2016

African American Women STEM Majors' Lived Experiences in Community College

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Walden University
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Abstract

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BS, University of Montevallo, 2000

Dissertation Submitted in Partial Fulfillment

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Abstract

The United States economy has an accelerating demand for science, technology, engineering, and mathematics (STEM)-related degrees and programs that makes it essential for members of minority populations to achieve degrees in these fields. African American women are underrepresented in STEM fields, suggesting a need to better understand their development and needs while attending community college. This hermeneutical, phenomenological research study investigated the lived experiences and perspectives of African American women enrolled in STEM majors at community colleges. The conceptual framework used to interpret data for this study was derived from Maslow, Erikson, and Rogers's humanist theories of social learning, and from Tinto, Lerner, Gilligan, and Noddings's action theories of selection, optimization, and compensation. Seven African American women from 2 different community colleges in the southern region of the United States were interviewed. Each described her lived experiences and educational encounters and how these led to persistence, transfer, or degree completion. Data were analyzed by identifying and comparing emergent themes. Three themes emerged: faculty involvement was vital to their wellbeing and productivity, mentors were integral for their support, and college partnerships with 4-year institutions helped these women meet their goals. This study's findings are designed to provide local and state community college administrators with information related to investment in and the importance of institutional encouragement, faculty involvement, and student mentorship to increase and sustain participation in STEM-related fields, as well as to better prepare underrepresented students for STEM careers.

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Dedication

This dissertation is dedicated to the Westry family: to my late father who instilled in me that education is essential, Willie Edward Westry Jr.; to my mother, Sharon Smith Westry, for supporting me when I needed it the most; to my sister, Sharell Westry Lewis, for her strength and support; and to my son, Zion Edward Westry, for being the driving force behind this project.

Acknowledgments

This journey to complete my dissertation has taken several years. My support systems have been nothing short of fantastic. I give the greatest of thanks to my chair, Dr. Laura Weidner and the late Dr. Thomas Rasco. I extend my deepest appreciation to my committee members, Dr. Cheryl Keen and Dr. Christina Dawson. I offer sincere gratitude to my editor, Dr. Carol Koller. I gratefully acknowledge the institutions that allowed me access to their student body as your help went above and beyond my expectations. I am especially grateful to my mother, Sharon Westry because without your strength I would have never strived to accomplish this goal. You have been a tremendous support system and resource for me during this journey. I want you to know you are amazing, and I love you. I want to thank my sister, Sharell Lewis, and my other friends. You all listened to me when I wanted to vent and offered a shoulder for me when I required a little cry. By doing so, you all became a bedrock that helped me maintain a peace of mind.

Because of this journey, I lost memorable moments with my son, Zion Westry, who is the greatest accomplishment in my life. However, this sacrifice for him and my family pushed me to never give up and to continue to be a positive role model in his life that I could never duplicate without this process. Finally, I want to thank the participants in this study for so graciously sharing their time and their personal stories with me. At the end of my journey, I am simply grateful for this process to make a difference and have an impact in other's lives.

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Chapter 1: Introduction to the Study

The science, technology, engineering, and mathematics fields of study (STEM) create important job opportunities for U.S. college graduates in a rapidly changing economy. In 2009, the President of the United States, Barack Obama, called for U.S. community colleges to take steps to create a workforce ready for the demands of the new U.S. job market, a call supported by the American Recovery and Reinvestment Act (ARRA) of 2009 and 2011 (White House, 2011a). The President's Council of Advisors on Science and Technology (2012) set out recommendations for community colleges to use to increase the number of acceptable candidates for STEM careers.

A basic understanding of how to think logically is important for every person to function effectively in society. A presidential mandate for the United States has been to get more men and women to complete a postsecondary education. This initiative was designed to increase the rate an individual completes a bachelor's or master's degree and is designed to assist the United States in strengthening its foothold in the global labor market (White House, 2011a).

Legal mandates have created conditions that require U.S. community colleges to change their policies. The ARRA was passed by the U.S. Congress in 2009. As a result of this new legislation, many community college presidents and administrators are dealing with new pressures to increase the transfer of students from community colleges into universities and ultimately degree attainment (White House, 2011b). In 2011, the ARRA was revised; the four major commitments to education outlined in the revised act were: (a) community engagement and investment; (b) expanding opportunities for students to

prepare for livable wage jobs; (c) research and development for next-generation learning models and resources for students and teachers; and (d) supporting a statewide focus on education systems redesigned (White House, 2011a). The Educate to Innovate campaign, which is designed to improve the participation and performance of America's students in STEM fields, focuses on each one of these initiatives (White House, 2011a).

A new emphasis indicated in the ARRA is to build the skills of the American public by using community colleges as a linking tool to reach certain demographics and private businesses that can aid in these objectives (White House, 2011a). These goals can potentially be achieved by creating and organizing financial aid and making federal programs more accessible, reliable, and efficient for students (White House, 2011b). Policy, planning, management, and accountability are in this plan for the country's community colleges (White House, 2011b). In 2009, President Obama voiced his support for higher education improvement and declared: "We will provide the support necessary for you to complete college and meet a new goal: by 2020, America will once again have the highest proportion of college graduates in the world" (White House, 2011b). Reaching the president's goal may or may not be possible; however, the need for support is still a reality to many who are seeking a degree.

This qualitative phenomenological research study investigated the lived experiences and perspectives of seven African American women interested in STEM majors while they matriculated in the community college. This study was designed to provide local and state community college administrators with information related to the investment in, and the importance of, encouragement, faculty, and mentors in the

community college experience. This study was designed to inform new educational models that will support African American women pursuing STEM fields of study based on the findings of this research.

Background

The U.S. community college system provides support to students who may be financially unable or educationally unprepared to study at a 4-year college or university campus directly after graduation. The focus of many community colleges includes a mixture of vocational studies, adult education, and liberal arts programs (Moore, Shulock, & Wassmer, 2004; Stumpf, 2013; Topper & Powers, 2013). According to Hagedorn, Cypers, Lester, Maxwell, and Moon (2006), "as more and more students elect to attend the country's network of 2-year institutions, the importance of assisting students to succeed on the path that leads through the community college to bachelor degree attainment is more pronounced" (p. 224). With this concept in mind, the community college system is a vital resource for many women and African American students. As the 2-year institution, acquires more students and continue to assist them through the community college to a bachelor degree women and African American students can take advantage of the resources available and increase their numbers in STEM degree attainment.

Community college personnel reported in the last 15 years that approximately 60% of student population is women and at least 50% of those students have a minority or ethnic background (Eddy & Lester, 2008; National Science Foundation [NSF], 2013; Stumpf, 2013). These student demographics suggest that it is important for community

college personnel to understand how women and minorities think and perceive their environment in order to educate these groups more appropriately. This understanding will aid in the reflective structural analysis that will shape future programs for these minority women.

Science, Technology, Engineering, and Mathematics

In order for community colleges and 2-year institutions to be able to service the majority of their students, policymakers must understand what the needs of these populations are. These policies must be constructed from the perceptions of the populations they seek to serve (Moustakas, 1994), which have changed significantly over time. The National Center for Education Statistics (NCES, 2010) estimated that U.S. community college enrollment was 53-61% women and 35-43% minorities from 2003 to 2008. With this percentage of women and minorities in postsecondary education, a growth in the STEM fields may have been expected. Women now make up the majority of U.S. students at the community college level, and minorities are the largest segment of growth in the population (Chang, 2002; Eddy & Lester, 2008; NCES, 2010; U.S. Census Bureau, 2014; Yonghong, 2008).

Over the past 50 years, affirmative action legislation has provided various opportunities for many women and minorities in fields that were previously inaccessible. As STEM fields are examined by new students, it becomes important to determine how women and minorities may choose one of these fields given the right environment in order to increase their participation. For instance, community colleges have women faculty who might serve as role models for women students. Eddy and Lester (2008)

remarked that, "community colleges are more likely to be gender equitable institutions compared to their 4-year counterparts with respect to numbers of men and women in faculty positions" (p. 112). More women faculty provides more women role models and more accessible mentors to women students. Given that the number of men and women faculty available to the student body is more evenly distributed in these institutions this may impact the number of men and women entering into a STEM-related field. With a more evenly distributed gender faculty institution it allows for more accessibility to persons with a degree in STEM who can shed a better understanding on the field of study. Yonghong (2008) stated, "not only will the increased participation of women scientists promote diversity and enhance innovative power, but it also impacts the education and career development of future generations" (p. 620). Increasing the number of women faculty in these areas may demonstrate to African American women that a STEM degree is obtainable and provide viable employment.

The increased participation by future generations of women and minorities in STEM fields may prove to be beneficial to the United States as the country prepares its workforce for the next 20 to 30 years in these areas. Although NCES statistics have predicted an overall growth in STEM enrollment in all fields by women, this has not occurred (NCES, 2010; National Science Board, 2012). Gathering more knowledge in this area could be beneficial in creating effective environments, programs, and support for women and minorities. To narrow the focus, this study concentrated on African American women based on convenience of the sample and feasibility in the region.

African American Women

Education plays a major part in students' lives and is the foundation for their future careers. It is important to examine how African American women interact with their postsecondary education learning opportunities and environments so that community colleges can proceed in its development of programs and structure to educate all of its population. Title IX of the Educational Amendments of 1972 states that no person can be excluded, denied, or discriminated against under any educational program or activity receiving federal financial assistance based on their sex. Despite this legislation, however, women continue to be underrepresented in nontraditional career and technical education and STEM programs more than four decades later (NCES, 2010; National Science Foundation, 2009, 2013). Collins (1997) stated that Black women have experienced both racial and gender oppression that "result in needs and problems distinct from white women and black males . . . black women must struggle for equality both as women and as African-Americans (p. 246).Many women have experienced a negative education environment within the STEM classroom as demonstrated in previous studies that left them feeling undervalued, leading to seclusion and melancholy (Brown, Cervero, & Johnson-Bailey, 2000). This is particularly problematic in mathematics and science classes during secondary and postsecondary education, making a career in these fields for some seem unthinkable (Smeding, 2012). It is critical to get past female gender bias, and when that is possible, some women have an added disadvantage of being a racial minority. Collins (1997) noted that minority women "are the only group that has experienced race, gender, and class oppression" (p. 252). Society has changed since

Collins and Johnson-Bailey made their observations, but understanding society's view of minority women in the mathematics and science fields continues to require reflection. Smeding (2012) noted that it is well documented that gender stereotyping creates an adverse effect on women regarding their decreased ability in areas such as reasoning and mathematics (p. 617).

