences and themes that influenced the shift from their interest in becoming a scientist, technologist, engineer, or mathematician to becoming an educator. I chose phenomenology for this study so that the essence of the lived experiences of these female participants could be described. Thus, this study enhanced the understanding of the process by which female STEM majors decided to pursue employment in education. Through the lens of transcendental phenomenology,

similarities were found in the life experiences of individuals and then the universal themes of the phenomenon were revealed (Moustakas, 1994).

Research Question

The research questions that guided this study were:

Research Question One

What key experiences prompted female STEM majors to enter the field of secondary education rather than enter corporate employment after graduating with a STEM-related degree?

Research Question Two

What personal background factors influenced female STEM majors to choose a career in a field other than a STEM profession?

Setting

The general setting for this study was two large school districts in the southern United States. These two districts were chosen for this study because of their public movement to propel their entire educational communities toward environments that realize the rigor, relevance, and relationships of STEM. Both school districts achieved this aggressive focus on STEM by providing incentives to attract qualified STEM teachers, securing industry and university partnerships, offering STEM programs or certifications in most, if not all, schools within the district. These school districts were also two of the largest districts within the state and served a diverse population of both students and teachers. The two districts were identified as School District X (SDX) and School District Y (SDY). Based on the 2015 United States Census Bureau, SDX had a community population of over 734,000 residents and SDY had a community population of over 895,000.

The racial demographics of the students in each school district include the following:

Black or African Americans in SDX was 54.7% and 27.6% in SDY; White or Caucasian was 36.4% in SDX and 57% in SDY; 8.8% in SDX were Hispanic or Latino as was 20.5% in SDY; 6.2% were Asian in SDX and 11.8% in SDY; and 0.4% were American Indian and Alaska Natives in SDX and 0.8% in SDY. In addition, of the residents who were 25 years of age and over, 88.4% were high school graduates in SDX, while 87.3% were high school graduates in SDY. Also, the percentage of residents who had at least an undergraduate degree was 40.3% in SDX and 34.4% in SDY.

Based on the state's department of education website, SDX served over 95,000 students in 126 schools. Of these schools, 26 were secondary schools. Over 52 different languages were spoken within this district and over 46,000 of the students received free or reduced-priced lunch. There were over 6,000 full-time and almost 500 half-time teachers. Of these teachers, roughly half had 10 to 20 years of experience, and over 5,000 were female.

According to the state's department of education website, SDY served over 177,000 students in 139 schools. Of these schools, 21 were secondary schools. Over 100 different languages were spoken within this district and over 90,000 of the students received free or reduced-priced lunch. There were approximately 22,000 full- and part-time staff members. The average teacher in SDY held a master's degree or higher and had 14 years of experience.

The rationale for selecting high schools as the setting for this study was to ensure the teachers who participated in the study were certified and teaching a variety of rigorous STEM-related courses. To receive certification, teachers were required to be highly qualified by passing an assessment which increased in difficulty based on the grade level being taught (Baldi, Warner-Griffin, & Tadler, 2015; Watters & Diezmann, 2015). Each school district had a similar organizational structure. Each school had its own individual administrative team and each department was represented by a department chairperson. The administrative teams

governed the school and they were directly supervised by the area superintendent and district superintendent.

Participants

The participants of this study were chosen using a combination of purposeful strategies (Palinkas et al., 2015), including criterion and snowball sampling. The participants of this study consisted of 12 female secondary STEM teachers. Correspondingly, Polkinghorne (1989) suggested a sample size of 5-25 participants to ensure thematic saturation and participants that represent majors from each area of STEM. An additional reason for this number of participants was to anticipate a possible reduction in the number of participants if some were unable to complete the study, and to ensure enough information was obtained to fully and completely represent the experiences of the teachers and for data saturation.

Table 1 STEM Designations and Courses Taught

STEM Designation	STEM Course Taught by Participants
Science	Anatomy & Physiology
	Biology
	Chemistry
	Environmental Science
	Forensics
	Genetics
	Healthcare Science
	Oceanography
	Physical Science
	Physics
Technology	Audio/Video Technology and Film
	Business and Technology
	Computer Science Principles
	Digital Design
	Digital Technology
	Web Design
Engineering	Architectural Drawing and Design
	Drafting and Design
	Engineering Applications

	Engineering Concepts
	Foundations of Engineering & Technology
	Robotics and Mechatronics
Mathematics	Algebra
	Calculus
	Differential Equations
	Geometry
	Mathematical Decision Making
	Number Theory
	Statistics

During the study, each participant was working as a teacher in either SDX or SDY. These teachers had taught a STEM-related class for at least one full year prior to the study. A list of classes taught by the participating teachers is presented in Table 1. For maximum variation, female teachers of all ages, religions, cultures, ethnicities, and years of experience were included. However, to be included in the study, teachers must have received their undergraduate degree in a STEM-related field rather than in the field of education. Pseudonyms were used for participants and for institutional names (Creswell, 2013).

Procedures

The goal of the research was "to discover what is known about a particular phenomenon or situation from the insiders' perspectives" (Chenail, 2011, p. 256). To accomplish this goal, I developed questions for semi-structured interviews. I received supportive assistance to review the semi-structured interview questions. Two educational advisors, who held doctoral degrees in the field of education at Liberty University, reviewed the semi-structured interview questions to help ensure face and content validity prior to IRB approval to conduct the study. There were two recommendations from the advisors. One advisor recommended using fewer interview questions, to maintain the attention of the participants, and to collect data that were reliable and had a depth of information. The other recommendation was to reword some of the questions to ensure the questions were framed in a

way that emphasized “the real strength of a qualitative approach, which is in understanding the process by which phenomena take place” (Maxwell, 2009, p. 232). Both recommendations were incorporated into the interview questions prior to IRB approval.

An application to conduct research was completed for the Research Review Boards (RRB) of SDX and SDY to request permission to conduct research within each school district (Appendices A and B) via email. When each school district’s RRB, as well as the Liberty University Institutional Review Board (IRB) (2014) (Appendix C) granted approval, I sent a letter of introduction to the principals of each high school, providing the rationale of my study and requesting permission to conduct my research at their school (Appendix D). With each participating school granting permission to conduct research, I secured the names of each department chair, and sent an email regarding recruiting participants (Appendix E).

Female secondary school STEM teachers were purposefully sought out for this study. A combination of criterion and snowball sampling strategies were used. In criterion sampling, a pre-specified set of criteria was used to select participants (Creswell, 2014; Palinkas et al., 2015). For this study, the criteria were female high school STEM teachers who had taught a minimum of one year at the secondary level because much of the literature suggested a greater shortage in female STEM workers. Only female high school STEM teachers were chosen for this study based on the literature relating the lack of females in STEM careers (Diekman & Steinberg, 2013; Perez, Cromley, & Kaplan 2014). The minimum number of 12 participants was not reached using the criterion sampling strategy; therefore, the snowball sampling strategy was also used.

Snowball sampling was accomplished as I requested from current colleagues, previous colleagues and individuals who had already agreed to participate in the study the name and contact information of possible participants who met the study criteria. Snowball sampling,

also called chain sampling, is a type of sampling that involves referring the researcher to other individuals who may potentially fit the criteria for participation in the study (Creswell, 2014; Palinkas et al., 2015; Patton, 2002). Snowball sampling was used to help secure a larger sample size and allow for participants who opted out of the study. In selecting STEM teachers who were teaching at the secondary level, I ensured the participants in the study had sufficient STEM knowledge and enough of a STEM background to be able to work outside of the field of education, in a corporate level STEM-related career field.

Data were collected using a survey, a questionnaire, a semi-structured interview, and journaling. High school teachers within the two chosen school districts were given a screening survey (Appendix F) to help me identify and obtain qualified and willing study participants (Creswell, 2013). The participants who fit the parameters of the study were contacted via telephone or email and added to the participant pool. The potential participants were provided with additional information regarding the intent of the study and the informed consent form (Appendix G), which was completed prior to the questionnaire phase of the study. After the informed consent forms were obtained, the data were collected over several weeks to allow time for me to gather rich and meaningful data from the participants about their experiences.

Each participant received each data collection tool in the same order. I began by presenting the screening survey first and provided the questionnaire next. The screening survey was used to establish the initial participant pool. The questionnaire was to activate the memory of the participants regarding how they chose a career. Permission to use the EPDC questionnaire is found in Appendix H and the questionnaire is found in Appendix I. I then conducted the individual interviews (Appendix J), and the research concluded with the journals (Appendix K). Then, the interviews were conducted so the participants could recall and reflect on the experiences that inspired their final career choice. Finally, the journal allowed the

participants to clarify and add additional information that arose after the interview.

After the data were collected, and interviews transcribed, I asked the participants to review for accuracy and integrity the transcriptions of the statements they had made during their interview. All collected and transcribed data were kept locked in a secure place. All electronic data were password protected. I personally read, transcribed, interpreted, and analyzed the data (Moustakas, 1994).

The experiences and perspectives of the participants were gleaned and consequently described in depth by examining multiple sources of data. Collecting multiple sources of data aided the credibility of findings through triangulation (Creswell, 2014; Moustakas, 1994). Lincoln and Guba (1985) described triangulation as a method using multiple sources of data to ensure validity. These data collection methods were chosen to ensure rich, thick details about the participants' experiences would be gathered in the interest of answering the research question in as much detail as possible. Additionally, Patton (2002) stated that a combination of sources provides a comprehensive perspective which allows the researcher to validate and cross-check findings.

The Researcher's Role

In this study, my role as the human instrument was to become a recorder of the pertinent information given by the participants (Lincoln & Guba, 1985). The goal of this study was to describe the participants' experiences. I am a special education teacher who is African American and of the Christian faith. For over a decade, I was a colleague of secondary female science teachers in one of the participating school districts in this study. I was not serving as a supervisor, administrator, or any other position of authority.

I have had numerous conversations with the teachers with whom I have worked. The interactions and conversations I had with these teachers had really resonated with me and

served as an inspiration for this study. By sharing my background as a special educator and my experience teaching, I was able to help these teachers feel more comfortable before and during the study. These conversations and my own bias in thinking that many career decisions were guided by the potential amount of money that can be earned, created my desire to know more about this phenomenon of women choosing education over corporate level careers in STEM (Beede et al., 2011; Glass, Sassler, Levitte, & Michelmore, 2013).

Data Collection

Data for this study were collected using a screening survey, a questionnaire, face-to-face interviews, and reflective journals. Qualified participants were asked to complete a questionnaire consisting of 25 questions. I then set up a day and time to conduct the semi-structured interviews and focus on the lived experiences of the participants. Finally, after the interviews were completed, the participants were given instructions and asked to complete reflective journal entries over the course of one week. Each of these data collection methods were used to identify common themes to develop explanations or make conclusions regarding the STEM-related experiences and perspectives of the participants. I also bracketed myself out of the study throughout the study. Creswell (2013) indicated this is done "by discussing personal experiences with the phenomenon . . . to identify personal experiences with the phenomenon and to partly set them aside so that the researcher can focus on the experiences of the participants in the study" (p. 78). Bracketing was done throughout the data collection process by the creation of reflective memos.

Screening Survey

Potential participants were given a screening survey (Appendix F). The screening survey was distributed to the teachers via email which enabled them to respond at their convenience via an online Google Forms link. The respondents who answered all five

questions on the screening survey, and left their contact information, were contacted via email or telephone to coordinate the delivery of the informed consent document (Appendix G). When the informed consent document was completed, the respondents were added to the participant pool.

To become a qualified participant and added to the participant pool, each respondent indicated she was female on Question one (Appendix F). Respondents indicated they had taught a high school STEM class for at least one year in Question two and indicated they had taught STEM-related classes in Question three. Respondents who had also affirmatively answered Questions four and five were added to the participant pool for the study. Question four indicated their job as a teacher was the first job obtained after graduating and Question five indicated the respondent would be willing to take part in the study. Any respondent who selected responses that differed from those discussed in this section were not added to the participant pool.

Questionnaire

After the informed consent was returned, the participants were asked to complete an electronic questionnaire. Svensson (2001) stated that "questionnaires and [other] rating scales are used to measure qualitative variables such as feeling, attitudes and many other behavioral and health-related variables" (p. 47). The name of this data collection tool is the Emotional and Personality-Related Career Decision-Making Difficulties (EPCD) questionnaire, and permission to administer it was obtained from the authors before it was used (Appendix H). The participants were asked to reflect on a time when they were approaching the completion of their STEM degree program and contemplating their career options. The questions were designed to uncover the decision-making process and the motivating thoughts, feelings, and experiences that led to the decision to become a teacher instead of pursuing a position in an

entry level corporate STEM-related job.

The short version of the EPCD consisted of 25 questions about how the decision to enter a specific career was made (Appendix I). The beliefs about the process of selecting a career were measured on an ordinal nine-point Likert-type scale. On ordinal scales, the order of each response is clear, and it is the response value that is important and meaningful. Ordinal scales are typically used to measure non-numeric concepts. The questionnaire consisted of three clusters of questions: pessimistic views, anxiety, and self-concept (Saka, Gati, & Kelly, 2008). The 25 questions on the EPCD were aimed at determining the participants' experiences related to their career choice.

According to Saka et al. (2008), pessimism is the tendency to focus on the negative aspects of situations and expect negative outcomes. Individuals with pessimistic views about the world tend to show psychological characteristics such as depression, hesitation, self-doubt, feelings of guilt and inferiority, and harsh self-criticism. Individuals with pessimistic views about control refers to the degree to which individuals attribute events and changes in their lives and environment to internal versus external experiences. Pessimistic perceptions have been found to be associated with career indecision and indecisiveness (Saunders, Peterson, Sampson, & Reardon, 2000). Questions two through seven related to pessimistic views and inquired about the process of researching the career choice, ideas about the world of work, and perceptions regarding individual control over a career selection (Saka et al., 2008).

Anxiety refers to feelings of stress and in this case, anxiety arising prior to the decision-making process. Included in these feelings are anxiety about one's responsibility for choosing a career and anxiety about one's failure to choose a career. Questions nine through 16 related to anxiety were questions and inquired about the decision-making process, uncertainty about the career choice that was made, and the outcome of making their choice. Self-concept and

identity refers to difficulties in forming a stable, independent personal and vocational identity. Questions 18 through 25 related to self and identity, inquiring about concepts that may cause anxiety in general, self-esteem, clarity of vocational interests, and approval from important people. The authors of the questionnaire identified question number one as a warm up question and questions eight and 17 as validity items (Saka et al., 2008).

According to a study conducted by Saka et al. (2008), the reliability and validity of the questionnaire was established with both Israeli and American students. In an Israeli sample, the internal consistency was determined by a Cronbach's alpha scores ranging from .70 to .91. In the American sample, the internal consistency was determined by a Cronbach's alpha scores ranging from .66 to .94.

Interviews

Following the collection of the EPCD questionnaire responses, I scheduled interviews at a date, time, and location that was convenient for each participant. A semi-structured interview with open ended questions was used to encourage the study's participants to express the reasoning and experiences that motivated their decision to major in a STEM-related field, as well as the aspects of their backgrounds that led to becoming a secondary teacher (Appendix I). The guided interview had a predetermined set of scripted questions, but also provided flexibility for the interviewer to ask clarifying and follow-up-questions (Patton, 2002; Stewart, Shamdasani, & Rook, 2007). Each interview was audio recorded and was between 10 minutes and 40 minutes long, which provided enough time to obtain an adequate breadth and depth of responses on the topic (Patton, 2002).

Each participant was given the same instructions, and was asked the same questions, in the same order. Interviews were conducted in a quiet and private area of the participant's choosing, or by telephone, if requested by the participant. I ensured the questions were

grounded in the literature and sought advice regarding the interview questions from educational advisors who possess doctorate degrees in the field of education. The advisors provided feedback and I revised the interview questions based on their feedback prior to the administration of the interviews. I personally transcribed each interview and asked the participants to review the transcription for member checking to ensure accuracy and to make changes to clarify meaning (Petty, Thomson, & Stew, 2012).

The following standardized open-ended interview questions were used with participant:

1. What is your background (ethnicity, religion, etc.) and did it play a role in your career choice?
2. How would you describe your personality?
3. In what area of STEM did you major?
4. Describe the most memorable events that helped to spark your interest in obtaining a STEM degree.
5. Initially, what type of career did you plan to obtain after you received your degree?
6. What events helped influence your decision to become a secondary teacher?
7. Describe your thoughts and feelings as you made the decision to become a teacher.
8. Describe a few STEM-related courses you took in college and how they prepared you to teach.
9. Which aspects of your personality (if any) would you consider to have positively or negatively affected your career decision?
10. Would you make the same decision if you could do everything over again? Explain.