Women make up approximately 50% of the U.S. workforce overall, but less than 20% of the scientific, mathematical, or technological workers (National Center for Education Statistics [NCES], 2012; Toglia, 2013). Yonghong (2008) explained that gender is a major obstacle that can cause a lack of support among female students' male counterparts. Coger, Cuny, Klawe, McGann, and Purcell (2012) noted, "misconceptions are too often confirmed by girls' peers, by cues in the popular media, by a lack of role models that run counter to stereotypes, and even by advice from their parents and guidance counselors" (p. B25). Women require substantial determination to alter these negative communications received from so many different sources (Byars-Winston, 2013; Community College Research Center [CCRC], 2012; Coger et al., 2012; Zimenoff, 2013). As a result, men are twice as likely to be awarded a STEM degree than women (Gayles & Ampaw, 2014; NSF, 2012; Zimenoff, 2013).

As society has changed, opinions and perceptions vary from region to region and from one individual to the next. In 2012, the National Center for Education Statistics (NCES) reported that from 1999-2000 and 2009-2010, 60% and 62% of females (respectively) earned associate's degrees, with 57% and 58% of women earning bachelor's degrees. In addition, the number earned by Black students for the same period

was 14% and 10% for associate's degrees and 11% and 10% for bachelor's degrees (NCES, 2012). The percentage of students who are African American women is not specified in these statistics; however, the majority of degrees attained by Blacks in STEM are earned from historically Black colleges and universities (NCES, 2012; NSF, 2013).

Statement of Research Problem

As community college presidents, deans, and faculty members search for their institution-identifying mission, it is important to know where to begin to look for an effective approach to the question of how to engage and motivate the next generation of citizens in this new global economy. With unemployment at a national high, jobs outsourced due to cost efficiency, or because corporations are unable to find qualified workers in the United States, there are many problems to overcome (White House, 2011b). Community colleges must try to encourage students to transfer to 4-year institutions to earn bachelor's degrees; however, with new world demands for production and efficiency in STEM fields, community colleges, 4-year colleges, and universities, are being pressured by governments and businesses alike to transition into a new entity (Antczak & Floyd, 2010).

The National Center for Science and Engineering Statistics, a department within the NSF, reported in 2013 that with the United States's accelerating demands for STEM-related degrees and programs, it has become necessary for precipitous degree attainment in STEM fields from underrepresented minority populations to bridge the gap (Robelen, 2012). With this in mind, community college personnel need to look at members of society who have been overlooked until the last decade: women and minorities, and, in

particular, African American women. According to the Community College Research Center (CCRC; 2012), "Advocates for expanding STEM-related education at community colleges say these courses provide a means for women to earn more, especially underserved minorities and those from low-income and disadvantaged backgrounds" (p. 14). Understanding what African American women need in education is a link to increasing their participation in the mathematics and science fields of study.

The dynamics of community colleges and their role in producing students who are interested in STEM fields have resulted in larger college enrollments of women and minority students over the 20-30 years (Laanan & Starobin, 2008). Harper and Sax (2007), however, declared that even though women made up the majority of new college students a decade ago, they still do not choose professions in mathematics and science, and opting out of research in many cases altogether, which ultimately decreases the number viable candidates for STEM programs. This statement was validated by Jackson and Laanan (2011), who discussed the role that community colleges play in attracting and retaining women participants in science and engineering programs; women hold less than a fourth of all STEM-related jobs in the United States (CCRC, 2012). When African American women abandon their pursuit of STEM majors, there is little information to determine what the primary and secondary reasons behind these decisions might be.

In the last 10 years, the amount of employment available in the fields of STEM has increased; at the same time, the corresponding numbers of women pursuing STEM opportunities are declining (CCRC, 2012; NSF, 2013). Several research studies have discussed women and minorities in the community college but as separate topics (Bose et

al., 2009; Drake, 2008; Laanan & Starobin, 2008; McJunkin, 2005; Swigart & Murrell, 2001). Researchers have specifically studied STEM and African American students have in terms of retention, transfer, and degree attainment (Chang, 2002; Kane, Beals, Valeau, & Johnson, 2004; Lloyd & Eckhardt, 2010). The NCES (2010) provided statistical data about the percentage of enrolled community college students transferring to a 4-year institution for an undergraduate degree in STEM programs and how this has declined overall (Ginorio, 2011). The President's Council of Advisors on Science and Technology (2012) predicted that there would be a shortage of personnel to meet the demands in the next decade, noting there are more vacancies in STEM fields than those who hold a STEM degree. The National Science Board (2012) predicted. that on average 30% of the new jobs available will be in STEM-related fields with only 11% of new graduates having STEM degrees. Providing graduates with employment opportunities is one of the goals of the Obama administration. Little is known about the lived experiences of African American women related to community college support, personnel involvement, offerings, and programs. It is also unclear how African American women perceive these influences in their pursuit of a STEM degrees and their persistence with their choice as they transfer from the community college.

There has been an increased interest by governmental agencies and educational institutions since 2009 regarding the disparity between women and minorities entering into the STEM fields. Because of this overall decline in participation in racial and gender categories in STEM (Brown et al., 2000), the NSF increased funding by 80% from 1993 to 1999, which contributed to increased opportunities for students entering STEM careers

requiring a technological background (NSF, 2009). The STEM Talent Expansion Programs and Advanced Technological Education initiated several programs in the expectation of increasing transfers from 2-year into 4-year institutions that lead to baccalaureate degrees and improve the educational prospects for college students by forming comprehensive university partnerships (Laanan & Starobin, 2008, p. 38). In 2011, President Barack Obama called for more funding for community colleges to prepare students for matriculation to 4-year universities (Koebler, 2012).

Despite these the new provisions designed to create more STEM graduates, minority women remain underrepresented in STEM disciplines; this underrepresentation has persisted despite the growing numbers of racial and ethnic minorities attending college in the United States (Heilbronner, 2011; NSF, 2013). The U.S. Census Bureau (2010) reported that African American, Hispanic, and Native American women represent just 10% of the nation's STEM bachelor's degrees. By understanding the experiences and perceptions of African American women enrolled in STEM courses, considerations could be made to help resolve many of the issues that may be the cause of their poor enrollment.

Purpose of the Study

The purpose of this hermeneutic phenomenological study was to understand the lived experiences and perspectives of African American women enrolled in STEM fields related to their matriculation in community college. The study explored women's experiences related to community college support systems and personnel, community college academic program offerings, and their intentions to continue to pursue STEM

fields at their subsequent transfer institutions. A person's motivation, intelligence, or fears are all constructs that refer to complex ideas that cannot be seen or measured in a concrete manner and call for careful listening to the person's lived experience (Dabbs, 1982; Heidegger, 1977; Moustakas, 1994; Van Maanen, 1982).

Increasing enrollment of African American women in STEM programs can change the disproportionate number of women and minorities in these fields (CCRC, 2012; Morganson, Jones, & Major, 2010). It is important to determine what programs produce the outcomes that the global economy needs and demands at the community college level. This challenge can be met if African American women have a clear understanding and guidance toward the programs that prepare and assist them in obtaining a STEM degree. Community colleges may provide this additional understanding and guidance; however, it is difficult to estimate exactly how much can be attributed to the dynamic of the community college or its faculty without further investigation. A better understanding of the essence of the life experiences of African American women enrolled in community colleges will aid institutions in advancing STEM programs. With this information, administrators can produce or continue programs that benefit and advance fields that are going to be the most marketable in the future (Hughes & Howard-Hamilton, 2003; Mack, Rankins, & Woodson, 2013; Moore et al., 2004; Topper & Powers, 2013).

Research Questions

The questions examined in this study were:

- Research Question 1: What are the lived experiences and perceptions of African American women enrolled in STEM fields while in community college?

- Research Question 2: What are the lived experiences of African American women related to supports and barriers while in community college?

- Research Question 3: What is the essence of African American women's decision making related to continuing to pursue one of the STEM fields?

Conceptual Framework

Women make up the majority of U.S. community college students; minorities make up the segment of this population with the greatest growth (Chang, 2002; Frehill & Ivie, 2013; Gayles & Ampaw, 2014; NCES, 2010; Yonghong, 2008). African American women experience the community college and the world differently from women of other races and African American males (Brown et al., 2000; Collins, 1997; Laanan & Starobin, 2008). The conditions and environment in which African American women find themselves are very important in their educational programs, ability to persevere, transfer to a 4-year university, and the final step of degree attainment within STEM fields (Brown & Brooks, 1996; Byars-Winston, 2013; Chang, 2002; Coger et al., 2012; Lerner, 2002; Lloyd & Eckhardt, 2010; Merriam & Caffarella, 1991; Zimenoff, 2013). Ample information is required to gain an understanding and describe the essence of the lived experiences of African American women and their perceptions of their environment, encouragement, and STEM programs (Moustakas, 1994; Van Manen, 1990). Administrators can model programs to be more conducive to the needs of female African American STEM majors and increase outcomes while maintaining the current number of

these students already present. It is imperative to foster growth in STEM majors by

African American women.