11. Is there any program, activity, etc. that could have been offered to you, which would have influenced your decision to pursue a STEM-related job in the corporate arena instead of teaching?
12. When you entered the field of education, how long did you plan on teaching?
13. Where do you see yourself in 20 years (at retirement age)?

Question one was asked to gain background and demographic information the participants wanted to share. Questions two through 10 were asked to gather information pertaining to the motivation for choosing to major in a STEM field. The purpose of questions two, three, and four was to gain an understanding of the specific occurrences that influenced these women to make the decision to major in a STEM-related program (Bona et al., 2010; Fulmer, 2014; Geist, 2008). Given the important role educators play in the development of our youth, it was important to determine which momentous experience had influenced individuals to decide to become educators after obtaining a degree in an area other than education (Koruklu & Aktamis, 2012; Snyder, Oliveira, & Paska, 2013; Tatar, Yildiz Feyzioglu, Buldur, & Akpinar, 2012).

Questions five through eight were asked to establish how the choice was made to enter the field of education. Weiss (1999) stated there was a relationship between perceived workplace conditions, morale, and the level of commitment to a chosen career. The purpose of questions nine and 10 was to establish the personality type of the participant. An individual's personality may generally determine the type of job he or she is most suited for (Piotrowski & Hemasinha, 2012; Robertson, Smeets, Lubinski, & Behbow, 2010; Zell & Krizan, 2014).

Questions 11 and 12 were asked to provide an additional opportunity for participants to reflect on their career decision. A person who is both knowledgeable and social is needed to be a successful teacher (Ramirez, 2010). The opportunity to further concentrate on those

encounters that may have managed to elude previous research has the potential to further the purpose of this study in ways that are empirical, theoretical, and practical. Question 13 was asked to obtain information on future employment endeavors. Several studies have reported on the importance of each individual's epistemological beliefs when choosing to enter and remain in a specific career. As stated by Jehng, Johnson, and Anderson (1993), belief systems are a driving force in intellectual performance.

Journaling

Journaling is a process by which participants share their "thoughts, ideas, feelings and experiences through writing and/or other [forms of] media" (Hayman, Wilkes, & Jackson, 2012, p.27). Journaling was used to document the specific experiences and feelings that were associated with the experiences of each participant. Journaling entailed the recollection, analysis, and evaluation of experiences, and has been accepted as a valid method of accessing meaningful qualitative data (Fakude, 2003; Hayman et al., 2012). In my study, journaling was used to reflect on the interview process as the participants privately recorded or clarified any additional thoughts, experiences, and feelings.

I provided step-by-step instructions to each participant regarding the expectations for journaling. The complete instructions and protocol for keeping the journal are also included in Appendix K. The instructions for the journal were the following:

Instructions for Journal

1. Whatever you write in your journal is another technique in gathering additional data that will add purpose and direction to this study.
2. Data will be written digitally or on paper, whichever is the best option for the participant.

3. Each participant will focus on past experiences related to majoring in a STEM field and becoming an educator.
4. Participants will keep a written record of any ideas, facts, or new information that may emerge after the interview has been conducted, that were not revealed during the course of the interview.
5. Participants will record any comments or questions that they may feel a need to clarify or add to data collection.
6. Participants should attempt to record small amounts of information frequently and as soon as anything comes to mind.
7. Participants may record any behaviors or encounters that they may recall after the interview has been conducted.

Participants were given the option of using a paper or an electronic journal, which included any participant-chosen platform through which a journal entry could be typed and sent via email. Each participant was allowed one week of time to reflect on the interview and to complete the journals. Each key statement was identified and coded into established clusters or categories of meaning. If no category or theme existed, the emerging theme was added. Journaling was the final phase of the data collection process. After all the data were collected, the task of analyzing the data began.

Data Analysis

In qualitative research, data analysis is the method the researcher employs to gain meaning from the collected data (Creswell, 2014). According to Patton (2002), the challenge of qualitative analysis "lies in making sense of massive amounts of data. Qualitative analysis involves reducing the volume of raw information, sifting trivia from significance, identifying significant patterns, and constructing a framework for communicating the essence of what the

data reveal" (p.432). This section describes how the data from the survey, questionnaire, interview, and journal were analyzed.

Analysis began with the organization of data, which was achieved by creating separate files for each source of data. As suggested by Moustakas (1994), I read, transcribed, interpreted, and coded, each source of data. Action verbs were used to describe participant responses in detail. Specific statements or themes were compiled to increase the transferability of information to others within the field (Creswell, 2013; Lincoln & Guba, 1985).

All data sets were analyzed in terms of key statements, patterns, commonalities, emerging themes, and interpretations. Each meaningful statement was identified during horizontalization of all data sources, and the data were coded so clusters of meaning were developed. From these clusters, emerging themes were established (Creswell, 2013; Moustakas, 1994). The data from the questionnaires, interviews, and journal entries were synthesized and integrated into the findings of the study.

The first source of data analyzed was the questionnaires. The questionnaires yielded simple numerical data that were expressed in frequencies and percentages simply to support the narrative data. The information received from the questions was then condensed into a table of frequencies and percentages which was used to visually show the predominant patterns of the responses within each of the three EPCD cluster designations. Frequency and percentage are both forms of descriptive research which describe the basic components of the data (Marshall, 2005; Trochim, 2002). These visual descriptions allowed me to display the emerging patterns using a visual illustration (Gall, Gall, & Borg, 2014). The simple numerical information gathered was used in chapter four to illustrate the qualitative data but was not analyzed as quantitative data.

For frequency, the multiple response questions from the 11 difficulty categories were separated and categorized based on three major clusters. The pessimistic view cluster consisted of six questions. The anxiety and self and identity clusters each consisted of eight questions. The questionnaire utilized a Likert scale with values from one to nine, on which scores of one through three fell in the range of strongly disagree, scores of four through six fell in the range of agree and scores of seven through nine fell in the range of strongly agree.

The second source of data analyzed were the interview transcripts. All interview responses were transcribed. The transcriptions were completed within three days of the interview. The transcriptions were sent to the participants to review for accuracy. The data were then analyzed based on Moustakas' (1994) seven-step method of analyzing phenomenological data. Each step was designed to analyze the transcribed interviews of the participants. Following is the detailed seven-step process I used to analyze the interview data.

Horizontalization was done first, by listing every expression that was relevant to the experience (Moustakas, 1994). All statements were included initially because each statement had equal value. Second, the interview transcripts were studied and reviewed for participant statements that referenced perceptions and experiences that related to majoring in STEM and the process of becoming a teacher. During this step, I reduced and then eliminated all nonessential, overlapping, or vague statements. This step involved using enumerative inquiry (Grbich, 2007). Enumerative inquiry was a technique used for listing data by which codes could be developed before analysis, so the data could be categorized in a way that was meaningful. Then, a flow chart identified and ranked the frequency of words or concepts collected.

In the third step, the statements were clustered into themes. Statements that were repetitive were removed so I was able to focus on relevant items. At this point, the remaining

statements were clustered into similar themes. A cluster map was then used to organize the data (Moustakas, 1994).

In the fourth step, the themes were expressed explicitly or implicitly. In this step, the themes that had been identified in step three were combined and validated by comparing the data with the full transcription of each participant. Explicit themes were directly stated, leaving me no room to speculate on how to categorize the theme. Implicit themes were those that were not directly stated, which required me to use my own thought processes to choose an appropriate theme. If the themes were not explicit or implicit, they were considered irrelevant to participant experiences and discarded (Moustakas, 1994).

Fifth, textural descriptions were constructed from the statements of each participant by descriptively integrating the themes of each set of participant statements. Textural descriptions captured vivid images of what the individual participants have experienced (Moustakas, 1994). Textural descriptions reflected what the participants had experienced and the qualities of their experiences. They encompassed the relationship between the phenomenon and the person who was giving the description. Examples of a textural description may include the "thoughts, feelings, and struggles of the person" (Moustakas, 1994, p.133).

Sixth, a structural description of the data was constructed. Structural descriptions were developed based on how each participant experienced the phenomenon in terms of the conditions, situations, or context (Creswell, 2014; Moustakas, 1994). Structural descriptions reflected how participants experienced the phenomenon and issues that influenced participants' experiences. Through the development of the textural and structural descriptions, I determined the structure or how the specific themes should be arranged. I then categorized the responses for individual participants and the collective group. Both textural and structural descriptions were written about the lived experiences of participants and the phenomenon. In the seventh

step, a composite of the two descriptions was constructed. The composite description expressed the "meaning and essence of the experience, integrating all individual textural-structural descriptions into a universal description of the experiences representing the group as a whole" (Moustakas 1994, p.122). According to Moustakas (1994), this composite description is a synthesis of both the textural descriptions and the structural descriptions, which revealed the essence of the phenomenon.

To obtain a deeper understanding of the phenomenon being studied, the themes were bracketed and coded during the entire progression of the data analysis. I used the computer software, Atlas.ti©, to code and analyze the data as the information was being collected. Atlas.ti© is a qualitative data analysis computer program that assists the researcher in identifying, coding, interpreting, and annotating the findings (Friese, 2014; Hwang, 2008). A voice recorder was also used to assist me with data transcription.

The composite descriptions included key meaningful statements, patterns, commonalities, emerging themes, and interpretations. Composite descriptions were a combination of the textural and structural descriptions. Each meaningful statement was identified and coded into clusters of meaning. From these clusters, emerging themes that conveyed the overall essence of the experience were established (Creswell, 2013; Moustakas, 1994).

The final source of data analyzed was the participant journals. The information from participant journal entries was read and organized. As repeated ideas were noted, codes were developed. These codes were evaluated for common threads and grouped into categories in terms of key statements, patterns, commonalities, and interpretations (Patton, 2002; Stoudt, 2012). The categories were grouped into themes which were compared with themes that had already been established. As the themes accumulated from the journal entries, interview data,

and questionnaire responses, designations were synthesized and reported (Creswell, 2013; Moustakas, 1994).

Trustworthiness

Trustworthiness provides a foundation to show that the study can be trusted as quality research. According to Lincoln and Guba (1985), trustworthiness is established through credibility, dependability, confirmability, and transferability. These criteria ensure that the study can be trusted and is noteworthy for the reader to build on in the future.

Credibility

Credibility refers to the extent to which the findings are accurately interpreted to reflect the participants' meaning (Creswell, 2014). To increase credibility, I utilized member checking as way for the participants to edit and clarify their own words (Carlson, 2010; Tuckett, 2005). Triangulation is achieved by utilizing multiple and differing sources, methods, investigators, and theories to provide corroborating evidence (Creswell, 2014; Lincoln & Guba, 1985). Two types of triangulation were accomplished in this study, methods triangulation and theory triangulation.

To attain triangulation of methods, different data collection methods were used to illuminate complementary aspects of the same phenomenon (Mathison, 1988; Patton, 2002). For this study, the different data collection methods were interviews and journaling, which were both qualitative. Additionally, for descriptive support of the narrative only, a Likert scale-style questionnaire was also used. However, no high level statistical calculations were used for this study. According to Gall et al. (2014), questionnaires and other self-report measures are typically used when "extensive contact with every research participant is not feasible and the desired information is not deeply personal… (the questionnaire) can elicit in-depth information" (p.349). Creswell (2014) also identified this approach as concurrent

triangulation. The triangulation of theories or perspectives was attained by using multiple theoretical perspectives to look at the data from differing vantage points (Mathison, 1988; Patton, 2002). The two theories used in this study were the transformative learning theory (TLT) and the social cognitive career theory (SCCT).

Furthermore, after the journal entries were transcribed, all participants were asked to complete member checking by reviewing the transcripts of their journals. In addition to the quality control aspect of member checking, the participants were also asked to notify me if they recalled any information or unintentionally excluded anything from the original interview session. Consequently, the participants had the opportunity to revise the transcripts, through journaling, for accuracy as well as make additions to ensure I had interpreted and communicated the meaning of the interaction (Creswell & Miller, 2000; Petty et al., 2012).

Dependability and Confirmability

Dependability refers to the stability of data over time and over conditions (Lincoln & Guba, 1985). To address dependability, I have described the context and setting of the study in depth. Additionally, individuals who were not connected to this study and who possess a doctorate degree in the field of education conducted peer reviews and an audit trail. Confirmability was another method used to establish trustworthiness. Confirmability is the degree to which findings could be confirmed by others (Lincoln & Guba, 1985). I used a log to document the steps of the research to develop an audit trail (Appendix L). An external auditor conducted an audit via peer review (Creswell, 2014; Lincoln & Guba, 1985; Patton, 2002). The auditor was required to have a doctoral degree and experience in the field of education.

Transferability

Transferability refers to the extent to which findings can be transferred to other settings, groups, or situations (Lincoln & Guba, 1985). To facilitate transferability, clear, distinct, thick, and rich descriptions was used to relate the essence of the phenomenon the female STEM educator has experienced. Maximum variation in terms of gender, age, culture, and ethnicity was also utilized to achieve transferability. According to Graneheim and Lundman (2004), "There is no single correct meaning or universal application of research findings, but only the most probable meaning from a particular perspective . . .. Trustworthiness of interpretations deals with establishing arguments for the most probable interpretations" (p. 110).

Ethical Considerations

Several ethical issues were considered throughout the research process. For data security, all hard copies of material were secured in a locked file cabinet and all electronic data were password-protected. Pseudonyms for the participants and the sites were used. I maintained a separate list that linked the pseudonym to the actual participants, it was also kept in a secure file cabinet in a separate location from the data files.

I obtained a signed consent form from each participant. I also ensured all participants were aware they could voluntarily opt out of the study at any time for any reason, no questions asked. The participants were given a copy of their transcribed data, which also served as notice that the study was in its final stage in lieu of debriefing. Additionally, all data were stored and then will destroyed after a period of three years.

Summary

The transcendental phenomenological approach was followed I this study. The transcendental phenomenological approach was used because it focuses on the underlying meaning of the feelings, thoughts, and experiences that occurred during the process of choosing a career after majoring in a STEM-related field. The research questions asked about

the key experiences that led females to major in a STEM program and the aspects of their background that led them to enter the field of education.

The setting was in two metropolitan school districts in the southern United States. The participants were female STEM teachers who decided to teach instead of work in a corporate area related to their degree. Chapter three described how data from a screening survey, questionnaire, one-on-one interview, and journal were collected and analyzed. The chapter also addressed how trustworthiness was established and the steps for dealing with ethical considerations.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this transcendental phenomenological study was to investigate, identify, and describe the lived experiences that influenced female STEM major graduates to become secondary educators rather than enter a STEM-related corporate profession. In phenomenology, the researcher attempts to understand the meaning of conscious experiences, such as perceptions and emotions (Connelly, 2010; Creswell, 2013). Patton (2002) also noted that phenomenological researchers explore "how human beings make sense of experience and transform experience into consciousness" (p.104).

In this chapter, I have described the profiles of the participants of the study. Next, I reported the results of the data that were gathered. Then, I identified the themes and sub-themes for the study as well as answered the research questions by triangulating the information from the three sources of data. Finally, I provided a summary of the chapter.

Participants

Participants consisted of 12 female secondary STEM teachers. All were currently high school teachers in one of the two metropolitan school districts within the same southern state and taught a STEM-related class for at least one full year prior to the study. Pseudonyms were used for each participant.

I began the study with 16 participants, which was within the range of Polkinghorne's (1989) suggested sample size of 5-25 participants to ensure thematic saturation. Data were collected from 16 participants through a questionnaire, 16 participated in individual interviews, and seven completed the reflective journals. However, because four of the 16 participants did not complete the journal phase of the data nor the member checking of the interview transcription, the data gathered from 12 of these participants were reviewed and analyzed for

this study. A sample size of 12 remained, which is still within range of the suggested sample size.

The age of each participant ranged from middle 20s to late 50s and teaching experience ranged from one to 28 years. All participants reported Christianity as their religious affiliation. Seven of the participants were African American, four were Caucasian, and one identified herself as Black Canadian. Eight participants taught in School District X (SDX) and four taught in School District Y (SDY). Following are individual profiles of each of the 12 participants. The profiles describe the age of each participant, the number of years of teaching experience, degree major, STEM degree designation, ethnicity, initial career goal, and school district in which the participant taught. Additionally, all participants were assigned pseudonyms for this study.

Carla

Carla is a 54-year-old African American teacher with 28 years of experience. Carla majored in the STEM area of science, earning her degree in Biology with a minor in chemistry. Her initial career goal was to become a dentist. Carla stated, "It was actually my biology teacher in high school was the one who sparked my interest in science in the first place. Uh,

Table 2 Participant Demographic Information

Participant	Age	Years Teaching	Degree Major	STEM Designation	Ethnicity	Initial Career Goal	School District
Carla	54	28	Biology	Science	African American	Dentist	SDX
Denise	37	10	Industrial Management	Engineering	Caucasian	City Planner	SDY
Erika	50	25	Mathematical Science	Science and Mathematics	Caucasian	Medical Doctor	SDX
Gwen	38	16	Mathematical Science	Science and Mathematics	African American	Undecided	SDX
Heather	47	23	Biology	Science	Black Canadian	Physical Therapist	SDX

Jenia	44	16	Business Administration and Technology	Technology	African American	Business Analyst	SDX
Lynne	48	20	Biology	Science	African American	Medical Doctor	SDY
Margaret	32	9	Biology	Science	African American	Medical Doctor	SDX
Pascale	30	7	Biology	Science	African American	Medical Doctor	SDX
Rachel	30	3	Exercise Physiology	Science	Caucasian	Physical Therapy	SDY
Tiffany	46	20	Biology	Science	African American	Pharmacist	SDX
Yolanda	26	1	Mathematics	Mathematics	Caucasian	Undecided	SDY

Note: Participants were assigned pseudonyms.

Uh, but I was really, believe it or not, in genetics type stuff but I always liked to take stuff apart and put stuff together . . . and doing more of the electrical, you know or building stuff." Table 3 shows the demographic information obtained from each participant.

Carla envisioned herself working with students even after she retires. She would eventually like to work with non-profit organizations, possibly establishing a summer camp. Describing her ideas regarding the summer camp, Carla stated:

> not necessarily just for the high achievers either! You know, I know everybody wants to work with the gifted kids and whatever, but I think the lower levels, they should have something for the lower levels too. [Be]cause at this point, the way the school is set up, they lose so much over the summer time. They need a little buffer and they don't have as many on the high school level as they do for the, you know, middle schools and elementary schools.

Denise

Denise is a 37-year-old Caucasian teacher with 10 years of experience. Denise majored in the STEM area of engineering, earning a degree in industrial management. Initially, she

wanted to pursue a career as a city planner. Denise cited her experiences as the daughter of an engineer as the spark for her interest in STEM. Denise stated:

> My dad, he was an engineer, and I was raised, um, he owned a company where they built schools and malls and, um, big, big, big buildings . . . my youngest memories would be, uh, sitting at the kitchen table with him, with a set of prints, uh, and he would say, uh, "OK, tell me how much dirt I'm gonna have to move from this job site to make it a level piece of ground?" And he'd just give me the blueprints and I would have to figure it out. I had to grid the thing off, I had to say, "OK, we need to move this dirt over here, we have to do this, we have to haul this amount away" . . . (or) give me the blueprints and he'd say, "How many door knobs do I need to order?"

Denise is grateful her path steered her towards the field of education. She stated:

> You can't do do-overs in life . . . I mean what I did back then . . . when I went to college, there weren't many girls in at Georgia Tech or even in the, in the thing [engineering]. So, it was kinda like my, um, bucket list, that this is what I wanted to do with my life. I don't think I looked at [the field of education], until I tutored that kid.

Erika

Erika is a 50-year-old Caucasian teacher with 25 years of experience. She majored in the STEM area of science and mathematics, earning a degree in mathematical science. Initially, Ericka had intended to become a medical doctor when she entered college but changed her degree by the end of her freshman year. The new major remained in a STEM field. Ericka described an interaction with a teacher stating:

> I was thinking about becoming a doctor. Um, and I had a professor my very first year of college who knew my family, who knew my older sisters, and she knew what kind of person I was in that I don't like to be told I can't do something . . .. And she said

> "Well, it's good you're going into medicine [be]cause I don't think you would make it as a math major." But you know just because you said that I think I'm gonna go in math and I had a high *A* in her class. I think I had like a 98 in her class anyway. So, I think she wanted to give me the push to go into math, because she saw me tutoring other people in her class.

Erika was so satisfied with becoming an educator that she turned down the opportunity to become an astronaut, because she did not want to leave the classroom. She stated:

> Yeah, and the Johnson Space Center contacted me and said well the teachers in space program is ending but, we can still put you through the astronaut's program because you have a major in mathematics rather than education. Um, you want to consider that? And I thought, well, that would take me totally out of the classroom. So, I had the opportunity to do something else and I turned it down. I know that sounds silly. "Turned down being an astronaut." Yeah, I did, I just, I like the classroom. I like working with kids.

Gwen

Gwen, is a 38-year-old African American teacher with 16 years of experience. She majored in the STEM areas of math and science, earning a degree in mathematical science. Gwen explained mathematical science is a combination of mathematics and computer science. Gwen entered college not knowing which career she would pursue. Gwen cited a high school experience as the reason for her career indecision, stating:

> Um, well I wanted to be a chemical engineer, right. But, then I took chemistry and I didn't understand anything. I felt really, really, slow so I was like, aah, this isn't gonna work. I didn't know what I was gonna do, but I was always really good at my math

> classes, and I was always really good at computer science, and you know a little from Column A, and a little from Column B [and] there I go.

At one-point Gwen had taken a break from teaching high school students and tried a corporate job after all. She stated:

> So, when I took a break, I was corporate training and I really enjoyed it. Like there are a lot of perks: you get to travel, you get points, you get per diems, you get mileage, you get rental cars, you get hotel stays. You know, it's just there are a lot perks to corporate training, especially when you work on contracts that I really enjoy. Um, and so I want to go back to that, and I don't really want to retire. I want to be able to work, to like maybe work three months out the year and not work another three months out the year, you know I want to be able to . . . [have] flexibility to decide, and I feel like if I'm a corporate trainer you can do that.

Although Gwen was initially, undecided when she entered her STEM degree program, corporate training fit her idea of pursuing a corporate career as well as meet the desire to educate others that she had developed as she decided to become a teacher.

Heather

Heather is a 47-year-old African American teacher with 23 years of experience. She majored in the STEM areas of science, earning her degree in biology. Heather's initial career goal was to become a physical therapist. Heather is a Canadian whose parents immigrated from Ghana, West Africa. She could not pinpoint a specific experience that sparked her interested in science stating, "I was just naturally a good science student. So, I don't know if there was a memorable event as such but, the most natural thing for me to do in university was to major in biology."

When Heather was asked if she would make the same decision regarding becoming a teacher, she stated:

> Yes, I think I would make the same decision again. I probably would stay in Canada though this time [laugh] instead of the states and teach, um, but, uh, yes. That's [be]cause I do enjoy, um, being an educator and the difference that I can make in a student's life.

Jenia

Jenia is a 44-year-old African American teacher with 16 years of experience. Jenia majored in the STEM area of technology, earning her degree in business administration and technology. She had initially intended to become a business analyst. Jenia stated a memorable event that helped maintain her interest in STEM was:

> working with Control Data Corporation, . . . they manufactured the world's largest super computer . . . and after that I went to do an internship with IBM in their PC center where they had stores, the visual storefronts got me interested.

Jenia enjoys teaching so much now that she would like to open a local branch of a specialized type of alternative school. She stated the school would be modeled after a similar school in St. Paul:

> where students have to be at least 16 years old . . . they had open campus where they can come in anytime from eight in the morning to eight in the evening. They had open lab, um, students could get credit for things that they do outside of the class.

Jenia went on to say:

> They had to do lab classes like um, boat building classes. Classes they had where students can participate in this boat building project where they design the boat and they learn about science, and float, and drag. And they put a solar powered engine in it

> and they designed the artwork on the outside, named it, painted it. And wrote literature and kept diaries about the project from start to finish. And then they could get credit for math, science, literature, art, um engineering depending on what they did on the project. And then at the end of the year they would take this boat and sail it in a regatta . . .. So, it gave them a chance to graduate or gave students a chance to come in and make up credits and transfers from the home school to graduate on time.

Lynne

Lynne is a 48-year-old African American teacher with 20 years of experience. Lynne majored in the STEM area of science, earning a degree in biology. Her initial career aspiration was to become a medical doctor. Lynne described a childhood experience that sparked her interest in STEM, stating:

> I think my mom growing vegetables on those two little strips of dirt in our concrete jungle . . .. I had to water the plants and for me summer time is the smell of wet tomato leaves . . .. I was always interested in observing the natural world and looking at the horned worms . . .. I remember keeping one [be]cause I wanted to see it turn into a butterfly. But it didn't, it just turned into slime but that's because it died.

When Lynne decides to retire, she still wants to be an educator in some form. She stated:

> I'd be happy if I can get paid to go back to school just to learn. I would like to learn Hebrew. I so that I can read the scriptures in the way that they were written originally. That's what I would like to do . . .. I work at a women's shelter where I'm sort of, I work in their tech lab, so I work with resumes and stuff like that. I teach, I've actually taught, because I have the basics of Hebrew. So, I've actually taught Hebrew to other people who are interested in learning the Bible from the Hebrew . . .. I've taught

> Prepper's classes . . .. They have TV shows on them. But, I'm not to the extreme [preparing for natural disasters] remember MacGyver, I've taught eating raw classes.

Margaret

Margaret is a 32-year-old African American teacher with nine years of experience. She majored in the STEM area of science, earning a degree in biology. Becoming a medical doctor was her initial goal when she entered college. When describing an early experience that sparked her interest in STEM, Margaret stated:

> I would say my 10th grade class was biology and, um, I remember in her class we would do a lot of hands on. Uh, color the cell or build this 3-D model, and she was very mean, and I don't know what it was but, at the end of all that I went through, I got an *A*. And I think from there I was like, "Wow, I can do really difficult things if I just put my mind to it," even though I thought I couldn't. And I was honestly just an average student before I got to high school, like a *C* student. When I got to high school, something changed in me and I started making like *A*'s and *B*'s . . . and so basically because I was good in science in high school, I chose to take that major.

At this stage in life, Margaret is able to fulfill a portion of her initial career aspirations, working part time in a hospital. Having some experience in her original career field, she stated "Um, um, yes, if I had to, would I choose teaching again? Yes, because even being in the hospital now, I don't get the same experience or happiness with the patients that I would in my classroom."

Pascale

Pascale is a 30-year-old African American teacher with seven years of teaching experience. Pascale majored in the STEM area of science, earning her degree in Biology. When she decided to major in biology, she initially wanted to pursue a career as a medical

doctor. The most memorable event that helped spark her interest in obtaining a STEM degree was when "I had to do . . . the science fair and . . . one where the topic was which popcorn brand pops the fastest . . .. I got first place out of all the science fair projects in my elementary school."

Pascale would not change her decision to become a teacher, and is:

> a person who believes in unique journeys. So, I don't like the butterfly effect, the what if's, because it'll turn your whole course into something that you probably won't be happy about. I think my course went the way it went due to the fact that being an educator has brought me to learning way more about myself than I actually knew. Even though, with science, you learn how to be observant of your surroundings, but sometimes you fail to realize you got to be observant of yourself. You wouldn't know it or pay attention to the weak aspects of yourself that you need to strengthen. So, for me, teaching was the best thing.

Rachel

Rachel is a 30-year-old Caucasian teacher with three years of experience. She majored in the STEM area of science, earning a degree in Exercise Physiology. Her initial career goal was to become a physical therapist. Rachel cited her high school experience as a period of time that sparked her interest in STEM, stating:

> My high school teachers were amazing and, um, they were hands on, they loved to, um, let me do for myself and helped build my critical thinking skills. They gave me problems and told me to solve them and answered questions, well not answered questions but let me figure out things in a real-world way and I just [pause] they sparked an interest and a love for science.

When asked if she would make the decision to go into teaching again, Rachel stated:

> Definitely. I think that I would actually . . . at least major in, [be]cause at the time I was thinking that you know as a college student about the money. You know the STEM class; this degree is going to make me more money. Uh, but now knowing what I know, it's a, it's not about the money, obviously for teachers.

Tiffany

Tiffany i**s** a 46-year-old African American teacher with 20 years of experience. She majored in the STEM area of science, earning a degree in biology. She entered college with a desire to become a Pharmacist. In citing an experience that sparked her interest in a STEM major, Tiffany stated:

> OK, I had a . . . chemistry teacher who sparked my interest and his name was Dr. O., I can't pronounce his name, but he was very cultivating, and he made sure that we, uh, really understood the various topics or various subjects that were in science. And I loved chemistry, so I would say that he was the one who sparked my interest in pushing me forward to make sure I complete my college degree [in science].

Tiffany would like to retire from education, but retirement is not the end of her career endeavors. She stated:

> At retirement age, in 20 years, I should be retired but who knows, I may be, um, doing something else. I might do a career change . . .. I'd still be young enough to do something else. So, I could do a career change . . .. I do have the desire sometimes, I always think about, Hmm, what if I just forgo everything and go back to school and still be a Pharmacist.

Yolanda

Yolanda is a 26-year-old Caucasian teacher with one year of experience. She majored in the STEM area of mathematics, earning a degree in mathematics. Initially, Yolanda did not

know what she wanted to pursue as a career; she just knew she wanted to work in a corporate office. When describing what sparked her interest in STEM, she stated "Um, I think just the functionality of being able to use math on a day to day basis. And the concepts that it could transfer over to multiple areas."

Yolanda was the teacher with the least amount of experience. She does see herself continuing in the field of education and stated:

> One thing that new teachers do when they get to school is, first of all they're young and, um, they look like the students a lot of times. And they feel like the kids are not going to take them seriously, but the kids do, they do. You just, they just try you the first time they want to see what you're worth, what you're made of.

Results

Within this section, I present the finding of the study based on the two research questions. The perception of the participants' experiences and common characteristics are described. The themes and subthemes that emerged are described followed by an explanation of how these themes answered each research question.

Theme Development

The Emotional and Personality-Related Career Decision-Making Difficulties (EPCD) questionnaire (Appendix I), was designed to analyze the emotional and personality-related aspects of career-decision-making difficulties using questions answered on a Likert-scale (Saka, Gati, & Kelly, 2008). As noted in Chapter Three, the questionnaires provided simple numerical data that were used to support the narrative data. The simple numerical information gathered is presented here in chapter four to illustrate the findings as descriptive information.

The EPCD included three clusters: pessimistic views, anxiety, and self-concept and identity. Participant responses were tallied based on the frequency of responses in each cluster

of questions. The first section of the questionnaire determined information regarding the age of the participants and the number of years of teaching experience, as previously shown in Table 3.

The remaining questions reflected the decision-making process at a time when the participants were completing their STEM degree program and contemplating career options. I utilized these questions to uncover the motivating thoughts, feelings, and experiences that led to the career decision that was made by the participants. I obtained these results by calculating the frequency of participant responses on the questionnaire for all three clusters. For this analysis, I included the number of participants who answered questions in the *agree* range of four through six and the *strongly agree* range of seven through nine for each question. Then, I converted each frequency into a percentage by dividing the frequency number by the total number of participants and multiplying that number by 100.

Table 3 Overview of Total Frequency and Percentage by EPCD Cluste

Cluster	Total Frequency	Total Percentage
Anxiety	32	33%
Self-Concept and Identity	26	27%
Pessimistic Views	16	22%

Note: Percentages were rounded to the nearest whole number.

After looking at the frequency of responses, I determined that participants agreed and strongly agreed with the highest amount of statements within the anxiety cluster. Rounding to the nearest whole number, 33% of the participants experienced feelings of stress or anxiety related to making a decision regarding their careers. The Self-Concept and Identity cluster received the second highest frequency of responses, with 27% and the Pessimistic Views

cluster resulted in 22%. Table 4 shows an overview of results from the questionnaire, with the order of total frequencies and percentages in each cluster presented from highest to lowest.

Table 4 Frequency and Percentage by EPCD Sub-Cluster

EPCD Cluster	Subsection	Frequency	Total Number of Responses	Percentage
Anxiety	Worry about choice made	9	24	38%
	Uncertainty of choice	8	24	33%
	Outcome after choice made	8	24	33%
	Career decision-making process	7	24	29%
Self-Concept and Identity	General anxiety	16	24	67%
	Clarity of vocational interest	7	24	29%
	Approval	2	24	8%
	Self-Esteem	1	24	4%
Pessimistic Views	Process of researching career	10	24	42%
	Ideas on world of work	6	24	25%
	Individual's control	0	24	0%

Note: Percentages were rounded to the nearest whole number.