The conceptual framework for this study draws from the work of several

researchers and theorists whose work makes up the different aspects and components of

the development of humanist, social learning, and action theories. Figure 1 shows the

schema developed for the conceptual framework to visualize the main factors in

understanding African American women's needs from the community college to increase

participation and retention in the STEM fields.
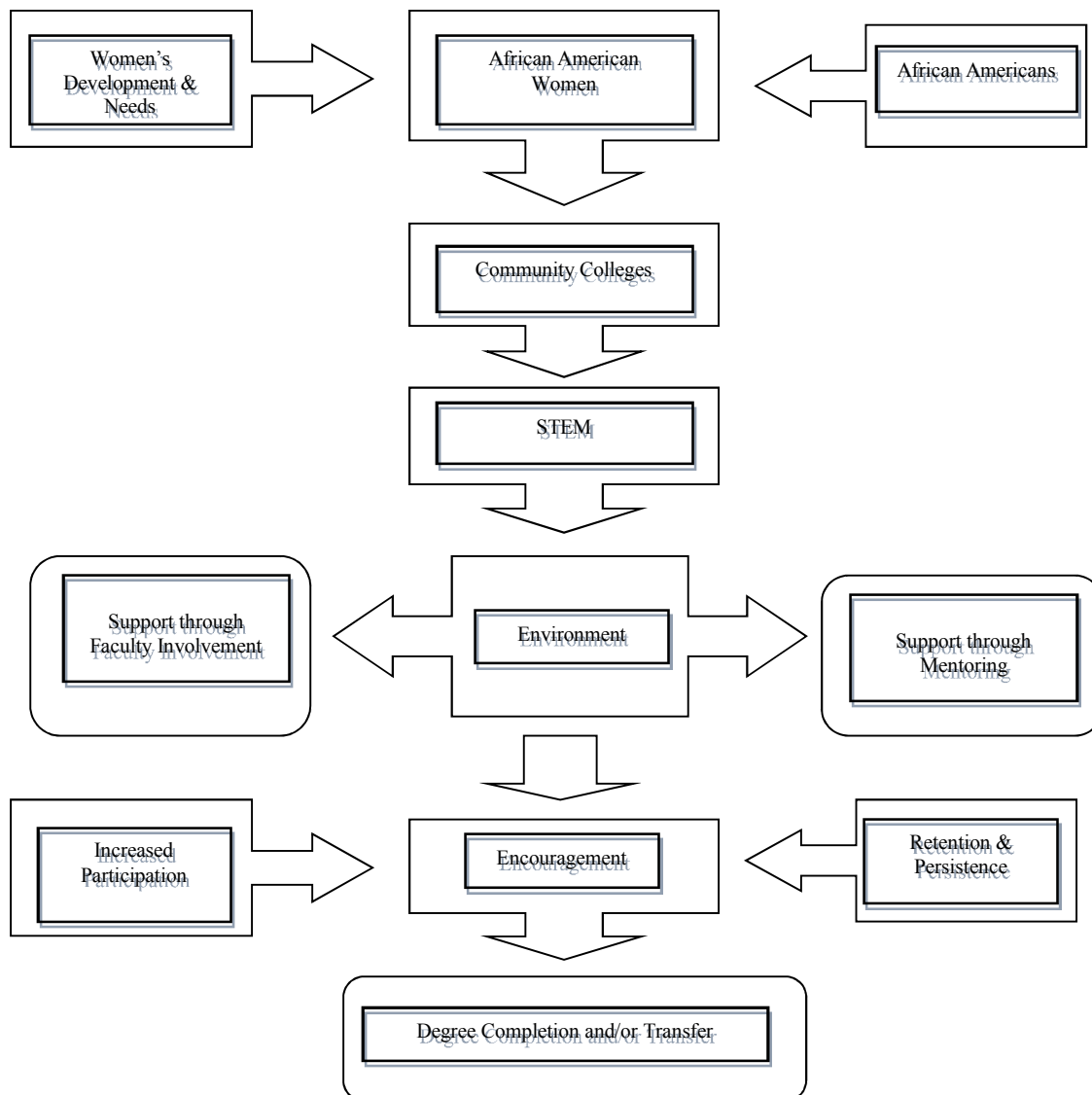
Figure 1. A flowchart showing factors that support African American women STEM degree completion.

Development

It is important to begin looking at the overall development of young women to understand how women mature and acquire number sense and quantitative development, since research has proven that women think, acquire, and understand information differently than men. Developmental theories provide a framework for thinking about

how women grow, develop, and learn. In contrast, theories such as behaviorism, also known as behavioral psychology, are based on the idea that all behaviors develop through some form of conditioning (Erikson, 1987; Skinner, 1953). My model combines theories of behavioral psychology and development as it pertains to selection, optimization, and compensation to provide a better understanding of the self so that women's behavioral tendencies can be examined.

Women's development involves acting on the specification of goals and creating a hierarchy based on commitment allowing a narrowing of all possible career choices to the specific, and in this case, one of the STEM fields (Belenky, Clinchy, Goldberger & Tarule, 1986; Gilligan, 1982; Lerner, 2002).

Environment and Encouragement

The classroom environment has the potential to either encourage or discourage students to continue in their STEM field of study. Tinto's (1993, 2012) student integration model and attrition theory suggest that the experiences students have with other students, instructors, and the institution as a whole will either integrate them into the learning process or alienate them from it. Gilligan (1982) and Noddings (2007) suggested that for institutions to reach everyone at their particular level of need, a variety of programs must be constructed to address all the different requirements, talents, and interest of the students in the institution. This process utilized action theories of optimization, which allowed the enhancement of existing goals and aided in individual motivation for self-development and retention.

Designing education programs appropriate for women will also aid in finding the optimal education experience for African American women **(**Belenky et al., 1986; Frehill & Ivie, 2013; Mack et al., 2013**).** A better representation of females in the mathematics and science classroom may also improve the environment or atmosphere for female learning. As a society, the focus has been studying men rather than distinguishing characteristics of intelligence and thought that are prominent and highly developed in women (Belenky et al., 1986). By finding these best learning models for women, the community college can not only remediate the lack of women in mathematics but also develop effective programs to promote female participation in the mathematics and science fields.

Jordan, Kaplan, Miller, Stiver, and Surrey (1991) explained, "it is noteworthy how often women express enormous doubts about their abilities and their competence" (p. 225). Byars-Winston (2013) stated, "these disconnects reveal the schisms that exist between the prevailing myth of meritocracy and the persistent reality of educational and occupational inequity" (p. 54). Zimenoff (2013) explained, "this problem is a function of lacking examples for these women, failing to provide opportunities for them to connect with others like them, and an overriding cultural judgment of whether or not they belong" (p. 135). These studies claimed that the combination of environment and encouragement support women in their self-actualization. Maslow (1954, 1973) provided support for his hierarchy theory of self-actualization. Maximization of gains and minimization of losses allows women to fulfill their need for self-respect, increased self-esteem, and admiration from peers. These objectives are obtained through modeling from mentors who are

successful in their field of choice, faculty involvement to help elicit the desired outcomes, and assistance in socialization (Lerner, 2002; Noddings, 2004).

Nature of the Study

I used a hermeneutic phenomenological approach to collect the lived experiences and perceptions of seven African American women from two community colleges in the southern region of the United States because the method allows the researcher to understand and explore unique perceptions of participants. One of the community colleges offers a STEM program; the other has STEM courses but offers no degrees in these fields. African American women's motivations, aspirations, and concerns are all constructs that refer to complicated mindsets that cannot be seen or measured in a concrete manner and call for careful listening to these women's lived experience and interpretation of that experience to determine their true essence. Because I was looking at these women's perceptions based on motivation, aspirations, and concerns regarding their completing or completion of a STEM degree, it was important to be able to describe the main constructs based on these abstract ideas. The main idea of this study is grounded in the desire of these African American women in STEM fields to continue pursuing a 4-year degree in their field upon transferring to a university. The second idea is based on my interpretation of their lived experience regarding the community college's resources, faculty, and environment. These women were attending a community college and either enrolled in STEM courses, or completed their degree in the recent past. Participants were interviewed for approximately 1 hour; interviews were recorded, and field notes were taken.

Definitions

Attrition: In the context of this study, when students leave college without completing a degree or program (Tinto, 1993, p. 1).

Development as selection (specialization) and selective optimization in adaptive capacity: A process of selection and selective adaptation. Selection is due to biological, psychological, cultural, and environmental factors. Developmental advances are due to processes of optimization. Development is selective, and because of age-associated changes in potential, compensation is also part of the developmental agenda (Lerner, 2002, p. 221).

Environment: The circumstances, objects, or conditions by which one is surrounded. An environment is also an aggregate of social and cultural conditions that influence the life of an individual or community (Voorhees, 1987).

Faculty encouragement: When the faculty of an institution (a) gives courage or confidence to raise hopes or provide sympathetic advice and interest in a student, or (b) advise and make it easier for a student to do something to strengthen them in an area of study (Nora & Rendon, 1990).

Faculty involvement: When the faculty member of an institution engages as a participant in a student's learning process (Thaxter & Graham, 1999).

Mentoring: A term used to describe a relationship between a less experienced individual called a mentee and a more experienced individual known as a mentor. It is a face-to-face, long-term relationship between a supervisory adult and a novice student that

fosters the mentee's professional, academic, or personal development (Donaldson, Ensher, & Grant-Vallone, 2000, p. 234).

Student retention and graduation: The rate at which an institution retains and graduates students who enter the institution as freshman at a given point in time (Tinto, 2012, p.126).

Student persistence and completion: The rate at which students who begin higher education at a given point in time continue in higher education and eventually complete their degree, regardless of where they do so (Tinto, 2012, p. 126).

Transfer rate: The rate at which a higher education system retains students until degree completion, regardless of where they first entered the system (Tinto, 2012, p. 126).

Transfer shock: A phenomenon occurring during the first and second semester of a student transferring from a community college to a university that accounts for a decline in academic performance (Laanan, 2001).

Assumptions

In the course of this study, four assumptions were made:

- The participants would share their experiences as honestly and as openly as possible.

- The participants would be self-reflective enough to be able to respond to the interview prompts beyond simple answers and that I would be aware of when I might probe to encourage more reflection.

- The reasons African American women stay in college are a combination of emotional attachment to the faculty, environment, and the institution due to social and individual factors (Brand & Kasarda, 2014; Yingyi, 2011). This assumption was used to guide the open-ended interview questions.

- Some of my biases that relate to the framework and my life experiences in the field might carry into the work.

Scope and Delimitations

This study explored African American women enrolled in STEM fields related to their matriculation in the community college. The study explored the women's experiences related to community college support systems and personnel, community college academic program offerings, and their intentions to continue to pursue STEM fields in their transfer to a 4-year institution. Participants were associated with two community colleges. One college consisted of 61.5% women and 23.5% African Americans with a total population of 9,547 students. This college did not have an active program in STEM but offered STEM-related classes on four campuses. The other community college consisted of 59.7% women and 39.2% African Americans with a total population of 5,413 students. This college has an active STEM degree program on two campuses and an active partnership with a 4-year institution.

The study had five major delimitations and was designed to focus exclusively on African American women. First, the sample of participants only came from two institutions, thereby limiting the ability to generalize the results to all community colleges, faculty, and college programs. Second, this study included only African

American women and did not examine to other female racial groups; hence, the information only pertains to African American women and may not be generalizable to other minority women. Third, the study depended solely on the thoughts, feelings, and opinions of African American women at the community college and cannot be conferred to African American women at the 4-year university level. Some generalizations may be made to other minority women; however, the information may be skewed. The fourth delimitation is the information obtained did not translate to African American men or males in general. Finally, all the data were collected in the southern region of the United States and may only pertain to this region. Generalizations may be made to other areas similar in population and other demographics.

Limitations

The data were collected, analyzed, interpreted, and reported exclusively by me, an African American woman; therefore, there may be the potential for bias by the researcher. The responsibility of a researcher is to minimize any biases by understanding and comprehending the residual effects of any biases that may exist, thus limiting misinterpretation and misuse of data. The size of the sample restricts the application of the findings to other settings, as well as the delimitations, such as focusing only on two 2-year institutions and African American women interested in the STEM fields.

Significance of the Study

Women understand things differently because women think differently than men (Blau, Ferber & Winkler, 2013; Gilligan, 1982; Jordan et al., 1991). Minorities also can have a unique viewpoint or frame of reference, and this can become complicated when an

African American is also a woman. Noddings (2004) claimed females define themselves by their interactions and relationships formed with others, and males define themselves based on their advancement and achievement. If this is the case, it can be determined that the mindset of the gender may cause the disparity in educational goals and advancement.

Researchers have determined that faculty-student interaction is an integral part of the community college atmosphere. This interaction is also important if there is to be an increase in women and minorities in the STEM fields, for that pursuit to develop into transferring to a university, and for earning a degree in one of those fields (Chang, 2005; Gayles & Ampaw, 2014; Topper & Powers, 2013). Understanding women's needs in education is important to their educational achievement in mathematics. How they become more proficient in, and elevated to, those higher mathematics courses that will aid in obtaining a degree in one of the STEM fields is important to understand as well.

It becomes imperative to turn the disenfranchised woman and disenfranchised minority woman toward resources at the community college and for the community college to seek resources and research to aid in this endeavor. Many studies have gauged the predicament that women face in entering the STEM fields (Byars-Winston, 2013; Coger et al., 2012; Shaffer, Marx, & Prislin, 2012; Zimenoff, 2013). The NSF has developed programs and services designed to encourage women students to pursue STEM fields, thereby encouraging community colleges to partner with the NSF and 4-year institutions to alleviate some of the financial burden in this endeavor (Laanan & Starobin, 2008). Laanan and Starobin (2008) note that the "Key to the success of these programs is an on-site coordinator who serves as the conduit and facilitator of the

program and its students, a faculty, staff, and partners" (p. 45). Additionally, there is still

little support for female students to pursue STEM fields, which may hinder their

academic progression and their career aspirations (Laanan & Starobin, 2008). The

National Survey of Recent College Graduates in 2004 found that

> more than 40 percent of science and engineering bachelor's and master's
>
> graduates attended community colleges at some point in their educational paths.
>
> These graduates were more likely to be Hispanic, African American, American
>
> Indian, or Alaskan native; older than traditional age students; and with parents
>
> with lower educational attainment. (Laanan & Starobin, 2008, p. 38)

With this research, Jackson and Laanan (2011) continued to probe along with Ong,

Wright, Espinosa, and Orfield (2011) into the issues of women and minorities. With new

research, there will be more opportunities to listen and understand what African

American women's needs might be. Practical contributions of the study are for African

American women and community colleges to have a shared role to increase the number

of applicable African American women for STEM fields. This study is important to

enhance programs that community colleges initiate, and for maintaining funding to

promote an increase in the number of African American women in STEM fields. In

addition, it is important to realize that one must first understand the female voice and

cognitive growth to acquire a clear path or directions for new and existing programs.

Lastly, community colleges must gauge program effectiveness based on the impression of

the actual participants: African American women.

Summary

The decade from 2000 to 2010 produced a significant change in U.S. society, with increasing employment demands for more individuals working in the STEM fields. This trend has increased and is expected to continue to grow well into the next two decades. Based on this pattern, there is great interest regarding how women and minorities will compete in the new global market compared to their male and nonminority counterparts. African American women will have an opportunity to use the new funding awarded to STEM programs to produce an appropriate number of eligible candidates for employment in these fields.

Chapter 1 consisted of an introduction to the research study of this dissertation on African American women, STEM fields, and the community college. It included the statement of the research problem, the purpose of the study, research questions, assumptions, limitations, definitions of frequently used terms, and the significance of the study. The research and investigation into the issues of African American women, STEM, and the community college are discussed in Chapter 2.

Chapter 2: Literature Review

Introduction

The purpose of this phenomenological study was to understand the lived experiences and the perspectives of African American women enrolled in STEM fields related to their matriculation in community college. This study was designed to explore women's experiences associated with community college support systems and personnel, academic program offerings, and their intentions to continue to pursue STEM fields at their transfer institutions.

There have always been questions in U.S. society regarding economic class, race capabilities, community influence, gender competency, and the nature of social integration, which leads to more questions as to how to bring about true social change that will last and create an ideal society. American society has experienced past successes as well as defeats that threaten forward progress toward a successful and sustained social, economic, and gender change of view. This change includes how women and minorities are perceived in society and education (Blake-Beard et al., 2011; Blau, Ferber & Winkler, 2013; Bryars-Winston, 2013; Coger et al., 2012; Green, 2008; Jordan et al., 1991; Kane et al., 2004; Mullin, 2012).

Women and minorities are the largest increasing portions of the population at the community college level (Eddy & Lester, 2008; NCES, 2010; Yonghong, 2008). At the same time, STEM programs do not have an adequate number of candidates to fill the demand in the fields associated with it (Mullin, 2012; Rosser, 2012; Seymour, 2002; Smeding, 2012; Townsend, 2006; Zamani, 2003). African American women are in ample

supply and if provided with the right tools they can produce an appropriate number of eligible candidates for employment in the STEM fields to cover the demand (Smith, 2011; Toglia, 2013; Zimenoff, 2013). Organizations such as community colleges need to take the resources they have available to attract this minority group. For community colleges and other 2-year institutions to be able to service African American women the majority of the U.S. community college population (Eddy & Lester, 2008; NCES, 2010; Yonghong, 2008) they must understand what the needs of this population are, and the programs that will make the most impact in their lives. This chapter explores the basic foundations of African American women's needs and development as they pertain to the community college's environment and encouragement, STEM, historically Black colleges and universities (HBCUs), and how each impact African American women's educational pursuits.

Literature Search Strategy

A population's education plays a major part in most students' lives, including where they will reside and the ability to sustain an acceptable living. The review of literature for this study initially focused on four components: African American women, community colleges, STEM fields of study, and retention and transfer to 4-year institutions. This review of the literature indicated that very few journal articles were available that examined intersections of these components; only a few studies were identified that examined all four components together. The literature review encompassed literature on behavioral studies and psychology, computer science and engineering, education, management and business, and multidisciplinary research databases.

The information for the literature review came from four key searches and included African Americans, women, STEM, and community colleges using the terms or keywords: *women*, *African Americans*, *science*, *technology*, *engineering*, *mathematics*, *community college*, *higher education*, *persistence*, *student success*, *transfer*, *retention*, *mentor*, *faculty encouragement*, *programs*, *STEM*, and *African American women*. Databases including ERIC, EBSCOhost, SocINDEX, LexisNexis Academic, PsycINFO, Academic Search Complete/Premier, Education Research Complete, ProQuest Central, Science Direct, and NTIS at the Walden University library were used. The majority of the literature review came from scholarly journal articles, published books, and transcribed conference presentations. After searching for literature on these topics, only a few studies that examined all four components together were found. At that time, older material was gathered, and information from elementary, middle, and secondary schools obtained for possible relevance.

Conceptual Foundations

Understanding women's needs in education are important to their remediation in mathematics, and for those who are proficient in mathematics, for their elevation to higher level courses. Understanding the female voice and cognitive growth patterns is necessary to acquire a clear path or direction for STEM programs; Belenky et al. (1986) noted that prior research had focused on women's intellectual competencies, and demonstrated how alike the sexes are instead of focusing on their differences. However, understanding the difference will aid in drawing more women into STEM programs.

Late adolescence, a stage that Erikson (1959) called adulthood, is an important period in

the development of women's core relational self-structure. Skinner (1974) described late

adolescence as a time when self-knowledge is aquired (Belenky et al., 1986; Gilligan,

1982; Jordan et al., 1991). Self-knowledge gives a person a special value; a person who is

aware of themselves is in a better position to predict and control his or her behavior and

circumstances (Gilligan, 1982; Skinner, 1974; Walsh, 1987).Also important is social

origin, which comes from understanding oneself and that upbringing determines a

person's value system (Skinner 1974). When a person's desires and dreams become

important to another person, the dreamer gains relevance through the original dream and

that person is said to become aware of knowing how to know.

Equal rights did not automatically produce equal representation, especially

regarding employment and salary, or in the sense that the sincere concerns of women

manifest in their public influence and power in education (Erikson, 1968). The theories

that claim women think, learn, and teach differently from men (Belenky et al., 1986;

Gilligan, 1982; Jordan et al., 1991) could be applied to African American women

suggesting it makes the process of selecting a viewpoint more difficult. According to

Howard-Hamilton (2003),

> Selecting appropriate theories for understanding the needs of African American
>
> women should, however, be based on their cultural, personal, and social contexts,
>
> which clearly differ significantly from those of men and women who have not
>
> experienced racial and gender oppression. (p. 20)

Finding a mentor or faculty member to help guide women in general and African American women in particular through the process is especially important if women respond based on relationships (Noddings 2007).