Each cluster was placed in order from highest to lowest occurrence, according to how often each participant responded within the range of agree and strongly agree (Gall et al., 2014; Marshall, 2005). The percentages were categorized by the highest to lowest percentage in each cluster (Deshpande, Gogtay, & Thatte, 2016; Lenson, 2012). Table 2 shows the frequencies and percentages of each EPCD sub-cluster.

There were four sub-clusters included in the Anxiety cluster. Participants responded nine out of 24 times in the *agree* and *strongly agree* range of the anxiety sub-clusters, indicating the participants were most worried about deciding on a career, as noted by 38% of the responses. Pascale, one of the participants who responded in the *strongly agree* range of the anxiety sub-cluster discussed the anxiety she experienced as she made her career choice, stating, "I had to work on that choice for a really long time because it became overwhelming to the point that I told myself, 'You're going to have an anxiety attack.'"

Next, at 33% and a frequency of eight of 24 responses, participants felt equal uncertainty about the specific career choice they had made and about the future that they would make for themselves as an outcome of making their specific choice. Yolanda, one of those who responded in the strongly agree range of the anxiety sub-cluster described her thoughts and feelings as she made the decision to become a teacher, stating:

> At the time there was a little fear because I had never stood up in front of a group of people especially a group of young people like teenagers and young people and tried to teach. I worried that I wasn't going to get their attention and not going to get them to understand and love science.

Finally, with participants responding at a frequency of seven out of 24 questions, 29% of participants felt uneasy about the overall process involved with choosing their career. Margaret responded in the *agree* range and described her experience with the overall process of choosing a career, stating:

> I was actually pre-med major but when, um, when I realized that medical school and all that would be a little more difficult, um, I ended up changing my major to just biology with a minor in chemistry. I ended up graduating with a science degree, my intention was to work at like a hospital or lab. And I was job hunting for about a year or two and

> could not find a job so, then I decided to teach. Because I couldn't find a job like in the traditional medical field or hospital.

The Self-Concept and Identity clusters had four sub-clusters. The general anxiety sub-cluster yielded the highest frequency of responses, which resulted in the highest frequency of responses, with 16 out of 24 responses and an overall percentage of 67%. General anxiety includes all concepts that may cause anxiety in general. Gwen, a participant who responded in the *agree* range discussed several things she considered as she made her career decision. Gwen stated:

> Um, when I graduated I didn't know what I was gonna do. I'm different because I got married in college and had kids and so when I was graduating it was more like, "OK I need to find a daycare. I need a job, I had to be around my kids, I need to be someplace where I can create a, you know, a good family home and stuff." So, that was more of my focus than the job I actually did and so, of course when you graduate you look for corporate jobs. And you know, I just didn't find a good fit in nothing I was interested in.

Participants agreed or strongly agreed seven out of 24 times that they were unsure of whether they clearly understood job descriptions. This was 29% of responses in the clarity of vocational interest sub-cluster. Tiffany responded in the *agree* range for this question and discussed how participating in interviews could aid in understanding what is a part of specific jobs. She stated:

> Internship programs allow students to really shadow people in that area. That might have, uh, might have steered me toward that particular area. Because I'm looking at what I think a person does and what I did when I got to college, but had I, um, had I

> maybe shadowed somebody in high school, I would have found out more about what they've done, and maybe I would have stayed in the corporate world.

Approval had a frequency of two out of 24 responses which resulted in 8% of responses. Self-esteem had a frequency of one out of 24 which resulted in 4% of responses.

The Pessimistic Views cluster had four sub-clusters. The sub-cluster that involved researching a career had a frequency of 10 out of 24 responses, yielding a percentage of 42%. Tiffany, responded in the *strongly agree* range for the sub-cluster that involved researching a career, and described her hands-on career research. She stated:

> Well, what helped me to do it . . . I was not a traditional student [be]cause I went to a junior college and all of that first. So, I subbed and did various other part-time jobs. So, I said, at some jobs, "Um, they still might have me not with the type of people I want to be around, as far as personality wise." [Be]cause with a biology degree most times you're set up in a lab working 12-hour shifts, three days on, three days off so then when I was, uh, finishing my degree, I tried to figure out where I wanted to go next. Did I want to get a Master's and a STEM career or go in education? So, from being a sub, I realized that I liked education.

The sub-cluster that involved ideas on the world of work had a frequency of six out of 24 responses, which was 25% of participant responses. Statements mentioned previously from Margaret and Tiffany are examples that reflect the ideas participants held on the world of work. No participant responded in the *agree* or *strongly agree* range for the sub-cluster *relating to the individual's control*, which yielded a percentage of zero.

Data from the interviews and journals were used to gather specific details, in the voice of the participants, pertaining to the experiences and accompanying feelings and thoughts that motivated their decision to become a teacher instead of pursuing a corporate career in a STEM-

related job. These two data collection methods, along with corresponding information from the questionnaire, were used to compile the textural and structural descriptions of the phenomenon from useful information that described the essence of the phenomenon. All 12 participants completed individual interviews, and seven participants completed an entry in their reflective journal. Four of those seven reflective journal entries stated there was "no additional information to add," and three of the journals provided additional statements. The data from both the interviews and the journals were transcribed and sent back to the participants to review the transcriptions. I reviewed, analyzed, and interpreted each set of data that was collected.

During the transcription process, I took notes and recorded my own perceptions and ideas concerning the information I had received, in order to set aside my personal opinions. I analyzed the data using Moustakas' (1994) method for qualitative data analysis. The first step in the data analysis method called *horizontalization* was to look at each statement and determine the relationship to an experience, idea, thought, activity, or event related to pursing and obtaining a STEM-related degree and becoming a teacher. I then uploaded the transcribed interview files and the transcribed journal files into the Atlas.ti© program. Atlas.ti© is qualitative analysis software that helps arrange and manage qualitative information in a systematic way. The software assists with linking and visualizing findings from multiple data sources (Hwang, 2008). All the experiences, ideas, thoughts, activities, or events that were identified, were coded using the Atlas.ti© program.

Table 5 Code Groups and Definitions

Code Groups	Codes Included	Number of Codes	Number of codes added from EPCD	Code Group Definition
Corporate Job	Initial Career Goal	121	10	Any mention of a
	Job Flexibility	35		business, company
	Earned Degree Field	33		vocation, or other
	Job Availability	32	6	job- related
	Lifestyle	15		terminology.
	Graduate Program	10		
Guiding or Desiring	Comments on Teaching	97		Any mention of
guidance	Impact on Others	88	16	teaching others,
	Mentoring	62	1	giving direction,
	Activities in Retirement	24		and wanting or needing guidance.
Miscellaneous	Interest in Major	87	7	Any comment that
	Coursework	27		does not clearly fit
	Job Satisfaction	26		into another code
	Ethnicity	18		group.
	Male Dominance in STEM	5		
Personality Traits	Easy Going	47		Any mention of
	Confident	40		personality or
	Persistent	40		characteristics that
	Helpful	33		describes a persons'
	Understanding	26		nature.
	Observant	26		
	Anxiety	5	32	
Raised/Reared	Early Experiences	156		Any mention of or
	Thoughts & Feelings	120	2	aspects of a
	Parental Influence	22		persons'
	Religion	20		upbringing.

Note: Occurrences from EPCD Questionnaire frequencies was added to a number of codes.

A list of open codes (Appendix M) and code definitions was developed from the interviews and journals. I then listed each statement, sorted the statements that were repeated across data sets, and determined the statements that significantly demonstrated the experiences related to

pursuing and obtaining a STEM-related degree and becoming a teacher. The occurrences of responses from the EPCD questionnaire were then added to the list. I completed the process of horizontalization by either splitting or merging the open codes as I bracketed each open code into code groups. Table 5 contains each code group and their definitions.

Table 6 Code Groups and Themes

Code Groups Included[1]	Number of Code Appearances Across Data Sets[2]	Themes
Corporate Job	202	Approaching a Corporate Career
Guiding or Desiring Guidance	287	Approaching a Corporate Career
Miscellaneous	120	Sense of Calling
Personality Traits	24	Sense of Calling
Miscellaneous	50	Early Influences
Raised/Reared	320	Early Influences

Note[2]: Number of codes reflect the frequency data from the EPCD questionnaires (see Appendix M for list of codes and Appendix N for sample cluster map).

I reviewed all sources of data to determine additional information related to the themes. Participant quotations provided evidence and support for the stated themes and answered the research questions, explaining participant perceptions of both the pursuit to obtain a STEM-related occupation and the decision to become a STEM teacher instead. Following horizontalization, I further analyzed the code groups and identified themes in relation to the research questions and the phenomenon as shown in Table 6.

Through the data analysis process, three significant themes and eight sub-themes emerged from the perceptions of the participants regarding how they made their final career decision. The first theme was approaching a corporate career which identified two sub-themes. The second theme was a sense of calling which identified three sub-themes. The third theme was early influences which identified three sub-themes. A table of identified themes, sub-themes with relevant code groups is displayed in Appendix O.

Theme One: Approaching a Corporate Career

The first theme provided insight into research question one, "What experiences prompted female STEM majors to enter the field of secondary education rather than entering corporate employment after graduating with a STEM-related degree?" Throughout the data collection process, participants referred to thoughts and perceptions which resulted from lived experiences and helped to solidify their decision to approach a career in a corporate STEM-related field but, ultimately deciding to move away from their initial career goal. Each of the participants expressed difficulty and concern regarding securing a job that would meet all of their needs and the opportunity to be exposed to a variety of corporate STEM careers.

Job availability and flexibility. The first subtheme in the theme of approaching a corporate career was job availability and flexibility. Concerns were noted for the ability to secure a job that would meet both their financial and scheduling requirements, a balance of both their wants and their needs. All 12 participants shared their thoughts and feelings regarding the shift away from the idea of pursuing a corporate job. Data analysis revealed why participants moved away from their initial career goal. To illustrate her concern, Rachel stated, "At the time I was thinking that, you know, as a college student about the money. You know the STEM classes; this degree is going to make me more money." Similarly, Yolanda stated, "I also think, being really transparent, the schedule and the hours and, um, work life balance was a huge contribution to also wanting to be a teacher." Several other participants also noted their concerns, Margaret stated:

> When I graduated from college and I couldn't find a job in a lab, I would go on different interviews and wouldn't get the job. I applied for internships at the CDC and didn't get the job. I guess I became discouraged in the medical field.

Next, Tiffany stated:

> I was trying to figure out whether this career would maintain the lifestyle that I liked to

> live, and so that was something I was torn with, because, you know, that if you work in industry, you start off making more money and then you end up making more money even just with a basic level degree. But here in education, you have to get advanced degrees to increase your income, and with that advanced degree comes more student loans and more debt. So that was one of the things that I toyed with.

Then, in her journal entry, Jenia documented her thoughts on how the need for flexibility played a role in her career decision. Jenia wrote:

> I kind of got into this career because of my eldest son. My original plan was to go into medicine, but I ended up getting married and having a child. That kind of waylaid my plans for medicine. Once my son was born, it would be unhealthy to be working with things like blood samples and body fluids. I didn't want to bring that home to my son. So, I chose education at the time, because I was still able to do the science, which I loved, and I was also able to be off on holidays and weekends. It had great benefits for me to be able to be with him and still be able to work my job.

Finally, when speaking about job flexibility and availability, Gwen also expressed the need to pursue a career that would allow her to spend time with her family. Gwen stated:

> I'm different because I got married in college and had kids, and so when I was graduating it was more like OK I need to find a daycare. I need a job, I had to be around my kids. I need to be some place where I can create a, you know, a good family home and stuff. So, that was more of my focus than the job I actually did, and so, of course, when you graduate you look for corporate jobs. And you know I just didn't find a good fit in nothing I was interested in.

The participants also commented on the amount of jobs that either could not be adapted to fulfill their unique requirements and obligations or that they were not offered at all. As

Margaret mentioned, “I would go on different interviews and wouldn’t get the job . . . I guess I became discouraged in the medical field.” Each of the participants expressed a sense of discouragement about the process of selecting a job in general, which was also mirrored in the responses selected in the EPCD questionnaire. Expressing discouragement, Tiffany mentioned, “I was trying to figure out whether this career would maintain the lifestyle that I liked to live, and so that was something I was torn with.” Twenty-two percent of the participants indicated there were many relevant factors to consider in their career choice. Ultimately, all the participants chose to follow their thoughts and feelings regarding the factors that were most critical to them, which led to becoming a teacher.

Corporate mentorship. The second subtheme in theme of approaching a corporate career was corporate mentorship. Mentorship is a development tool that can empower people to achieve their goals and aspirations. A mentor, according to Merriam-Webster, is “a trusted counselor or guide.” Ten out of the 12 participants reported they may have made the decision to pursue a corporate position if they had the benefit of a mentor paired with more internship or externship opportunities. Supporting the idea of corporate mentorship, Carla stated that students such as herself “need somebody to kinda get in there and help guide you to different areas.” In her journal entry, Jenia also commented on what could have been done differently to steer her towards the pursuit of a corporate career. Jenia recorded that “some type of STEM rotation, or teaching rotation, or externship” would have been helpful while she was in college, so she would know what would be expected of her. Third, Pascale echoed this sentiment by stating:

> A lot of times, one of the gaps in education is that you don’t have the businesses coming back to the schools to show the students that what you’re learning over here and you do a little bit more training, you can come over here and get the experience on

> how to put this together. And then we can be innovative, and you can push technology even more, if you come over here.

Tiffany expressed the similar sentiments and added the idea of shadowing someone in a STEM field earlier in high school as opposed to the majority of the participants who mentioned participation in internships or externships during college. Tiffany stated:

> Because I'm looking at what I think a person does and what I did when I got to college but had I um had I maybe shadowed somebody in high school I would have found out more about what they've done and maybe I would have stayed in the corporate world.

Finally, Margaret indicated she also may have been more likely to pursue a corporate career if she had the opportunity to participate in more programs geared towards mentorship, implying that participating in such programs earlier than in college may have been beneficial. Margaret commented:

> If I would have done more of, like, kinda, of like, how I did the Bridges Program in undergrad when I was in junior college. Because it kinda set me up in the real-world setting doing real world things. I think if I would have done that in college, I would of took like a STEM career or would have not got[ten] discouraged. Um, like, like the internship with CDC, if I would have gotten something like that, I think it would have pushed me into that type of career. But because I couldn't find a job, or it wasn't easy to get a job at the time, it kinda discouraged me from working in a lab or doing research. And I said, well, let me just try to teach at least, [be]cause, I liked science and I wanted other people to like science especially kids. So, if I would have had that I think it would have pushed me that way

When deciding on a career that may impact the rest of a person's life or at least the next 20 to 30 years of a person's life, it may be natural to have some degree of anxiety. This is also

indicated on the frequency of responses on the EPCD questionnaire within the Anxiety cluster. Thirty-three percent of the teachers participating in this study agreed that the process of choosing a degree caused them to experience some anxiety, as they committed to a certain career and wondered if they would regret the decision later or feel responsible for mistakes that were made. Many of the participants expressed similar sentiments as Yolanda when she expressed her feelings about the decision to become a teacher, stating, "At the time there was a little fear." In general, the participants felt the ability to take part in mentorship activities would have encouraged them to continue their original goal, provided valuable contacts in the corporate world, in addition to reducing some of the uncertainty that develops when making a career decision. As stated by Carla, STEM majors "need somebody to kinda get in there and help guide you to different areas."

Theme Two: Sense of Calling

The second theme also provided insight into research question one, "What key experiences prompted female STEM majors to enter the field of secondary education rather than entering corporate employment after graduating with a STEM-related degree?" Analysis of the data revealed the experiences that encouraged the aspirations of the participants and developed the desire to influence future generations. This sense of calling emerged as subthemes for the desire to empower, being helpful, and being understanding.

Desire to empower. The first subtheme in the sense of calling was the desire to empower others. Participants conveyed the sentiment that the desire to impart knowledge was an innate and integral trait that was just a part of who they were as individuals. All 12 participants also revealed their beliefs on continuing in the field of education and indicated they were called to teach. All 12 participants specifically mentioned that their aspirations to affect the lives of the students they taught is what motivated them to remain in the field of

teaching. For instance, in her interview, Jenia specified she explicitly wanted to work within a priority or low performing school. She wanted to use her high school experiences with wanting to attend college to empower her students. Jenia said:

> My counselors didn't help. My parents didn't go to college. Um, the one sibling that did go to college was out of the house. So, nobody even knew I wanted to go to college, even though that was an aspiration since I was in 9th grade. So, this is probably my way of giving back and knowing that there's a need there and people need to have some type of help. Even though they want to go to college, I'm finding that a lot of students don't know how to even apply to college. So, it's more about helping people with life skills and making them, uh, have a smooth transition from secondary to post-secondary so they can be economically sound later on in life, rather than [just], um, giving them the curriculum. We do give the curriculum, but you have to impart time for other things and life skills.

Then, in her journal, Rachel wrote she enjoys "just working with kids as they transition out of high school and into life. I enjoy helping prepare them for the next step, whether it be college, a job, or just doing general mentorship within the building." Furthermore, when asked what influenced her to become a secondary teacher, Heather stated, "Definitely being able to influence students and feel like I have, um, a say in these kids' lives and making a difference." Heather also provided a journal entry regarding the ability to empower others. She wrote:

> I am a fun, outgoing person, charismatic person who doesn't meet strangers. I can get people to do things that they may not want to do. So, I think I have the type of personality that gets along well with others regardless of who you are and how big of a wall you put up. I'm the one that can break down those walls!

Next, Pascale expressed being a teacher not only allows her to empower others but has

also served as a sense of enlightenment for her own strengths and weakness. Pascale stated:

> I like being a leader, um, and then I also like when people can look up to me because it helps you grow as well and strengthen yourself in certain areas where you're not as strong. Like at first, I wasn't a people person; I'm a little bit better now.

Additionally, Lynne, along with four other participants, enjoys teaching so much, she would want to continue her quest to coach others when she decides to retire from teaching high school. Lynne stated she would be:

> happy if I can get paid to go back to school just to learn. I would like to learn Hebrew, so that I can read the scriptures in the way that they were written originally. So, because I have the basics, I've actually taught Hebrew to other people who are interested in learning the Bible from the Hebrew. That's what I would like to do, so, my teaching is fine, I like it, and again I do it. . .. I work in the tech lab (of a shelter) so I work with resumes and stuff like that. So, I, I, I do a lot. I've taught Preppers classes, I've taught eating raw classes. Right, so in fact, I'm about to take an emergency preparedness class through the, um, fire department on how to be like a volunteer in case of emergency. So, that will be, add something else I'd be able to teach once I've learned it myself [laugh]. So, teaching is just, it's just, it's kinda who I am. It's who I am so whether I get paid or not I find myself in those kind[s] of positions.

Finally, Ericka would like to sit back and enjoy the fruits of her teaching as she shares the impact she has had on some of her students. Erika stated:

> I've always been told that I was pretty easy to talk to and I, I honestly think that's why kids tell me they love coming to my class because they feel comfortable. They don't feel intimidated even though it's a math class. So, I think the positive is just I can make people feel comfortable and that puts them in a better frame of mind to learn, and I

> could hopefully have an impact on the future. You know when you think about becoming a teacher, you're like, ok, here's a place where I can sit and help mold people for the future. I guess that's just the feelings that were going through my head . . . [even when I'm at] retirement age, I'm, I'm hoping to sit back and be happy with, with kids I've influenced, and it's funny, um, I teach at a high school where I now have colleagues who were my students when they went here.

Being helpful. The second subtheme in the sense of calling them was being helpful. Students maybe more receptive when they feel that a teacher cares and is genuinely trying to help them be successful. Five of the 12 participants mentioned that even if they were unable to give their students a sense of empowerment, one goal they strive for is to be helpful to the students whom they teach. As indicated in her journal entry, Rachel told a story about an experience she had at the school where she currently taught. She wrote:

> When things go well in the class for one person, they spread the word. It's really funny because I and another teacher was the only ones who taught Chemistry in the school my first year and so, the next year, at the beginning of the school year, my classroom was full of students, and I was like why do I have 60 students in here? And the other chemistry teacher don't have but 10. So, I said, no, this has got to change. The students said, "Oh please Ms. (Rachel), don't get rid of me, don't send me to her (the other teacher). I want you, I want you!" I said, I can't teach all of ya'll chemistry, ya'll can't stay in here! And so, I found out later on that the word had passed (around the school) that the kids had enjoyed my class. So, they told the other kids [that my class], it was a difficult class though, and, "Oh, she'll teach you, she take her time, she slow down, she easy to understand." And so, they spread the word and so all of them wanted to be in my class.

Similarly, two participants who were self-proclaimed *control freaks* also discussed how they wanted to be helpful to the students in their classes. The first participant, Yolanda said:

> I am very much a control freak, . . . I like leadership roles, I like, um, planning. I like executing; I like meeting goals and seeing things completed. So, education has been really good for me for that [because] I am a caring person but, um, I also have high expectations. I like success and I like to help my students succeed and see people learn.

The second self-proclaimed *control freak*, Denise, also revealed that she really enjoys helping those students who truly needed extra assistance in learning the subjects that she teaches. Denise stated that she:

> was looking at different schools, like where would I want to teach, and I know, I knew I didn't want to work with kids, affluent kids. I didn't want to work with kids that had a lot of, um, that didn't have struggle, that weren't struggling. I didn't want to work with honors or AP kids, nothing like that. I wanted to work with kids that had real challenges, possibly didn't have real resources, their parents to go and get a tutor.

Being understanding. The third subtheme in the sense of calling theme was being understanding. Many teachers can remember what it was like to be a student and can empathize with the many issues that their students are facing. Five of the participants expressed they struggled as a student and understood what it was like to be a student learning a difficult subject. Demonstrating this idea, Carla stated, "I guess I wanted to be the kind of teacher I wanted to have as a student. I wanted to have a rapport with my students . . . but I want you to learn if you're capable of learning." Similarly, Yolanda said, "Well, it's my goal to get the students to understand what I understand, the functionality and just being able to use math on a day to day basis. And the concepts that it could transfer over to multiple areas."

Finally, Denise and Pascale were empathetic to their students as they both had

struggled as students when they were growing up. They both discussed alternative methods for ensuring their students get a good understanding of the subject matter they teach. Denise said,

> When I became a teacher, I was teaching much lower level students but still at the high school level. But, I can look at an Algebra II kid and say, "OK, you don't understand this because you don't understand [topic]," and then I can pinpoint the lower steps, way down two or three years before, that they didn't master, and we can start from there.

Pascale added:

> Um, and have alternative ways of how to do that, because one thing we know is that we have to be versatile in teaching. Everybody is not an auditory, kinesthetic, visual learner, you know not in one. You have to know how to break things down and have new ways of doing stuff and not being a stale individual [teacher].

Supporting the earnest emotion, the participants revealed during their interviews and reflective journals, the high levels of intensity regarding this concept of being called to the teaching profession are important to note, which corresponds to the low frequency and percentages of responses in the approval and self-esteem areas on the Self-Concept and Identity cluster of the EPCD questionnaire. Respectively only 4% and 8% agreed they did not understand themselves or they needed the approval of others. Demonstrating the belief of being destined to teach, Lynne declared, "I would have sought out other pathways and, um, maybe not ended up in high school, but still ended up with a science-teaching pairing, and in some way or another, I would still be instructing, coaching, or guiding others!" Additionally, as indicated in the Pessimistic Views cluster, none of the participants agreed that choosing the right career depended on luck, or that they had no control over choosing the right career for them. As Gwen simply stated, "I just think that teaching was a part of God's plan, you know, for my life." This statement reflected the sentiments held by all of the participants, that there

was a deep and clear understanding of their own personality, and they were keenly aware of their purpose in life.

Theme Three: Early Influences

The third theme provided insight into research question two, "What personal background factors influenced female STEM majors to choose a career in a filed other than a STEM profession?" Participants made references to the aspects of their background that influenced them to change the career they had decided to pursue. Analysis of the data revealed that many of the experiences that formed each participant's interest in the STEM-field in general occurred early in their lives.

Grade school influences. The first subtheme in the early influence theme was grade school influences. Participants discussed how early experiences in grade school helped to shape their interest and desire to pursue a STEM-related major by the time they decided to go to college. Four of these participants recounted their experiences in high school, and three of them recalled an experience in elementary school. To begin, Tiffany stated, "I did have a great high school teacher who was a chemistry teacher that fostered my love of chemistry. That's why I decided to go into Pharmacy . . . that's how I got started with STEM period." Next, Pascale spoke of a high school teacher who was influential to her. She stated:

> She was my coach my sophomore year. And I would just go in her class from time to time. And I was like ok, I just saw just her influence on her students and how they loved her and then how real she was, and she would just talk to us about real life. You know at that time when you're in high school, you kind of get that sense of you know that you're about to hit real life, real soon.

Similarly, Carla and Margaret both spoke about how they enjoyed their biology classes in high school. Carla stated, "It was actually my biology teacher in high school (who) was the

one who sparked my interest in science in the first place." Margaret added:

> I would say my 10th-grade class was biology and, um, I remember in her class we would do a lot of hands on. Uh, color the cell or build this 3-D model and she was very mean and I don't know what it was but, at the end of all that I went through, I got an *A*. And I think from there I was like, "Wow, I can do really difficult things if I just put my mind to it," even though I thought I couldn't. And I was honestly just an average student before I got to high school, like a *C* student. When I got to high school, something changed in me and I started making like *A*'s and *B*'s. So, you know, science was like my favorite subject that I excelled in. And so basically because I was good in science in high school, I chose to take that major in college.

Pascale, along with Denise, described a noteworthy elementary school experience that began her interest in STEM early on. In her journal entry. Denise wrote, the "most memorable event was in 5th grade, we got to dissect an owl pellet. I found a little, a rat head, skull. I just remember that, and I was like my first time, I was like 'science is cool.'" Pascale added a description of her early experience, winning the science fair. She said:

> I had to do the fair, the science fair and I did one where the topic was which popcorn brand pops the fastest and not knowing that that project would be the beginning of my love of science. . .. I got first place out of all the science fair projects in my elementary school and . . . this was like where third, no, fourth and fifth graders competed, and I was like, what! Let me think about this some more!

College influences. The second subtheme in the early influences theme was college influences. Participants cited the importance of receiving opportunities at the college level for helping to shape their career aspirations. Four of the participants described early college experiences in their list of the most influential experiences that guided them towards pursuing

their STEM-related degree. First, Tiffany shared about a "teacher who sparked my interest and his name was Dr. O, I can't pronounce his name. But he was very cultivating, and he made sure that we really understood the various topics or various subjects that were in science." Second, Ericka added that the professors "that I took, um, were very influential. So, more than just the course themselves. I started watching how my teachers taught and to this day I actually model a lot of what I do after my calculus teacher."

In addition, Lynne also credited one of her college professors for being the model to some of her teaching methods. She said:

> I had a person, a professor, he's still there at the University of Buffalo . . . he taught evolutionary biology and he sang to us. Yes, he dressed up . . . and our minds were blown . . .. There was a picture of Mendel on the screen and then the lights came on and he was standing there looking just like the picture. [Be]cause, [he was] a Caucasian man, he was bald, he had a beard just like Mendel and he was dressed in what the guy was dressed in. And so, he came dressed for that lecture. And then on one of the last lectures, he actually sang a song with a hat and cane about evolutionary biology . . . [and now] I have 16 songs. So, I don't know if I sing because of him, but I can't ignore that that did happen and it kinda blew my mind. And even though, I think I got a *C* in that class, I learned so much, so much just by the way he taught in this huge lecture hall. There were 200 students, but he was very interactive with us as far as college professors go.

Parental influences. The third subtheme in the early influence theme was parental influences. Participants felt that early experiences as they grew up with their parents and immediate family members had influenced their interests in a STEM-related area. There were three participants who reflected on childhood experiences which involved impact of their

parents on the desire to learn more about specific STEM areas. One participant, Heather, stated:

> I'm Canadian and my background, I'm a black Canadian, my parents are from Ghana, West Africa and they immigrated to Canada, which is where I was raised. I was born in England, moved to Canada and went from K-12 in Ontario . . . My father was a physical therapist and my mother was, she didn't stay at home, but she had little businesses that she did. So, um, I think that shaped me in terms of, you know, having, wanting to go to post-secondary school and, um, making sure I got a university degree.

A second participant, Lynne, discussed a memorable event that helped shape her interest in a STEM-related area. She reflected:

> Both of my parents are from the Island of St. Kitts, K-I-T-T-S. Um, my parents were divorced when I was six, so my mom was a single mother and she raised me in the Bronx. So, even though we lived in the concrete jungle, in the backyard we had two strips of dirt and my mom grew vegetables. I think my mom growing vegetable on those two little strips of dirt in our concrete jungle. Um, I never, so I had to water the plants, and for me summer time is the smell of wet tomato leaves. They just have a certain smell, and so I was always interested in observing the natural world and looking at the horned worms that would be the caterpillars. And even I remember keeping one [be]cause I wanted to see it turn into a butterfly. But it didn't, it just turned into slime but that's because it died. Finding out why it died was the beginning of my interests in science, and my mom pushing me to be better than she was, was a big influence. She pushed me into college, she was a nurse and she told me that I had two options as a woman of color, to be the first female president or to be a doctor!

The third participant who described how her parents influenced her interests in a

STEM-related area was Denise. She said:

> Well, my dad, he was an engineer and . . . he built large build, structures, buildings. He would, he owned a company where they built schools and malls and, um, big, big, big buildings like that. Even when I, my youngest memories would be, uh, sitting at the kitchen table with him, with a set of prints, uh, and he would say, uh, "Ok, [Denise], tell me how many, how much dirt I'm gonna have to move from this this job site to make it a level piece of ground?" And he'd just give me the blueprints and I would have to figure it out. I had to grid the thing off, I had to say ok, we need to move this dirt over here, we have to do this, we have to haul this amount away. He'd say, "Denise look at the blueprints and tell me how many door knobs do I need to order." So, I'm like just a kid and he's gonna go back over me. But, he helped me understand how to plan for building a building from the foundation up.

Early experiences such as these, provided an introspective look into the background of each participants of this study. These experiences provided evidence that both internal and external factors were influential to the lives of the participant. Supporting the idea that career choice develops as a result of early experiences, the corresponding high frequencies of the clarity of vocational interest at 29% and ideas on the world of work at 25%. All of these influences play a role in the decision-making process.

Research Question Responses

RQ1: What experiences prompted female STEM majors to enter the field of secondary education rather than enter corporate employment after graduating with a STEM-related degree?

The first research question for this study sought to determine the key experiences that prompted female STEM majors to enter the field of secondary education rather than enter corporate employment. The themes of approaching a corporate career and sense of calling provided insightful understanding about the question. Five subthemes emerged within these two themes as the participants described the experiences that affect their decision in pursuing and obtaining their careers. The ability to find available and flexible position and the ability to secure meaningful networking relationships were a priority when making their choice. As Margaret stated:

> When I graduated from college and I couldn't find a job in a lab, I would go on different interviews and wouldn't get the job. I applied for internships at the CDC and didn't get the job. I guess I became discouraged in the medical field.

In addition, a strong internal need to make a difference in the lives of students contributed to the feeling that participants were called to become teachers. The ability to empower, help, and demonstrate understanding students was important. Ericka would like to sit back and enjoy the fruits of her teaching as she shares the impact she has had on some of her students. Erika stated:

> I've always been told that I was pretty easy to talk to … that's why kids …don't feel intimidated even though it's a math class… the positive is just I can make people feel comfortable and that puts them in a better frame of mind to learn, and I could hopefully have an impact on the future.

Denise, also revealed that she enjoys helping students who need extra help. She stated:

> I knew I didn't want to work … with kids that … weren't struggling. I didn't want to work with honors or AP kids, nothing like that. I wanted to work with kids that had real challenges, possibly didn't have real resources, … to go and get a tutor.

Several internal and external events impacted the career decisions of the participants. External experiences which occurred directly after receiving their undergraduate degrees, such as the inability to find a corporate job, opened the door to the idea of becoming a teacher. Once the participants began teaching, they experienced internally rewarding experiences that impacted the desire to continuing the pursuit of a corporate position.

RQ2: What personal background factors influenced female STEM majors to choose a career in a filed other than a STEM profession?