Women's Needs and Development

It has been stated that women are often conflicted concerning societal values, upbringing, and traditional gender roles (Byars-Winston, 2013; Gilligan, 1982; Shaffer, Marx & Prislin, 2012; Taylor, Gilligan, & Sullivan, 1995; Walsh, 1987). The internal and external struggles in the minds of many women may be preventing them from moving forward in mathematics and science fields (Chang, 2002; Jordan et al., 1991). Belenky et al. (1986) characterizes this as the subjective knowledge stage where the inner voice becomes critical and women are insecure and unsure. If women make it through this stage, however, there is world of knowledge and opportunity awaiting them (Belenky et al., 1986). This world of knowledge is where the reversal of fortune occurs, and women may progress from an unsure future to a defined and possibly lucrative career in STEM fields.

Understanding a person's history and future goals is very important in education. Women understand things differently because women think differently than men (Gilligan, 1982; Jordan et al., 1991; Taylor et al., 1995 Walsh, 1987). Women view themselves based on their relationships and interactions with the people around them, whereas men are more competitive and view themselves based on achievement and personal advancement (Clifton, Perry, Peter & Roberts, 2008; Lloyd & Eckhardt, 2010).

The level of student preparation for higher education courses is a concern. In 2002, a third of all students attending community colleges and other 2-year institutions were enrolled in remedial or development courses (Chang 2002). A decade later, this number has increased to two-thirds of all students (Topper & Powers, 2013); therefore, it can be concluded that this pattern is getting worse. Men are less likely to cope with prolonged shifts of goals than women (Chang, 2002; Clifton et al., 2008). If a woman has to take a few remedial courses to get back on track toward her ultimate goal, she is more likely to continue and complete it over that of her male counterpart, who is more likely to view the setback as a sign of defeat (Clifton et al., 2008). Herein lies a major difference in women's and men's way of thinking: women seek connection and relationships while men are more competitive (Gilligan, 1982; Jordan et al., 1991; Taylor et al., 1995). Even though some developmental courses be can added to the associate's or bachelor's degree programs, when this situation occurs women may see it as progress and positive reinforcement to continue their education.

Life is full of tangible events that define who women are in society. Women view the world through their personal relationships, rather than who people are in and of themselves; therefore, a woman's world consists of human connections made through these relationships and their ideas are as based on those perceived associations (Gilligan, 1982). If life experiences are the sum of life crises as Erikson (1959) would describe it or the understanding of a woman's place in society as Skinner (1974) stated, then it could be said that life experiences are the totality of relationships that shapes who women are.

A critical issue for many community college administrators is designing programs to match task requirements, and help with student integration into rigorous study that leads to learning at the construction and innovation levels that assists in the transfer to a 4-year university (Morris & Daniel, 2007). Once there is a change of perspective by these administrators regarding how the classroom can be run to accommodate these needs then progress can be made. Actions may include remediation, the implementation of project-based e-learning, and Internet courses on and off campus at the community college and university levels. A better representation of females in the mathematics and science classroom may also improve the environment or atmosphere for female learning (Malcolm, 2010; Morris & Daniel, 2007). By finding approaches that work well for women, the community college cannot only remediate women in mathematics but also develop effective programs to promote female participation in the mathematics and science fields (Boubouka & Papanikolaou, 2011; Reyes, 2010). More importantly, it has been noted that approximately half of all students receiving a bachelor's and master's degree in science and mathematics have attended or taken a class at the community college level (Lloyd & Eckhardt, 2010). This profound discovery validates the president's mandate that community colleges pick up the slack and move students forward to enroll at a 4-year university.

African American Women

The belief that life experiences are the totality of all relationships that may eventually shape who women are as individuals may doubly apply to women who are racial minorities given their unique and relevant life experiences. It is critical that society

gets past gender barriers especially when it comes to African American women who have

an added disadvantage of being a minority group (Howard-Hamilton, 2003; Zamani,

2003). Understanding society's view of minority women in the mathematics and science

fields requires concentration and a keen eye; one must reflect on how society views

cultural, economic, and political issues (Hughes & Howard-Hamilton, 2003; Taylor et al.,

1995; Walsh, 1987). Brown et al. (2000) and Howard-Hamilton (2003) stated that many

minorities, women, and especially African American women, are seen as inept or not

capable of the higher order thinking required to comprehend and execute mathematical

and scientific tasks.

Taylor et al. (1995) indicated that women's hopes for their future were both a

positive and negative thing that can become central to their relationships and work

environment. These hopes become important components that support, encourage, and

teach women how to deal with a world where they are confronted with numerous

challenges. Conversely, if women experience disappointment or derision as they try to

form these relationships, the same hopes that can propel them to significant achievements

can shift to an obsession to obtain a home and family that may hinder them in every other

aspect of life (Taylor et al., 1995).

Life is full of numerous events that define who women are in society, and these

societal views are sometimes even stronger in the African American culture (Collins,

1997; Bryant et al., 2005). Collins (1997) stated that African American women

experience both racial and gender oppression, which causes them to struggle for equality

as a woman and as an African American. This attitude makes it difficult to change the

societal view, and in many cases, societies that view women in this way have problems moving beyond this assumption. Dominant ideas like those previously mentioned in education cannot be easily reversed, along with forms of exclusion representative of these characteristics (Bryant et al., 2005; Palmer, 2001; Taylor et al., 1995). According to Howard-Hamilton (2003),

> One can argue that very little has changed for African American women in higher education over the past two centuries. Stereotypes and inequities continue to exist and create formidable roadblocks for them as they attempt to gain educational and economic parity in this society. (p. 20)

Compensation must be made as well as an effort to understand something that is biological, cultural, and societal, and reflects the views of the outside world and the African American woman within. African American women are the only group that has experienced gender, race, and class oppression (Collins, 1997; Howard-Hamilton, 2003; Taylor et al., 1995; Zamani, 2003).; Their lives are therefore crammed with a complex network of theoretical interpretations, biological classifications, gender analysis, social construction, cultural experiences, and the reality of race.

The Community College

In the United States, there are over 6 million students each year attending community colleges, and statistics show that this number is steadily increasing exponentially (Cohen & Kisker, 2010). U.S. community colleges enroll almost half of the nation's undergraduates each fall and half of all first-time freshmen in its 1,100 campuses across America (Brawer & Cohen, 1987; Cohen & Kisker, 2010; O'Banion, 1997). This

phenomenon is mainly due to features such as affordable tuition, open admission policies, flexible course schedules, and convenient locations (Cohen & Kisker, 2010; O'Banion, 1997).

While visiting the campus of a community college, several things can be observed including a wide student demographic and a sense of community and academia. The community college's student population represents its local culture where the student benefits economically through lowered tuition and fees to help jumpstart their academic plans before entering costly 4-year institutions (Horn & Ethington, 2002; Hagedorn & Purnamasari, 2012). This culture determines classes offered by assessing the skills required in the local and surrounding communities as well as the nation's global demands. In addition, the student population represents a change the community may be undergoing that demonstrates diversity in the student population consisting of first-time freshmen or mature students seeking to increase their educational level or improve performance in their respective careers (Colatrella, 2014; Frehill & Ivie, 2013; Lewis & Middleton, 2003). It might also suggest that the community college aligns itself with various 4-year institutions to help students meet the demands of these rigorous academic programs.

The community college's sense of identity stems from the fulfillment of each student's educational goals. The students work diligently to ensure they gain knowledge to launch their careers as well as involve themselves in the daily activities needed to build their creativity and critical thinking skills to become assets in the workforce. Fulfilling

student goals are reached based on a keenly designed plan of action geared toward meeting diverse needs in sustaining the economy and workforce (Coger et al., 2012).

The community college feel of academia stems from the students' need to increase resources in their lives. The community college offers unique educational experiences offering diminutive class sizes, and allowing for the faculty to bestow additional personalized instruction upon the student with concrete preparation. This, in turn, creates an environment conducive to learning, thereby leading to individual achievement and the overall success of the community college (Mullin, 2012).

Community colleges were originally designed to encourage students to transfer to 4-year institutions by allowing them to take freshman and sophomore level classes at an affordable rate. What has happened instead is that community colleges offer a variety of occupational degrees allowing students the ability to go straight into a profession resulting in a less than optimal transfer rate. When the student has short-term goals and those goals are to join the workforce within 18 months to 2 years, this option is more enticing than transferring into the university, which may take 4 to 5 years before they have any real earning power. According to Hagedorn et al. (2006), "as more and more students elect to attend the country's network of 2-year institutions, the importance of assisting students to succeed on the path that leads through the community college to bachelor degree attainment is more pronounced" (p. 224). Bailey, Calcagno, Crosta, and Jenkins (2007) determined that if the community college can identify students who need additional assistance in math and science courses early, and provide them with supplementary help, that the confidence level of the students increased along with the

likelihood of degree attainment. Hagedorn et al. stated that many students who enter community college with less than proficient mathematics and English skills required for college level courses cause them to be unable to thrive at the remedial courses, college level courses, and advanced studies courses stages. Hagedorn et al. also noted that many students believe that the community college process will take 2 years to complete regardless of their lack of direction towards a particular degree or skill set. This feeds into the misconception that students will be able to transfer to any 4-year university; however, this perception can be eliminated with counseling and mentoring (Hagedorn, 2006, p 239).

Taylor and Tisdell (2001) mentioned that in order to communicate to all students, institutions must understand society and how it works. How men, women, and minorities are viewed and related to in society will often determine how a person's perception will manifest in the classroom (Taylor & Tisdell, 2001). Researchers have also determined that faculty-student interaction is an integral part of the community college atmosphere and important if there is to be an increase in women and minorities in STEM fields and the pursuit and achievement of a 4-year university degree (Coger et al., 2012). Additionally,

> Those teaching with this orientation have a sociological view of the world that examines how culture and power relations based on the social structures of gender, race, class, sexuality and their intersections shape learning. Difference is conceptualized not as personality differences but rather as positionality where one

is positioned based on the intersection of gender, race, and class relative to the

dominant culture. (Taylor & Tisdell, 2001, p 9)

It has even been suggested that community colleges' need to adapt their idea of student-centeredness to include opportunities for internship and mentoring that does not merely provide opportunities for interaction with faculty and staff, but with working professionals minority students require at these campuses (Chang, 2005; Zamani, 2003). As the community college helps all students in their attempt to proceed to a higher level, it is important that these institutions do not lose the focus that in order to have evolution they must first determine the relational aspects of learning to help all those who pursue it.

Eddy and Lester (2008) reported that over the last 10 years 60% of the student populations are women and most community colleges reported that at least 50% of their students are from a racial minority or ethnic background. Given these statistics there is a newly formed responsibility by the community college to understand how women and minorities think and perceive their surroundings in order to better educate these groups.

Science, Technology, Engineering, and Mathematics

Regardless of the perception of the effectiveness of affirmative action legislation, it has opened various up opportunities for many women and minorities in fields where the door was previously closed. As the STEM fields are examined it becomes important to determine the probability that women or minority students may choose one of these fields given the right environment. A part of every institution of higher learning is the environment it projects. Administrators need to realize that the faculty must include a representation of the student body that attends their institutions in order for those students

to envision themselves in the STEM fields. Eddy and Lester (2008) noted that "Community colleges are more likely to be gender-equitable institutions compared to their 4-year counterparts with respect to numbers of men and women in faculty positions" (p. 112).

Yonghong (2008) indicated that the reasons women and minorities do not stay in faculty positions at universities and colleges are because few opportunities are awarded to these groups, which causes there to be a disparity in the support shown to women and minorities in leadership roles once these positions have been achieved. Many women and minorities encountered some obstruction in receiving their position in the first place which may cause some resentment (Yonghong, 2008). Other reasons for the disparity are noted by Eddy and Lester (2008) who affirmed that impartiality at the community colleges based on gender remains fairly low, and that discrimination still exists in areas of salary, representation of women in certain fields, and few women in "high-powered governance committees" (p. 114). Yonghong (2008) stated that "not only will the increased participation of women scientists promote diversity and enhance innovative power, but it also impacts the education and career development of future generations" (p. 621). Eddy and Lester note,

> One of the methods to address gender issues among students is to acknowledge the diversity of the student population and promote greater gender awareness and sensitivity. As open access institutions, community colleges enroll large numbers of students of color as well as students from various socioeconomic groups. One important suggestion to assist students who face identity conflicts is to provide a

forum to discuss identity issues with a focus on the negative perceptions of help

seeking that are often connected to gender socialization. (p.111)

Creating programs to promote women and minorities into more administrative, faculty,

staff, and mentoring positions are important for retention, university transfer, and degree

completion (Eddy & Lester, 2008; Zimenoff, 2013).

Noddings (2004, 2007) would argue that it is not only an institution's purpose to

seek these programs but, it is also an ethical position that must be taken. Phelan (2008)

wrote that "ethics are indeed timeless, even critical, to the advancement of people,

organizations, communities, and countries" (p. 63). He also mentions that "many college

policies decline to define ethics, opting instead for 'know it when they see it,' which does

little to strengthen the policy, let alone encourage specific behaviors" (Phelan, 2008, p

63). This policy has also been seen as the main issue; everyone has different levels of

ethics, and the perception of what is unethical varies from person to person.

The NCES (2010) estimated that community college enrollment was comprised of

53%-61% female students and 35%-43% minorities from 2003 to 2008. Given these

figures, there should be some growth in the STEM fields at this level of education. Eddy

and Lester (2008) mention that this leads to many discussions on the gender gap and lack

of representation of women in the STEM fields. It may also lead many students to believe

that discrimination and bias still exist. Their research also showed that women were not

entering the STEM fields and that the number of men entering these fields was

decreasing (Eddy & Lester, 2008). Eddy and Lester went on to discuss the need for

community colleges to create mentoring programs at the high school level and within the

community college system as well (p. 111). Laanan and Starobin (2008) argued that

community college is the way to increase women and minorities in the STEM fields:

>[The] National Survey of Recent College Graduates 2004 found that more than 40
>
>percent of science and engineering bachelor's and master's graduates attended
>
>community colleges at some point in their educational paths. These graduates
>
>were more likely to be Hispanic, African American, American Indian, or Alaskan
>
>native; older than traditional-age students; and with parents with lower
>
>educational attainment. (p. 38)

Women still hold firm to past beliefs or stereotypes that males are stronger and

more competent in mathematics and science areas of study while they are stronger in

humanities professions (Seymour, 2002; Smith, 2011). In 2009, the NSF encouraged

community colleges and universities to seek financial assistance from foundations and

other agencies like the NSF to develop and deliver programs and services to encourage

more female and minority participation in the STEM fields (Laanan & Starobin, 2008).

Many studies have been completed to gauge the predicament that women face in entering

the STEM fields as there is still so little support for female students to pursue these areas

of study. Women and minority career aspirations are impeded because of the lack of

social and academic support to pursue STEM fields (Bose et al., 2009; Chang, 2002;

Coker, Huang, & Kashubeck-West, 2009; Laanan & Starobin, 2008; Rosser, 2012;

Smith, 2011).

The problem of support can be averted if women and minorities have

understanding and guidance from the community college; however, more needs to be

done to achieve an even distribution of women and minorities in the STEM fields. Laanan and Starobin (2008) note that "In addition, community colleges can arrange mentoring programs in business and industry for female students to meet female engineers and learn about their career opportunities" (p. 45). The fundamental predicament, however, is the ability to transfer to a 4-year university. Once community colleges get these women interested in the science and mathematics fields, the question then becomes how to retain them.

Historically Black Colleges and University System (HBCUs)

HBCUs are leading 4-year institutions in awarding African American students degrees in STEM fields (NSF, 2013). The NSF (2013) instituted the HBCU-UP in 2000 to assist STEM students with support and preparation in implementation of projects, research, planning, grants, awards, and other funding opportunities.

Chang (2005) noted that minority students in separate studies also convey a sense of marginality at other institutions of higher learning. Many African American students stated that the atmosphere of HBCUs are affirming and refreshing (Walker, Zarif, Gilbert, & Hynd, 2014). Bose et al. (2009) proclaimed that minority women feel less social pressure, isolation, overall personal dissatisfaction, and overt racism at a HBCU school than at predominantly Caucasian colleges or universities. This dissatisfaction could stem from the effect of negative opinions that originate from gender stereotypes as women are perceived as being unable to reason effectively in mathematics and scientifically challenging situations or domains (Smeding, 2012). Students declare that HBCUs promote academic achievement and success and do so through a supportive and

nurturing atmosphere. In addition, their policies and practices and cooperative peer relationships become the supportive boost that is needed to propel minority women toward a career in the STEM fields. Finally, researchers observe that these colleges have special programs to assist with the financial difficulties many students may face (Bose et al., 2009).

Community College Environment

Environment

The environment consists of a group or individual's surroundings, conditions, or influences. When it comes to the environment at institutions of higher learning, its conditions and influences top the list for many students in their decision making process. It becomes difficult for students to relate to their environment when they do not see themselves in any of their surroundings. African American women find it difficult to identify with the university setting when they are not represented in the classroom, staff, and in other aspects of their surroundings. This cultural construct discourages individualism and gives a sense of commonality, which may lead to a sense of isolation (Ma, 2011; Rosser, 2012). This construct underlies the importance of the institutional environment present at any institution of higher education where African American women attend. The community college instructor sets the tone for this environment because this is where a large majority of African American women begin their education.

The community college instructor's job is to educate his or her students; however, many of these students hope that the institution can increase their academic preparation through remediation and advance them to a point where they can excel at the university

level or to join the workforce and achieve a position with prestige. The faculty set the atmosphere or environment of the institution. Brawer and Cohen (1982) stated that the teaching profession is different from other professions because it is regulated by laws, boards, and most importantly, administrators that all contribute to a lack of autonomy. The professional educator, however, can create his or her sense of purpose and accountability for themselves (Brawer & Cohen, 1987). The fact that there are a disproportionate number of women and minorities being hired for high-ranking positions at the community college level is still a concern, although women and minorities report they have higher satisfaction with their job and profession at a community college versus the university level (Flowers, 2005; Townsend, 2006).

Traditional 4-year research institutions for STEM study have left diversity out of the classroom (Jenkins, 2011). African American women should be able to focus directly on their studies and less on their gender so that they can grasp complex concepts on a wide variety of topics. The community college may provide a close sense of togetherness regardless of race or gender (Laanan & Starobin, 2008). Studies done by Reille and Kezar (2010) suggest a number of important lessons for staff, faculty, administrators, and community college presidents as they move forward with programs designed to increase women's involvement in the mathematics and science courses of study including awareness of biases.

Faculty Involvement

There are more women taking on leadership roles in the community college and 2-year institutions as staff managers, faculty, administrators, and college presidents;

therefore, how these women view their leadership positions are important (Drake, 2008;

Gayles & Ampaw, 2014; Jain, 2010). Increasing the number of underrepresented students

in STEM fields also increases the number of role models for other African American

women. As more role models appear, more African American students begin to believe

that STEM career positions are attainable (Byars-Winston, 2013; Kane et al., 2004;

Laanan & Starobin, 2008). Community colleges, in general, are seen as being based in

and servicing the community in which they are located. The main job of any

administrator is to get the faculty on board with the programs that the community college

is trying to initiate. A strategic process is important to tackle the continuous improvement

of the community college. Jenkins's (2011) perspective is that the administrator should

appoint a board or department to develop a process or program that helps students set

goals, measure student learning and progression in their respective fields of study,

identify gaps in learning and achievement, align policies and practices to improve the

preferred established outcomes, and assess the effects of alignment to make further

improvements based on the expressed and unexpressed needs of the students (Jenkins,

2011). The faculty must believe in and gain acceptance of the plan put forth by the

president or administrator to accomplish these outcomes. The president, dean, chairs,

faculty, and staff then must put in place a strategic action plan developed from internal

and external sources to have a clear and concise vision that is shared by all. Lastly, the

president must follow through with commitments made to the faculty and staff to develop

a reputation for integrity, responsiveness, and cooperation that will aid in retaining

faculty and staff support in the future (Brand & Kasarda, 2014; Green, 2008; Townsend, 2006).