The second research question sought to determine the personal background factors that influenced female STEM majors to choose a career in a filed other than a STEM profession. The theme of early influences provided insightful understanding about the question. Personal factors from different time periods within the participants background had a strong impact on their decisions to choose a career whether it be grade school, college or as they were reared in general. Of her grade school experience, Tiffany stated, "I did have a great high school teacher who was a chemistry teacher that fostered my love of chemistry. That's why I decided to go into Pharmacy . . . that's how I got started with STEM period." Lynne credited one of her college professors for being the model to some of her teaching methods. She said: "I had a person, a professor, he's still there at the University of Buffalo . . . he taught evolutionary biology and he sang to us."

Additionally, recalling an early parental influence, Denise said:

> My dad, he was an engineer and . . . my youngest memories would be, uh, sitting at the kitchen table with him, with a set of prints, uh, and he would say, uh, "Ok, [Denise], tell me how many, how much dirt I'm gonna have to move from this this job site to make it a level piece of ground?" And he'd say, "Denise look at the blueprints and tell me how many door knobs do I need to order." So, I'm like just a kid and…he helped

me understand how to plan for building a building from the foundation up.

Experiences that occur earliest in life can affect the thoughts and feelings of individuals for a longer period of time (Lewis et al., 2016). The effects of these early experiences shaped the career aspirations of the participants in this study. Together, the three subthemes provided insight into the background factors that impacted the phenomenon of women choosing education over corporate level careers.

Summary

This chapter presented a description of the 12 participants, the results of data analyses, and the identified themes. The data that were analyzed from the questionnaires, individual interviews, and journaling, resulted in the identification of three themes: approaching a corporate career; sense of calling, and early influences. The findings provided answers to the research questions: (a) What key experiences prompted female STEM majors to enter the field of secondary education rather than entering corporate employment after graduating with a STEM-related degree? and (b) What personal background factors influenced female STEM majors to choose a career in a filed other than a STEM profession?

Rich insight into the experiences and the perceptions of the participants' background that guided the career decisions of female STEM majors were uncovered throughout all phases of the study. Participants decided not to pursue positions in corporate STEM-fields for several reasons. The reasons included the inability to secure a job and the desire to find a job that is flexible enough to fit their individual lifestyles. The majority of the participants also revealed they would have been more persistent in following their initial career goal if they would have had the opportunity to participate in additional internship, externship, or other mentorship opportunities, in which they could have established clear ideas regarding what the corporate job would entail, and to establish corporate contacts.

Additionally, the analysis of the data revealed two overarching reasons that these female secondary STEM majors decided to become teachers instead of seeking jobs within the corporate arena. A powerful influence for this decision was that the participants felt they were called to be in a helping profession. The other powerful influence, early experiences from the participants' backgrounds, also helped to shape their decisions to become educators.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this transcendental phenomenological study was to investigate, identify, and describe the lived experiences that influenced female STEM majors to become secondary educators rather than enter a STEM-related corporate profession. This chapter begins with a summary of the findings, continues with a discussion of the findings, and presents the theoretical, empirical, and practical implications of the study. The chapter concludes with an outline of the delimitations and limitations of the study, recommendations for future research, and a summary of the study.

Summary of Findings

A phenomenological approach was taken to examine the perceptions of female STEM majors regarding their decisions to enter the field of secondary education. Data were collected with a questionnaire, interviews, and reflective journals. Data from the questionnaire were analyzed for the frequency of responses to which participants agreed or strongly agreed. The interviews were transcribed, and reflective journals read. These transcriptions and journals were interpreted and coded separately. Significant clusters were identified from responses to the questionnaire, and significant statements were identified and coded from data collected through interviews, journal entries, and data from the questionnaires. Three themes and eight sub-themes were identified from responses to questions guided by the two research questions. The research questions were: What key experiences prompted female STEM majors to enter the field of secondary education rather than entering corporate employment after graduating with a STEM-related degree? and what aspects of the background of female STEM majors influenced their decision to make a change in the choice to pursue a different career? Each research question was presented and then answered.

The first research question was: What key experiences prompted female STEM majors to enter the field of secondary education rather than entering corporate employment after graduating with a STEM-related degree? An analysis of all data sources identified two main themes for experiences that prompted female STEM majors to enter the field of secondary education rather than entering corporate employment after graduating with a STEM-related degree. The themes were: (a) experiences that led participants toward and then away from a corporate career and (b) experiences that substantiated their perceived sense of calling, which led the participants away from the corporate career path and towards the field of secondary teaching.

Within the first theme of approaching a corporate career, two sub-themes emerged. The first of the two sub-themes were a combination of job availability and job flexibility. Each of the 12 participants indicated they entered college with a desire to pursue a corporate career when they graduated. These 12 participants encountered disappointment with job availability and job flexibility upon graduation when they attempted to secure a position in the corporate arena. The participants noted they were either unable to find a corporate job, or the schedule flexibility of becoming an educator was more appealing than the schedule requirements offered in a corporate position.

The second sub-theme was corporate mentorship. Ten of the 12 participants indicated there were also additional events that would have sustained their motivation to pursue a STEM-related career in the corporate arena. These 10 participants surmised that had they had multiple opportunities to participate in internships and externships, even as early as high school, they would have had the necessary encouragement to continue pursuing that corporate STEM-related career. These participants indicated that participation in programs such as these

would have allowed them to gain first-hand knowledge of what was expected in specific STEM-related positions as well as helped them to develop valuable corporate connections.

The second theme under research question one was a sense of calling, which revealed three sub-themes. The first sub-theme under the participants' sense of calling was the desire to empower others. All 12 participants noted they ended up working as educators because they perceived they were called to this occupation, meaning that being a teacher was in fact what they were supposed to be doing in life. All 12 participants enjoyed and wanted the ability to empower the next generation of students. They felt being a secondary educator was the right platform that bridged their desire to guide students and their appreciation for STEM.

For the second and third sub-themes related to their sense of calling, almost half of the participants indicated they wanted to be helpful and they wanted to be understanding. These participants enjoyed finding ways to teach by utilizing innovative methods and strategies in order to reach students who struggle or may not grasp concepts immediately. Other participants understood what it was like to struggle both academically and economically themselves. They wanted to reduce as many negative extraneous variables for students as possible in order to create a clear path for learning to take place.

The second research question attempted to identify personal background factors that influenced female STEM majors to choose a career in a filed other than a STEM profession. An analysis of the data identified one theme regarding the aspects of the background that influenced female STEM majors to change their career pursuits. This theme suggested that early experiences the participants had encountered in their personal backgrounds influenced their career choices. These early influences emerged into three sub-themes, identified as influences from grade school, college, and their parents. A total of seven participants described influential grade school experiences; four participants recounted influential college

experiences; and three participants detailed parental influences.

Discussion

The goal of this transcendental phenomenological study was to investigate, identify, and describe the lived experiences that influenced female STEM majors to become secondary educators rather than enter a STEM-related corporate profession. This goal was realized using two research questions. In order to link and make connections between the body of literature and the current study, specific literature recognized in Chapter Two is recounted and compared to the data collected in this study.

Empirical Literature

Historically, women have outnumbered men in the teaching field, since an industrialized economy reduced the necessity for women to do tedious everyday chores such as making clothes and other household items by hand (Slater, 2016; Spring, 2015). The mass production of items by machines opened doors through which middle- and upper-class young, educated, and unmarried women could provide a provide a suitable pool of low-paid teachers (Slater, 2016; Spring, 2015). Today's teachers are still mostly women and are still relatively low-paid (Snyder & Dillow, 2013); about half of the participants in this study mentioned that they could have made more money if they had pursued a corporate job (Langdon et al., 2011; Rothwell, 2013). However, today's teachers now come from all socio-economic classes, all backgrounds, and the teaching positions are usually held throughout their lives (Boyle 2004; Snyder & Dillow, 2013).

Although not necessarily a reflection of better wages, the job outlook for teachers is expected to grow even more in the next 10 years (Bureau of Labor Statistics, 2016). While certification does require a college degree, for many of the disciplines taught, the degree can be in any number of related subject areas (Ingersoll, Merrill, & Stuckey, 2014). Consequently,

many college graduates are attracted to the field of teaching, whether they have a degree in education or not. Although the data from this study supported the claim that college graduates can teach various related subjects with their degree, several of the participants expressed irritation with having to pay for certification related tests and courses, as well as having to go back to school for additional degrees in order to receive a pay increase.

Similarly, growth in opportunities for employment in STEM occupations has increased steadily over the past few decades (Bureau of Labor Statistics, 2016, Noonan, 2017). However, on average, STEM workers earn more money than many other occupations, even if they do not have an advanced level of education (Carnevale, Smith, & Strohl, 2013; Hillier, deWinter, & Twidle, 2013). With recent discourse from leaders in governmental, public, and private sectors, the belief has developed that the United States (U.S.) is facing a shortage of individuals majoring in fields related to STEM (Carnevale et al., 2013; Hillier et al., 2013).

As a result of this discourse, industry leaders, as well as policymakers in the U.S., have heightened their focus on attracting capable employees in STEM fields (Tadjeh, 2013; Vilorio, 2014). With this expanded focus comes the need for more females represented in the STEM workforce. The National Science Foundation (American Chemical Society, 2012) reported that women made up almost equal percentages of graduates receiving degrees in science and engineering. However, the percentage of women who work in STEM occupations has only increased 4% (Beede et al., 2011; Glass, Sassler, Levitte, & Michelmore, 2013). The data from this study supports these previous studies in that each of the participants did receive a STEM degree, and none of them work in a corporate STEM occupation. One point important to note is that two of the participants did leave teaching briefly in order to work in the corporate arena, noting they did make considerably more money, but decided to return to teaching.

External experiences, such as gender differences (Landivar, 2013) or the observation of a mentor (Fulmer, 2014), occur due to environmental influences and result in learned behaviors and ideas. These external experiences may result in the minimization of extrinsic motivators, which may be a necessary ingredient in the choice to pursue and obtain STEM-related majors (Hernandez, Schultz, Estrada, Woodcock, & Chance, 2013; Smoot-Taylor, Woods-Erwin, Ghose, & Perry-Thornton, 2001). Previous research reported gender differences as an obstacle that deters women from entering STEM-related fields and is manifested in stereotypical perceptions and feelings of being out of place (Jagacinski, 2013; Perez-Felkner, McDonald, Schneider, & Grogan, 2012; Spencer, Logel, & Davies, 2016). Findings from my study do not support this suggestion because only one participant mentioned an experience related to stereotypical male dominance. However, that lone participant stated the experience did not prevent her from reaching her educational goals.

Studies conducted by Leslie, McClure, and Oaxaca (1998) and Wang, Eccles, and Kenny (2013) on women and minorities in science noted that three concepts were closely related: self-concept/self-efficacy, peer influence, and goal commitment. The studies indicated that a persons' self-concept, self-efficacy, and level of commitment can be shaped by people, activities and experiences outside of one's self, such as peer pressure, another external influence (Acker & Oatley, 1993; Hernandez et al., 2013). The results of this study affirm these indications as participants did reveal the positive impact of early experiences as well as parental influences on their commitment to seek a college degree in their chosen field.

Flexibility with work schedule and educational events such as the opportunity to participate in STEM-related internships and externships were previous external influence findings that were also reinforced by the results of this study. Of important note, cultural views towards women's roles and student retention were not specifically discussed by the

participants of this study. However, since all participants did pursue and earn a STEM degree, implications of Fulmer's (2014) claim of "having a positive attitude toward science-along with the host of related perceptions and experiences that go into such attitudes contributes to students' motivation for and persistence in school science" (p. 200) was supported. Additionally, cultural views towards women's roles were also not specifically discussed. However, due to the mention of job flexibility as a result of familial obligations, coupled with the Christian faith identified by each participant, imply that traditional cultural beliefs about parental style and familial guidance did play a role in the career decisions of the female secondary STEM teachers in this study (Bergen, 2006; Ghanizadeh, Eishabadi, & Rostami, 2015; Zimmermann, 2012)

Internal experiences, such as the internalization of social roles (Lewis, Stout, Pollock, Finkelstein, & Ito, 2016), occur due to influences that come from within. These experiences may be considered a manifestation of biological or innate preferences. Internal events may also produce attributes or characteristics that are inherent to a person's personality or a part of a person's constitution.

Studies have shown women with a strong religious faith make life choices based on the tenants of their chosen religion (Gonsoulin, 2010; Scott, 2002; Stavrova & Siegers, 2014). The results of the current study reflect support for this body of research as the participants, although all 12 reported religion did not play a role in their pursuit of a STEM-related degree, expressed the perceptions they were called to the field of education and had a desire to fulfill that calling by becoming a teacher. On the other hand, the same body of research suggested religion can predict the acceptance of certain faith-based topics such as the disbelief in the concept of evolution (Sickel & Friedrichsen, 2013) and produce other faith-based conflicts such as the differing understandings of the nature of science (Taber, 2017). The portion of the body of

research on religion is contradicted by the results of my study as none of the participants' claimed any disbelief of what was learned in any of the classes related to their STEM-related coursework.

The impact of social roles and a person's self-efficacy were previous findings that were also reinforced by the results of my study. A social role, along with the aforementioned self-efficacy, can be both internalized and externalized. People's beliefs about their social roles may influence the kind of jobs they seek or avoid. Choosing a non-compatible career may facilitate or impede progress toward a goal and the maintenance of that goal (Diekman & Steinberg, 2013). Although three of the 12 participants described their personality as introverted or quiet, teaching by design is a social occupation; therefore, the results of my study do support these findings.

Theoretical Literature

The theories guiding this study were the transformative learning theory (TLT) (Mezirow, 1991) and the social cognitive career theory (SCCT) (Lent & Brown, 1996). Both the TLT and SCCT theories related to self-awareness, which guides and motivates individual behaviors. The two theories provided a framework for investigating how internal and external experiences shape the way women develop their interests and eventually make career decisions.

Mezirow's (1991) TLT, originated from both developmental psychology and cognitive psychology. An important concept is transformational outcomes, which is a process that results in a transformation due to experiences with a learner and an educational program or event designed to foster learning experiences. Therefore, the results of this study are consistent with the tenets of this theory, as adults encounter additional information, experience, situations, feelings, and thoughts every day. The participants of this study entered college with a desire to

major in a specific STEM field based on inspirational experiences from their background; however, once unique familial and scheduling requirements entered the equation, new commitments impacted their thinking regarding possible careers, and changed or transformed their decisions.

These findings concur with previous research that determined emotional experiences influence individuals who began a career in STEM-related field and left their position in order to pursue a career in education (Duran, Lopez, & Hughes, 2015; Snyder, Oliveira, & Paska, 2013). These findings also support Stevens-Long, Schapiro, and McClintock (2012), who stated, "Transformation as an outcome refers to a deep and lasting change, equivalent to what some people term a developmental shift in worldview" (p. 184). To the participants of this study, their career choice was a critical decision as it affected important factors such as their quality of life, flexibility with their family, and job-related stressors.

The SCCT, grounded in in Bandura's social cognitive theory (Lent et al., 1994), centered on how self-efficacy, outcome expectations, and personal goals interacted with environmental and personal variables. According to the Psychology Glossary, self-efficacy is "a person's belief in his or her ability to complete a future task or solve a future problem" (p.1). Outcome expectations refer to the consequences that occur based on the performance of a certain task, and personal goals consist of both choice and performance goals.

The participants in this study had the desire to fulfill what they perceived to be their calling in life through their career choice. The decision to change careers based on this calling is equivalent to their self-efficacy in guiding themselves away from the discouragement and dissatisfaction a corporate career may have offered them. The expected decrease in discouragement and dissatisfaction is the outcome of the decision, which resulted in the acquisition of a career that is gratifying and fulfills what they believe they have been called to

do. These factors also led to the increased level of commitment to teaching that accompanied this career decision. These findings are supported by other studies that reported similar results relating to self-efficacy and outcome expectations, as well as career choice and calling (Ali & Menke, 2014; Conklin, Dahling, & Garcia, 2013; Kaminsky & Behrend, 2015).

Both the TLT and the SCCT discuss issues that relate to career entry or life periods associated with preparation for and implementation of career choice. The two theoretical viewpoints suggest that individual interests are shaped and molded over time. What may interest a person one day may not interest the same person the next day. Similarly, personalities develop over time because of what people experience and are exposed to over time. As a person transitions out of young adulthood and the number of responsibilities increases, different life paths can emerge. Both theories intertwine when dealing with self-reverent thinking in that self-knowledge and self-control are the ideas that guide and motivate people's behavior as they go through life and attempt to fulfill what they feel they are called to do (Lent & Brown, 1996; Marmon, 2010).