The community colleges can also provide external links with secondary schools and 4-year institutions if they empower the faculty to establish common learning outcomes and assessments for academic programs, and then have the faculty and administration rethink college policies to help students better negotiate the pathways they take through the institution. This action may lead to better student engagement and development protocols for better practice. These steps, along with a continuous improvement plan, should increase the degree attainment of students who enter the community college (Jenkins, 2011).

Leaders must also be aware of the dangers of hiring an unsuitable person for a task. It is important that every president, dean, and chair know the people working under them. This means everyone in an administrative position needs to know and evaluate faculty and staff for their strengths and weaknesses along with evaluating on what can be done by changing employee responsibilities periodically (Basham & Mathur, 2010). To achieve this goal, the governing body of the community college must work collaboratively. When collaboration with management, faculty, staff, and even the student body is achieved, then social change can occur in society and the educational system (Campbell, 2011).

Social change is desirable, but there are new hiring processes that may cause obstacles for community college presidents and administrators. Attribute based person-job matching reports are supposed to help profile the appropriate person for a particular

job; however, this is not effective in all cases, and presidents need to be able to determine

what job will be best for each candidate (Campbell, Syed & Morris, 2010). According to

Howard-Hamilton (2003), "Faculty and administrators should maintain a concerted effort

to provide course materials and programming that are relevant to African American

women" (p. 24).

Support Through Mentoring

Students who have a positive experience with a counselor or faculty member

remember the impact that individual had in his or her life and its effect on assisting them

in achieving their goals. For this reason, advisors, program coordinators, and mentors are

vitally important in the higher education process (Borum & Walker, 2012).

Academic and career success has been linked to factors based on the mentoring

relationship according to the research (Blake-Beard, Bayne, Crosby, & Muller, 2011).

Mentoring can be explained or defined by one person guiding, teaching, and counseling

another in some field of study (Hagedorn & Purnamasari, 2012; Patton, 2009). The

relationship built between mentor and mentee will improve, enlarge, and amplify the

STEM fields and related programs at many universities and community colleges. Patton

and Harper (2003) claim that "Mentoring is particularly important on the graduate level

because emerging scholars and practitioners who intend to excel in their respective

professions have the opportunity to make connections and learn how to maneuver

successfully within their area of specialization" (p. 67). This statement is supported by

Hagedorn and Purnamasari (2012) who reported that undergraduate and graduate

programs need more mentors. This support system is lacking for many African American

women, and it can be very difficult for them to locate mentors in the STEM fields where they can build connections to stay motivated and encouraged to succeed (Hagedorn & Purnamasari, 2012; Patton, 2009; Patton & Harper, 2003). In response to the studies produced in the late 1990s and early 2000s new programs were developed and acts created.

In 2007, Congress passed the America Competes Act. In 2009, two of President Obama's initiatives—the American Reinvestment and Recovery Act and Educate to Innovate—were signed into law. The America Competes Reauthorization Act passed in 2010. All of these acts have increased funding to community colleges and universities to intensify the focus on the improvement and preparation of unrepresented populations in the science and mathematics fields by primarily using the community college and the transfer process set between the community college and the university systems (Hagedorn & Purnamasari, 2012). These programs call for collaboration between businesses and educational institutions which creates additional mentors (Patton, 2009). When African American women mentors cannot be found, acceptable substitutes are Caucasian women who understand the foundation of being a woman in a mathematics or science field and have the ability to create a mutual trust and respect through an understanding of diversity (Blake-Beard et al., 2011; Borum & Walker, 2012; Byars-Winston, 2013; Dahlvig, 2010).

Community College Encouragement

Encouragement and Participation

Encouragement and participation start with recruitment. According to Hagedorn and Purnamasari (2012), the United States "has begun to get scared about how to focus the efforts to improve the science and mathematics preparation for all secondary and postsecondary schools that includes the entire educational spectrum" (p. 145). African American women have a general distrust, lack of knowledge, and social stigma that contribute to the lack of participation in mathematics, science, and research (Coker et al., 2009). Most recruitment has focused on Caucasian women; moreover, the information gathered from this group cannot be directly relevant to African American women (Blake-Beard et al., 2011). In order to recruit African American women to participate in STEM fields, it is important to build a rapport or relationship with them (Belenky et al., 1986; Coker et al., 2009; Taylor et al., 1995). This relationship starts with women but goes far beyond this basic foundation to include awareness of each institution's multicultural environment. Coker et al. (2009) state,

> As with any multicultural work, researchers must engage in personal reflections, learning, and experiences that facilitate self-awareness with a multicultural context, including an understanding of the ways in which race, class sexism, and sexual identity oppression operate in society. (p. 161)

Marginality is one characteristic that minority students share (Chang, 2005). An important part of learning is care, as Noddings (2004) stated, with minority students reporting that HBCUs promote academic achievement and success, and do this through a

supportive and nurturing atmosphere. Chang (2005) reported that African American students feel invisible in the classroom and with faculty members in many cases. The community college along with other postsecondary institutions can adopt a multifaceted instructional approach that promotes students' academic and psychological readiness to pursue advanced degrees and careers in STEM fields, which in turn, may increase encouragement and participation (Bose et al., 2009). In addition, these policies and practices along with cooperative peer relationships become the supportive boost needed to propel African American women into a career in the STEM fields (Bose et al., 2009).

Noddings (2004) claimed that a person's needs come first and foremost before an education can begin. From the current research it is clear that if community colleges can find the funding to create programs that start at the secondary levels, bring in the community to recruit more African American women, assist them by providing adequate faculty, advisers, and counselors, and provide for continuous encouragement and guidance, then African American women will be better prepared to transfer to 4-year institutions. Once the community college produces this strong academic community along with study groups, this will provide a stable support that can discourage any upcoming setbacks and provide a shield for some of the academic challenges that lie ahead. The goal is to provide African American women with the critical belief in themselves and a commitment to develop and deliver on their potential.

Retention and Persistence

While females are more likely to attend community colleges, they are less likely to find themselves at the most highly selective schools, furthering concern for the

developmental identity of minority women (Sadker & Sadker, 1994). Studies have

suggested several important lessons for staff, faculty, administers, and community

college presidents as they produce more programs designed to increase women's

involvement in the mathematics and science courses of study. These include peer and

faculty mentoring, established learning communities, and continued research (Reille &

Kezar, 2010; Taylor et al., 1995; Vieyra, Gillmore, & Timmerman, 2011; Walsh, 1987).

Life on a community college campus is very different than what might be found at

a 4-year university; however, an atmosphere of academic rigor is still important. If one of

the main focuses of the community college is to provide developmental and remedial

courses, then it is imperative that these institutions conduct a needs assessment to

customize programs to their culture and student populations whether they are male,

female, minority, or nonminority students. In addition, the community college must

balance potential limitations of the campus or campuses by assessing the program's

effectiveness (Reille & Kezar, 2010).

According to Reille and Kezar (2010), "All colleges have their biases and lenses,

valuing some competencies more than others, sometimes to the point that they may not

pay attention to critical competencies that their future leaders will need" (p. 65), and this

may lead to a disconnect with students. Statistics suggest that community colleges or 2-

year institutions enroll the most assorted student populations in the postsecondary

educational system, so understanding the needs of these students is vital to the continued

success of these institutions (Schwartz, 2007). The needs of the African American

woman who attends a community college is not just a problem that must be solved; it is a

representation of a lack of understanding women's development (Gilligan, 1982). Women's distinctiveness is observed in how they form relationships and their importance of as they pertain to school, instructors, courses, and home. These are all intertwined to produce a complex environment that must be recognized and respected by the community college. Presenting a dilemma as a real world math problem narrative of relationships that extends over time may assist women with the unique way women see life.

Derby (2007) reported that the potential interactions between ethnic background, orientation regarding course participation, and degree completion are all intertwined. If this is the case, then the interaction of women and minorities students and participation in orientation courses is the key to degree completion. Allowing students who need remediation and developmental courses to take them in condensed courses have proven to have some merit (Tinto, 2012; Yingyi, 2012; Zimenoff, 2013). Community colleges are in a strategic position to help increase students' access to, and participation in, the transfer process, yet students need to understand that the environment they will be entering at the university will be considerably different than that of the community college (Hagedorn, Cypers & Lester, 2008).

The term *transfer shock* has been used to describe the first and even second semester of a student transferring from the at home feel of the community college to the overwhelming obscurity of the university that accounts for a dip in academic performance. It is helpful for many students if they are better prepared for (a) a drop in grades in the first semester; (b) grades that will improve in direct relation to their length of schooling after transfer; and (c) encountering greater difficulty adjusting which may

lead to a longer time to graduation (Laanan, 2001). If students can adapt to the institutional culture, expectations, isolation, and conflicting priorities then the transformation will be considerably easier. This is true for all the students who transfer from community colleges, not just women and minorities (Reyes, 2011).

Transfer and Degree Completion

For mathematics, science, and engineering majors, retention and transfer rates are very similar to other academic fields with approximately 20% transferring to a 4-year institution or university and only about 30% graduating in the field in which they transferred (Lloyd & Eckhardt, 2010). Brawer and Cohen (1987) stated that the collegiate connection between the community college and the 4-year institution is the basis for higher education through transfer; however, if one or both is destabilized then the entire system suffers. In addition, the intention to transfer by the student and its manifestation through the actual transfer to the university is what keeps the system working smoothly (Brawer & Cohen, 1987).