Implications

The goal of the research was to investigate, identify, and describe the lived experiences of this segment of the population of educators. The findings of the current study provided a voice for female STEM majors and can thereby inform the ideas of current female STEM majors. The findings can also inform the practices of industry leaders, post-secondary institutions, as well as educational practitioners, giving them a better understanding of how certain experiences can impact career decisions. Additionally, these findings can inform the caregivers of future female STEM majors on their role in motivating students. The implications of my study are important in the following ways:

1. This study highlighted the shared events and experiences that caused female STEM majors to change their decision to obtain a position in a corporate STEM-related field following graduation.
2. This study identified potential ways for industry leaders and post-secondary institutions to preserve the motivation and intent for female STEM majors to follow through on their initial intentions of securing a position in a corporate STEM-related field.
3. This study explored the background experiences that had the strongest influences on the career choices of female STEM majors.
4. This study provided data and evidence to support current studies and guide future studies for female STEM majors in both their career choices and job satisfaction.

Empirical Implications

Empirically, both federal and industry leaders discussed the need for America to regain its lead in STEM-related innovations. The Obama administration pushed to get more students interested in STEM, and once they were interested, getting them to enter jobs where they could apply what they had learned to reach endeavors that could bring America back to a position with a global competitive edge. President Trump also signed two initiatives into law by in 2017 (INSPIRE Women Act, 2017; Promoting Women in Entrepreneurship Act, 2017). These initiatives set out to advance space and science exploration efforts by encouraging women and girls to study STEM as well as encouraging entrepreneurial programs that recruit and support women (Arter, 2017; INSPIRE Women Act, 2017; Promoting Women in Entrepreneurship Act, 2017).

A key implication of this study was for both industry leaders and post-secondary institutions to recognize the importance of finding, securing, and providing federal funding for

programs that foster interests in STEM-related areas in all grades, K-12, and college years. In order to achieve the goal of producing knowledgeable graduates, cooperative supports began to be offered in these areas for programs that provided incentives at each of these levels of education as well as promoted business and industry partnerships (STEM Education Coalition, 2011). Every participant of this study either recollected experiences that occurred during programs such as these, which served as a catalyst for their interest in a STEM area or affirmed the belief that participating in an increased number and variety of programs in higher grades and in college would have sustained their vigor towards following through on their initial intentions of pursuing a corporate career in a STEM field.

Another empirical implication of this study was the importance of offering incentives to industry leaders. Along with the funding, industry leaders should be offered incentives to create mentorship, internship, and externship opportunities to bolster the imagination and creativity of future scientists, technologists, engineers, and mathematicians. The incentives must be favorable enough to counteract any perceived risk that is associated with such an endeavor. As stated before, the participants of this study believed that an increase in the number and variety of guided programs might would have sustained their attraction in pursuing a corporate STEM-related career. With new legislation being signed into law by President Trump (INSPIRE Women Act, 2017; Promoting Women in Entrepreneurship Act, 2017), the possibilities are endless as to the types of programs that can be created. There may even be programs developed, which bridge industry with activities that fulfill the sense of calling female STEM teachers in this study identified as the reason for remaining in the field of education.

The compilation of the previously stated implications leads to another implication, which may serve to motivate current female STEM majors as well as the caregivers of future

STEM majors in pursuing STEM-related careers. The job outlook for STEM workers is growing (Bureau of Labor Statistics, 2016). However, several of the participants of this study revealed that a reason for entering the field of education rather than a STEM-related corporate career was the lack of job availability and the perceived inflexibility of STEM-related jobs in the corporate arena. Therefore, following through on other suggestions will also serve as a means of notifying potential STEM majors that certain positions are available, that a person meets eligibility requirements, that the person is capable of successfully performing the duties of the job, and that a specific position can be tailored to meet specific scheduling requirements, such as the potential to telecommute or work from home.

Theoretical Implications

The theoretical framework for this study was grounded in both Mesirow's transformative learning theory (TLT) and Lent, Brown and Hackett's social cognitive career theory (SCCT). As adults receive new information they decide to make or not to make a change in their lives. Both the TLT and SCCT aid in identifying the aspects of family life and other responsibilities that must be seriously weighed to determine both the benefits and drawbacks of obtaining a STEM career. Additionally, these theories suggest the events a person encounters throughout life influence the formation of ideas and opinions. These ideas and opinions play a role in how a person makes his or her final career decisions.

The implication of the TLT is that motivational factors resulting from a person's experiences are triggers that influence life choices. These triggers are important for industry leaders, post-secondary institutions, educational practitioners, and caregivers to acknowledge when working with STEM majors in the future. The stages of the TLT begin with critical reflections of the disorienting dilemmas of life. The stages continue through self-examination; recognition of discontentment; exploration of options; planning; acquiring knowledge; trying

new roles; building competence; and becoming confident in the chosen new role. The final stage is the reintegration of the new role based on the new perspective (Marmon, 2010; Mezirow, 1991). The participants in this study indicated they traveled through these stages by way of each elementary, high school, college, and familial influence they experienced from the time they entered grade school to the time they received their college degree. As discovered in this study, the participants experienced a transformation as they reflected on their current ideas and opinions and were willing to make a change. Ultimately, the participants accepted the change as something that was now a part of their being (Marmon, 2010; Mezirow, 1991).

The implication of the SCCT is that circumstances produce patterns of thought as people develop basic career attributes and make important career decisions. This can assist female STEM majors as they navigate through life and make choices based on their specific circumstances. The SCCT is based on the interaction of environmental and personal variables with a person's self-efficacy, outcome expectations, and personal goals. The participants of this study indicated they strongly believed in their own abilities; therefore, they did not doubt they could perform tasks associated with a corporate STEM position. However, they decided that they could not coexist in a corporate position and remain true to the women they had transformed into as a consequence of their experiences. Thus, the participants could not reconcile their personal goals with the conditions and requirements of the corporate environment, their family values, and other personal factors.

Practical Implications

Practical implications of this study can contribute considerably to educational practitioners who intend to promote programs designed to raise the interest level of students pursuing a STEM-related field in general. The future economic growth and development of Americans in general depends on an increase in STEM innovations (Gonzalez & Kuenzi, 2012;

Puffenberger, 2010). Although this study focused on female STEM majors who decided to become secondary school teachers, the findings of this study may be generalized to female STEM majors who decide to seek employment in any other non-STEM-related field. The overwhelming consensus of the participants that early experiences play an important role in the desire to major in STEM garners support for the creation of grants, training programs, summer camps and other activities geared towards providing multiple experiences earlier in a student's educational career (Dave et al., 2010; Gonzalez & Kuenzi, 2012; Liu et al., 2014).

This study can also provide a contribution to educational practitioners who need to form alternative and innovative lines of thinking when developing and promoting programs designed to guide students away from the field of teaching if they are contemplating a change in career goals and have already earned a STEM degree. Every participant in this study decided to remain in the field of education due to the feeling they were called to the occupation, and in order to fulfill their desire to be helpful and empower future generations. This sense of calling is pivotal, and the choice is related to one's level of commitment (Ingram, 2013). Life experiences can change a person's focus, which can change a person's aspirations, which ultimately relates back to the individual's level of commitment. Therefore, in order for these female STEM majors to remain interested in continuing in a STEM field, they need to have and retain the proper motivation. Thus, the creation of unique positions that include duties that would appeal to this category of qualified graduates who have earned a STEM-related degree.

Delimitations and Limitations

Delimitations are purposeful decisions the researcher makes to limit or define the boundaries of the study. As a result, the qualitative design was chosen because it allowed me to gain an understanding of the essence of experiences that influenced female STEM majors to

become secondary teachers using their own words. For the purpose of this study, I set boundaries to select participants who were teachers in the two-specific school districts that had achieved recognition for implementing STEM activities at all grade levels. I chose to set boundaries to the scope of this study, selecting only female teachers and exclude male teachers, because much of the literature suggested a greater shortage in female STEM workers (Arter, 2017; Landivar, 2013). Thus, the gap in research was in understanding why these female STEM majors decided against seeking a corporate job. Another boundary was in selecting participants who were teachers with an earned STEM undergraduate degree who took their first full-time position after graduation in teaching rather than a corporate STEM-related job. I set this delimitation, because I wanted to get a clearer understanding of the perceptions of these teachers on corporate jobs without them having firsthand experience working in the area.

Limitations are potential weaknesses of the study that cannot be controlled. One limitation of the study was that the participants identified themselves as members of only two ethnic groups and one religious faith. Inclusion of participants from other ethnic groups and religions could have increased the generalizability of the study. Another limitation that influenced generalizability was that the participants were all females from one southern state. The inclusion of male STEM majors and STEM majors from other states could have also increased the generalizability of the study.

An additional limitation of the study was the number of years since the teachers graduated from college. The time span from teachers' graduation dates ranged from two to 30 years. The limiting of participants to those who had received their undergraduate degree within the past five years could have increased the validity of the current study, because of the wide variation in the types and numbers of STEM programs and initiatives available between

two and 30 years ago. Consequently, there was not as much of a focus on increasing participation in STEM-related fields thirty years ago.

Recommendations for Future Research

The current study focused on investigating, identifying, and describing the lived experiences that influenced female STEM majors to become secondary educators rather than enter a STEM-related corporate profession. However, future research should be conducted to achieve a much clearer picture of the types of activities necessary to attract STEM majors into corporate jobs. By including male STEM majors who began teaching immediately following college, a better understanding of what is needed to attract more STEM majors in general, could be explored.

Additionally, a future study including female STEM majors from multiple countries could expand the focus of this study. STEM is the way of the future and it would be interesting to find out the influential events that shape the lives of women all over the world. Further studies are also needed to explore the commonalities and differences between STEM majors who began working and stayed in a corporate STEM-related job directly after college, those who began working in a corporate STEM-related job directly after college but left in order to teach or pursue another occupation, and those who began teaching directly after college. After the graduates were attracted to the STEM field, they must have developed a reason to remain in the field.

Summary

This chapter presented the findings for this study of the lived experiences that influenced female STEM majors to become secondary educators rather than enter a STEM-related corporate profession. Theoretical and empirical literature were discussed along with the implications of the study. The delimitations and limitations of the study and

recommendations for future research were also provided. The data indicated intrinsic and extrinsic experiences are critical in guiding career decisions.

The purpose of this transcendental phenomenological study was to investigate, identify, and describe the lived experiences that influence female STEM majors to choose a career in secondary education. Twelve female secondary STEM teachers participated in the study. The data sources included questionnaires, interviews, and journals. In total, three themes emerged, they were: (a) approaching a corporate career; (b) a sense of calling, and (c) early influences. The theme of approaching a corporate career and sense of calling emerged in response to research question one and the theme of early influences emerged in response to research question two.

The literature reviewed included the theoretical framework for this study. The two theories that grounded the study were Mesirow's transformative learning theory (TLT) and Lent, Brown and Hackett's (1994) social cognitive career theory (SCCT). The implication of the TLT is that motivational factors influence life choices. The implication of the SCCT is that individual circumstances help develop basic career attributes. Both of these theories suggest the events a person encounters throughout life influences the formation of ideas and opinions and play a role in how that person makes his or her final career decisions.

The literature also suggested that both external and internal experiences play a role in the career decision making process. External experiences, such as gender differences (Landivar, 2013) or the observation of a mentor (Fulmer, 2014), occur due to environmental influences and result in learned behaviors and ideas. In addition, internal experiences, such as the internalization of social roles (Lewis, Stout, Pollock, Finkelstein, & Ito, 2016), occur due to influences that come from within.

Findings of this study suggest that female STEM majors are interconnected; the same single experience can produce both internal feelings and thoughts that lead to decisions affecting the external environment. The findings of this study are significant as it informs stakeholders of the need to focus on the population of female secondary STEM majors and teachers. This is a phenomenon that must be recognized by several stakeholders including both federal and industry leaders. In order to attract qualified and knowledgeable female STEM employees, it is necessary to reevaluate how funding is allocated, develop innovative programs, and reinvent job descriptions. The findings of this study also serve as a way to convey to stakeholders, the importance of providing opportunities for potential employees to participate in relevant and meaningful experiences. Without these changes, it may be difficult to attract graduates to corporate jobs instead of losing them to other occupations, such as teaching.

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Appendix A: School District X Research Approval Letter

Knox Phillips Dr. R.
Director Superintendent

Stephen Green

DeKalb County School District
www.dekalb.k12.ga.us

Research, Assessments, and Grants
1701 Mountain Industrial Boulevard
Stone Mountain, GA 30083-1027

September 19, 2016
Ms. P. Richardson-Spears
[redacted]

Reference: A phenomenological study of female STEM majors who have decided to become educators (File # 2016-013)

Dear Ms. P. Richardson-Spears:

This letter is to inform you that your research proposal has been conditionally approved by the Department of Research, Assessments, and Grants for implementation in the DeKalb County School District (DCSD). Any interviews with teachers will need to be scheduled before or after school hours. We cannot approve meeting during the school day or their department meetings. Also, please forward a list of high schools you plan on working with to the Department or Research, Assessment, and Grants (michael_j_shaw@dekalbschoolsga.org).

When you begin your research you must secure the approval of the principal/chief site administrator(s) for all schools named in the proposal. You should provide the application with all required attachments and this district approval letter to the principal(s) in order to inform their decision. **Please remember the principal/chief site administrator has the final right of approval or denial of the research proposal at that site. In addition, note that teachers and others may elect not to participate in your research study, even though the district**

has granted permission.

Please remember, the last day to conduct your research in DCSD for the 2016-2017 school year is Friday, March 31, 2017. This approval is valid for one year from the date on this approval letter. Should there be any changes, addenda, design changes, or adverse events to the approved protocol, a request for these changes must also be submitted in writing to the DCSD Department of Research, Assessments, and Grants during this one year approval period. Changes should not be initiated until written approval is received. Further, should there be a need to extend the time requested for the project; the researcher must submit a written request for approval at least one month prior to the anniversary date of the most recent approval. If the time for which approval is given expires, it will be necessary to resubmit the proposal for another review by the DCSD Research Review Board. Completed results are required to be submitted to the Department of Research, Assessments, and Grants.

Best wishes for a successful research project. Feel free to call 678.676.0325 if you have any questions.

Sincerely,

Knox Phillips	**Michael J. Shaw**
Knox Phillips	Michael J. Shaw
Director	Coordinator II

Data Collection

MS

Michael Shaw (Research, Assessment, Grants) <m@dekalbschoolsga.org>
<[redacted]@dekalbschoolsga.org>

Dear Ms. Richardson-Spears,

It was nice meeting with you yesterday afternoon.
You posed a question about when you can send out your initial email to teachers.
Post planning day, May 26,2017, is an acceptable date to do just that.

Let me know if you have any other questions.
Good luck.

Sincerely,

Michael J. Shaw
Coordinator II – Research, Data, and Evaluation
Office of Research, Assessment, and Grants
DeKalb County School District
1701 Mountain Industrial Boulevard
Stone Mountain, GA 30083
(678) [redacted] - (office)
(678) [redacted] - (fax)

"Education is the most powerful weapon
which you can use to change the world."
- Nelson Mandela

Appendix B: School District Y Research Approval Letter

Re: File ID 2017-37

Dear Ms. Richardson-Spears:

This is to advise you that your research application, "Phenomenological Study of Female STEM Majors who Have Decided to Become Teachers," ID Number 2017-37, has satisfactorily met GCPS Research Standards and was approved by the Institutional Review Board. This approval is effective December 6, 2016 through March 31, 2017. Please note the following comments regarding your study:

- Reflecting on choices could be helpful for the interviewee, and could then transfer to helping students think about choices as well.
- By participating in this study, teachers may help school districts and teacher preparation programs better understand and support women in their interests to pursue STEM careers, and especially those careers in the area of teaching.

Please note the following requirements of you as a researcher in GCPS:

- A copy of this approval letter must be attached to any initial communication with a Gwinnett school or office.
- The above File ID number must be included in the subject line of any communication with a Gwinnett school or district office concerning this research study.
- If circumstances prevent you and every member of your research team from following these requirements, please let me know so that we can make alternative arrangements.

Note that schools and teachers may elect not to participate in your research study, even though the district has granted permission.

Please forward a copy of your results to me when they are completed.

Best wishes for a successful research project. Please call me at (678) if I may be of further assistance.

Sincerely,

Colin Martin, Ph.D.,
Executive Director
Research and
Evaluation

cc: Dr. Judy Shoemaker, Liberty University, [redacted]@liberty.edu Porcia Richardson-Spears, [redacted]@liberty.edu

the broad prize
for urban education

Appendix C: Liberty University IRB Approval

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

June 2, 2017

Porcia Richardson-Spears

IRB Approval 2884.060217: A Phenomenological Study of Female STEM Majors Who Have Decided to Become Educators

Dear Porcia Richardson-Spears,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

[redacted]

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
The Graduate School

Appendix D: Letter of Introduction to the Principal

Greetings Principal X,

My name is Porcia Richardson-Spears and I am a doctoral student currently conducting a study to determine the most important factors that have influenced female educators to become high school STEM teachers. I am also a Dekalb County School District employee and have worked as an Interrelated Special Education Teacher for ten years,

For my study, I am seeking the participation of teachers who have received a degree in a Science, Technology, Engineering, or Mathematics field. I would greatly appreciate the opportunity to speak to your STEM teachers after classes have ended. The overview of my study will take no more than 5-10 minutes.

If this is a request that you are willing to grant me, please provide me with the names of your STEM department chairs so that I can introduce myself. I would also like to give your department chairs the opportunity to notify their department members of my intentions, in advance.

Thank you in advance for considering my request.

Sincerely,

Porcia Richardson-Spears

Attachments: Copy of Dekalb County School Districts RRB approval letter

Copy of District RRB application

Copy of Request for Meeting for department chair

Appendix E: Email Request for Meeting

Hello Department Chairs,

My name is Porcia Richardson-Spears and I have been approved to conduct research by the district and the principal of your school. I am currently conducting research to determine the important experiences that influenced the decision of female STEM majors to become educators. I have worked as an Interrelated Special Education Teacher for 10 years and I am currently a substitute teacher for Dekalb and Gwinnett County Schools. To aid in finding individuals that may be interested in assisting me, I ask that you please copy the statement below and send it to the members of your department. If interested, each teacher can complete the survey at a time that is convenient for them.

If there are any questions, my email address is [redacted] or [redacted] Porcia_Richardson-Spears. Thank you for your time.

Sincerely,

Porcia Richardson-Spears

Statement:

Hello STEM Teachers,

My name is Porcia Richardson-Spears and I am currently conducting research to determine the important experiences that influenced the decision of female STEM majors in becoming educators. I have worked as an Interrelated Special Education Teacher for 10 years and I am currently a substitute teacher for Dekalb and Gwinnett County Schools. I would very much appreciate your assistance with this study. Please help me by competing a 5-question screening survey. The survey can be accessed by copying and pasting the following link into your browser: **https://goo.gl/forms/D5XmDSH4NfMMAFLb2**

I sincerely thank you for your time, Porcia Richardson-Spears

Appendix F: Screening Survey

A Phenomenological Study of Female STEM Majors Who Have Decided to Become Educators

1. What is your gender?

___ Male ____ Female

2. How many years have you taught a high school STEM class?

___ less than 1 year ___ 1-3 years ___ 3-7 years ___ 7-15 years ___ over 15 years

3. Which STEM class do you teach?

_____

_____

4. After you graduated with your initial undergraduate degree, was your first full time jo in the field of education?

____ Yes ____ No

5. Are you willing to participate in the other phases of this study in order to share more information regarding your decision to major in STEM and become a teacher? (This will require no more than 2 hours of your time.)

____ Yes ____ No

If you answered yes to question #5, please provide your contact information.

Name_____

Email address _____

Telephone Number(s) _____

If you know anyone who may be interested in participating in this study, please forward them this survey or provide their contact information below.

Printed Name_____

Email address _____

Telephone Number(s) _____

The online link to this survey is at: **https://goo.gl/forms/D5XmDSH4NfMMAFLb2**

Porcia Richardson-Spears

Liberty University Graduate Student, Researcher

Appendix G: Letter of Informed Consent

The Liberty University Institutional Review Board has approved this document for use from 6/2/2017 to 6/1/2018 Protocol # 2884.060217

A Phenomenological Study of Female STEM Majors Who Have Decided to Become Educators

(Date)

Dear STEM Teacher,

You are invited to be in a research study conducted by Porcia Richardson-Spears, a doctoral candidate in the School of Education at Liberty University. You were selected as a possible participant because you are a female high school teacher that majored in a STEM field. Please read this form and ask any questions you may have before agreeing to be in the study.

Background Information: The title of the study is *A Phenomenological Study of Female STEM Majors Who Have Decided to Become Educators*. The purpose of this research is to offer female STEM teachers the opportunity to have a voice regarding the events that influenced their decision to choose a career in the field of education rather a corporate career.

Procedures: If you agree to be in this study, I would ask you to do the following things:

1. Answer a questionnaire that has 25 questions and will take 15-20 minutes.
2. Participate in an individual interview which will take 30-60 minutes.
3. Complete a written/typed journal which will take 20-30 minutes.

Risks and Benefits of Participation: The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life. A possible benefit for the participants of this project is the opportunity to reflect on the events that had the most dominant influences on career-related choices, which may be helpful in future discussions with students.

Compensation: Participants will not be compensated in this study.

Confidentiality: The records of this study will be kept private. Your name and all other personally identifiable information will be kept confidential. The name of your school or the school district will not be included in the final report. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records. I may share the data I collect from you for use in future research studies or with other researchers; if I share the data that I collect about you, I will remove any information that could identify you, if applicable, before I share the data.

The interviews will be conducted in a location where others will not easily overhear the conversation. Interviews will be recorded and transcribed. The recordings will be stored on a password protected device and in a locked file cabinet. Only the researcher will have access to these recordings. The participants of this study will be assigned a pseudonym. The data will be stored on a password locked computer and may be used in future presentations. After three years, all electronic records will be deleted.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University. You will not be penalized or lose any benefits to which you are otherwise entitled if you decide that you will not participate in this research project. If you decide to participate in this project, you may discontinue participation at any time without penalty or loss of benefits. You have the

right to inspect any instrument or materials related to this study. Your request will be honored within a reasonable period after the request is received.

How to Withdraw from the Study: If you choose to withdraw from the study, please contact the researcher at the email address/phone number provided at the end of this document. Should you choose to withdraw, data collected from you will be destroyed immediately and will not be included in this study.

Contacts and Questions: You may ask any questions you have now. If you have questions later, **you are encouraged** to contact the researcher or the researcher's faculty advisor, using the information provided below. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.

(Researcher's name)____Porcia Richardson-Spears_____

(Researcher's school) ___Liberty University_____

(Researcher's phone number) _____ (researcher's email address) _ @liberty.edu_____

(Institutional contact's name [dissertation chair,] __Judy Shoemaker_____

(Institutional contact's affiliation ___Liberty University_____

(Institutional contact's phone number)_____ _____

(Institutional contact's email address)___ @liberty.edu____

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent: I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

☐ The researcher has my permission to audio record me as part of my participation in this study.

_____

Signature of Participant Date

_____

Signature of Investigator Date

Appendix H: Permission to Use or Adapt the Emotional and Personality Career Difficulties Scale (EPCD)

Itamar Gati, Ph.D. School of Education, Hebrew University, Jerusalem, ISRAEL

If you agree to the following conditions, please sign the attached statement, indicate the number of copies you desire to reproduce for your research, and mail 2 copies to me at the above address. When I receive the signed copies .1 will send you a copy of the EPCD al ng with your copy of the signed permission slip that will allow you to reproduce the instrument. Please limit requests to no more than 1000 at a time. If you need more, please let me know. Permission expires one year after it is granted.

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2. I agree to include the copyright statement shown on the instrument. Please add that it has been reproduced with the permission of the authors.
3. I will share the results of my research with Itamar Gati and Noa Saka, and provide specific data for secondary analysis with the understanding that appropriate credit will be cited.
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5. Foreign translations must be back translated into English and approved by Itmar Gati.

gati@gmail.com>

Dear Porcia,

YES, you have our permission to use the EPCD until August 2018.

= =

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Appendix I: Emotional and Personality-Related Career Decision-Making Difficulties (EPCD)

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Appendix J: Semi-Structured Interview Protocol - a Phenomenological Study of Female STEM Majors Who Have Decided to Become Educators

Date & Time:_____ Interviewee:_____

Brief Description: The purpose of this research is to offer female STEM teachers the opportunity to have a voice regarding the events that influenced their decision to choose a career in the field of education. The questions are as follows:

1. What is your background and did it play a role in your career choice?
2. How would you describe your personality?
3. Which area of STEM did you major in?
4. Describe the most memorable events that helped to spark your interest in obtaining a STEM-degree.
5. Initially, what type of career did you plan to obtain after you received your degree?
6. What events helped influence your decision to become a secondary teacher?
7. Describe your thoughts and feelings as you made the decision to become a teacher.
8. Describe a few STEM-related courses you took in college and how it prepared you to teach.
9. Which aspects of your personality (if any) would you consider to have positively or negatively affected your career decision?
10. Would you make the same decision if you could do everything over again? Explain.
11. Is there any program, activity, etc. that could have been offered to you, which would have influenced your decision to pursue a STEM-related job in the corporate arena instead of teaching?
12. When you entered the field of education, how long did you plan on teaching?
13. Where do you see yourself in 20 years (at retirement age)?

Appendix K: Instructions and Protocol for Keeping Journals

After the completion of the interview, please take one week to complete journal entries in the provided journal or via an electronic file.

1. Whatever you write in your journal is another technique to assist in gathering additional data that will add purpose and direction to this study.
2. Data will be written digitally or on paper, whichever is the best option for the participant.
3. Each participant will focus on past experiences related to majoring in a STEM field and becoming an educator.
4. Participants will keep a written record of any ideas, facts, or new information that may emerge after the interview has been conducted that were not revealed during the course of the interview.
5. Participants will record any comments or questions that they may feel a need to clarify or add to data collection.
6. Participants should attempt to record small amounts of information frequently and as soon as anything comes to mind.
7. The participants may record any behaviors or encounters that they may recall after the interview has been conducted.

Participants will maintain written journals in a safe place until collected by the researcher

Appendix L: Audit Trail

DATE COMPLETED	***SPECIFIC TASKS***	***FIELD NOTES/ REFLECTIVE NOTES***
May 10, 2017	Proposal Defense	Positive feedback from committee, added second research question,fter minor revisions, approval granted to submit IRB application.
May 12, 2017	Requested IRB approval	
June 2, 2017	Received IRB approval	Approved after three sets of revisions
June 2, 2017	Sent emails with study information and link to screening survey	Sent emails to department chairs
June 18, 2017	Received first response to screening survey.	
June 25, 2017	First informed consent and questionnaire received	Began scheduling interview dates.
July 10, 2017	Conducted first interview	Gave first set of journal instructions
July 11, 2017	Completed first interview transcription	Transcriptions took more time than expected
August 10, 2017	Received 16th informed consent and questionnaire	
August 15, 2017	Conducted 16th interview	
September 7, 2017	Received 7th journal	
September 7, 2017	Received 12th transcription approval	
September 7, 2017	Transcribed 7th journal	
September 8-October 5, 2017	Analyses and synthesis of all three sets of data	Atlas.ti 8
October 5-October 19, 2017	Developed manuscript	

October 19, 2017	Submitted manuscript to committee	As directed by chair, copied my chair.
	Audit trail conducted	Conducted by educational advisors, satisfactory audit.
October 20-24, 2017	Revisions to manuscript	Recommended by chair and committee
October 23,	Chair sent copy to Liberty SOE to forward to research consultant	
November 3-6, 2017	Made necessary revisions	Recommended by research consultant
January 19, 2018	Submitted manuscript to chair again	Chair must forward to SOE Gate
April 5. 2018	Chair submitted manuscript to Research Consultant	Chair forwarded draft to SOE Gate
April 11, 2018	Received approval to proceed to defense phase	
	Prepare for Pre-Defense	April 11-18, 2018
	Dissertation Defense.	Defended on Wednesday, April 18, 2018
April 18, 2018	Became Dr. Richardson-Spears	Praise the Lord!
April 18, 2018	Prepare for graduation and prepare dissertation for library	Comply with graduation requirements; commencement date May 19, 2018

Title: _____

Signature: _____

Date: _____

Appendix M: List of Codes

Activities in Retirement

Anxiety

Comments on Teaching

Confident

Coursework

Early Experiences

Earned Degree Field

Easy Going

Ethnicity

Graduate Program

Helpful

Impact on Others

Initial Career Goal

Interest in Major

Job Availability

Job Flexibility

Job Satisfaction

Job Satisfaction Observant

Lifestyle

Male Dominance STEM Parental Influence

Mentoring

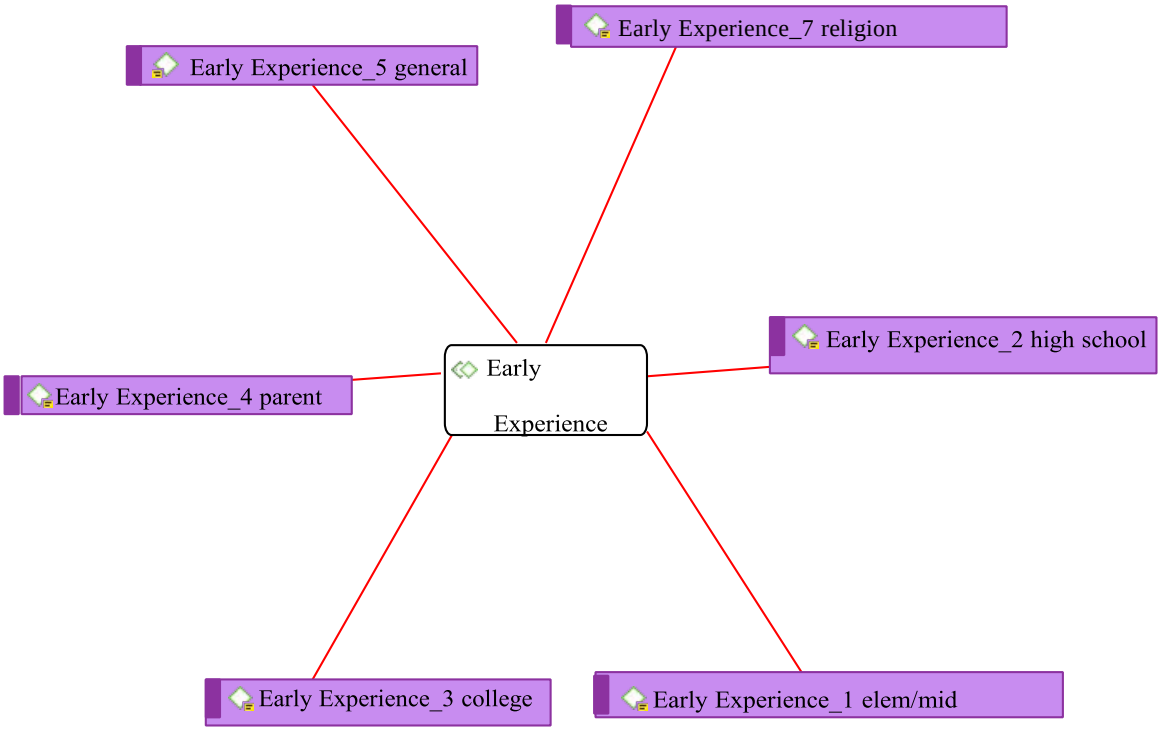
Persistent

Religion

Thoughts and Feelings

Understanding

Appendix N: Sample Cluster Map



Appendix O: Table of Identified Themes, Sub-Themes, and Codes

Theme	Sub-theme	Code Group	Code
Approaching Corporate Career	Corporate mentorship Job availability and flexibility	Corporate Job Guiding or Desiring guidance	Activities in Retirement Comments on Teaching Earned Degree Field Impact on Others Initial Career Goal Interest in Major Job Availability Job Flexibility Job Satisfaction Lifestyle Graduate Program Mentoring
Sense of Calling	Being helpful Being understanding The desire to empower others is just in me	Personality Traits	Anxiety Confident Easy Going Helpful Job Satisfaction Observant Persistent Understanding
Early Experiences	College Influences Grade school influences Parental Influences	Raised/Reared	Coursework Early Experiences Ethnicity Male Dominance STEM Parental Influence Religion Thoughts and Feelings