The transfer of a student to a 4-year institution is one of the central missions of the community college; however, it is difficult to determine actual transfer rates due to the way students matriculate from one college to another. Why is this the case, and how can it be made it easier to track students? Brawer and Cohen (1987) stated there are too many permutations that affect the data sets that are collected by colleges making them too difficult to pinpoint a definition of transfer. Some of these factors are (a) students who transfer to universities in other states; (b) students with dual enrollment at the community college and university;(c) students who take a" break" before entering the university;(d)

students who transfer without earning an associate's degree; and (e) students who began coursework at a university, only to withdraw and take classes at a community college, and then return to the university (Brawer & Cohen, 1987; Cypers et al., 2008). The data collected by state agencies also have large disparities based on students who transfer to private universities. Any time data is based on student completion of survey forms this has the potential to lead to inaccurate data.

Recognizing these challenges can help preserve, enhance, and articulate the transfer function as an important organizational strategy for leaders (Campbell et al., 2010; Jackson, Starobin & Laanan, 2013). It has been stated that the only way to get a clear or more accurate picture of this situation is to analyze the transcripts of all students who are enrolled in universities and for them to accept a certain number of community college classes as evidence that the student has transferred from the community college (Brawer & Cohen, 1987; Hagedorn et al., 2008). Leaders can make a difference in removing the barriers many students face when transferring from the community college to the university by noticing those community colleges that increase the number of students studying STEM fields. These data can provide a boost of confidence in the American community college system; however, the scrutiny can seem unbearable to the presidents of the community colleges to produce evidence that their programs are working for the targeted groups. Broadening female participation in STEM is of high priority and getting improved numbers for minorities in these areas may even trump this other expectation (Laanan & Starobin, 2008). These groups are gaining footing and progressing at a steady pace. Understanding this form of education may determine future

earning power. The correlations between women, minorities, and the African American woman who may not be able to obtain a fair opportunity to achieve prominent jobs and occupations based on their education is unacceptable (Clifton et al., 2008; Mack, Rankins & Woodson, 2013).

Students can combat any obstacle if they have the resources to do so; however, many milestones must be met for the students to feel they have accomplished something and give them the drive to continue (Bailey et al., 2007). Simply attending classes does not constitute an actual education. Students may believe that regardless of what courses they have taken they will graduate in 2 years from their community college and move into a university of their choice without the proper coursework or grade point average (Hagedorn et. al, 2006). At the same time, secondary educational systems need to do a better job of preparing students for the rigor of a college education and form alliances with neighboring colleges (Bailey et al., 2007). Hagedorn et al. (2006) state, "The apparent gap in success between African Americans and other students points to the need for programs designed to help all students succeed" (p. 241). If students are presented with convenient course schedules, faculty involvement, sufficient information regarding transfer requirements at enrollment, and good academic advising, then transfer is possible.

Summary

This chapter discussed the literature review process and the difficulty in discovering current material on the four components of this study: African American women, community colleges, STEM, and retention and transfer to 4-year institutions.

There were a few studies that focused on the basic foundations of women's needs and African American women's needs and development, along with the community college environment and encouragement as they relate to STEM, HBCUs, and 4-year institutions. Conclusions were made based on the community college transfer programs as a significant part of an intricate system of education providing access to individuals who may have numerous complications or disadvantages such as income, education, and opportunity. The community college affords these individuals the opportunity to continue their education and transfer to the 4-year university level. The previous research on transfer students points to a complex academic, social, or psychological period of adjustment. These experiences may be based upon the environmental differences between 2 and 4-year institutions. An awareness of the expectations of the 4-year schools, mentors, and programs designed to aid in the transition will facilitate a student's successful change and ultimate success in the completion of a bachelor's degree (Campbell et al., 2010; Hagedorn et al., 2006).

The key to the success of any community college or university program that focuses in STEM or offers STEM courses is a coordinator that heads the program, a president who backs the program fully, faculty and staff who work to ensure its success, the partners who will be mentors and future employers, and the African American students who will take this partnership as a positive learning experience. As a result, these students will spread the word that will increase the participation of other African American women in these fields. The literature review illustrates the gap in the information that pertains to the motivations and perceptions of African American women

in community college. It also illuminates motivations to investigate STEM, African American women, and the community college. Chapter 3 discusses the research design and methodology of this study including the data analysis plan and issues of trustworthiness used in this research study.

Chapter 3: Research Method

Introduction

The purpose of this phenomenological study was to understand the lived experiences and the perspectives of African American women enrolled in STEM fields as these related to their matriculation in community college. The study explored these women's experiences pertaining to community college support systems and personnel, community college academic program offerings, and their intentions to continue to pursue STEM fields at their transfer institutions. In this chapter, I particularize the phenomenological research design and strategies for data collection and analysis for this research study. I also describe the setting, designate the population, and communicate my role as the researcher, along with acknowledgment of any ethical considerations as they pertain to the perspectives of African American women enrolled in STEM fields and their matriculation in the community college.

Research Design and Rationale

The research questions addressed in this study were:

- Research Question 1: What are the lived experiences and perceptions of African American women enrolled in STEM fields while in community college?

- Research Question 2: What are the lived experiences of African American women related to supports and barriers while in community college?

- Research Question 3: What is the essence of African American women's decision making related to continuing to pursue one of the STEM fields?

A phenomenological research design was preferable over case study as it allowed for exploration of all the concepts examined in the research simultaneously and assisted in providing an understanding of the lived experiences and perspectives of the research population, as suggested by Hatch (2002). Van Maanen (1982) observed, "The result of ethnographic inquiry is cultural description. It is, however, a description of the sort that can emerge only from a lengthy period of intimate study and residence in a given social setting" (pp. 103-104). Data collection for a case study of this type was beyond the time available for this research.

The phenomenological approach to the study was preferable to a narrative or grounded research design. Narrative studies are designed to explain what provides meaning in the lives of the subject by telling a story more broadly and are not bound to a single setting such as a community college (Creswell, 2007, 2009; Hatch, 2002; McJunkin, 2005; Merriam, 2002). Grounded theory offers an explanation regarding a phenomenon (Creswell, 2007, 2009; Hatch, 2002; McJunkin, 2005; Merriam, 2002); however, time did not make this extensive research possible.

Since other research already established a relationship between community colleges, women, and African Americans, it was important to view the community college from the perception of African American women to understand what may motivate her to maintain and continue to pursue a STEM degree According to Moustakas (1994) understanding the significant, tangible interactions of a phenomenon is inherent in giving an account of an experience in the framework or circumstances surrounding a particular situation are the primary target of phenomenological knowledge or research.

The use of a phenomenological design maximized my opportunity to hear the lived experiences and perspectives of African American women enrolled in STEM fields related to their matriculation in community colleges.

Phenomenological research investigates and illuminates the specific phenomena based on perceived experiences by a person or group in a particular situation. In addition, a phenomenological study "produces a wealth of detailed information about a much smaller number of people and class" (Patton, 1990, p. 14). This inductive method is achieved through detailed and in-depth data collection involving observations, interviews, and reports (Creswell, 2007, 2009; Heidegger, 1996; Maxwell, 2005; Merriam, 2002; Patton, 1990). I utilized a hermeneutic phenomenological approach that involved reviewing the experiences of a person or group to acquire ample amounts of information to describe lived experiences completely in a reflective manner. This approach was inclusive in nature and optimized analysis of the quintessence of the individual or group's experience, as suggested by Dabbs (1982), Moustakas (1994), and Van Manen (1990).

Role of the Researcher

Moustakas (1994) expounded on the role of the phenomenological researcher as one who determines the essential structures of an experience by interpreting the participant's descriptions of the condition in which they occurred (p. 13). Van Manen (1990) postulated that "from a phenomenological point of view, to do research is always to question the way we experience the world, to want to know the world in which we live as human beings" (p. 5). As a researcher, I strove to interpret participant descriptions and

explore the perceptions of their lived experiences, keeping in mind how I view the world. I am an African American woman who teaches at a college in the discipline of mathematics and has 15 years of experience working with students from age 14 to adulthood. I began my higher educational pursuits at a community college and transferred to a university with a scholarship to study mathematics and physics. I have taught at a community college or college setting since 2007; this female African American demographic is reflective of the participant pool for this study. I was not an employee of the study sites at the time of this study, so my professional roles did not affect data collection, except for providing me with the necessary background experience of working with and relating to other African American women.

Understanding how one's experiences shape your view point is important. Van Manen (1990, 2007) hypothesized that "to be aware of the structure of one's own experience of a phenomenon may provide the researcher with clues for orienting oneself to the phenomenon and thus to all other stages of phenomenological research" (p. 57). It is because of this awareness of my adaptability that I strive to familiarize myself with the phenomenon that I had previously experienced as an African American woman who attended a community college and transferred to a university in a STEM major. Moustakas (1994) referred to phenomenological research as something that must form from an intense interest in a problem or experience that affects someone personally and causes a focal point to that personal history (p. 104). I was interested in learning more about African American women and the community college. My experience with the community college environment and its personnel empowered and inspired me to

continue my studies in my STEM field and to encourage other students to strive in the mathematics and science fields as well.

Moustakas (1994) stated that researchers must reflect and reconsider phenomena through a fresh lens unclouded with prejudice (p. 33). I recognized my personal biases as an African American woman who faced many instances where my STEM degree began to feel unattainable because of the role my environment played in my experiences at a community college and university. The support I received from my family, as well as the positive experiences I had attending a community college and university, were such that I did not allow these events to hinder my objectivity. I used criterion sampling and followed Moustakas's advice by using bracketing through the process of epoche where I deferred all judgments about the topic of the study. A peer reviewer was also utilized to minimize the potential for bias.

Methodology

Selecting Participants

I used a purposeful criterion sampling approach to select participants. The primary criterion for participation in this study was that participants be African American women who were students at community colleges in the southern United States. A formal letter was written to the presidents of the colleges and the deans of enrollment services at the study sites to request permission to solicit participation from African American women currently enrolled in STEM courses and who have completed three or more quarters or two semesters. Permission was granted to recruit students via flyers. The

African American women who responded to these flyers thereby established their willingness to participate in the study.

The criteria used to select participants from those who responded to this study were that each: (a) self-identified as African American woman who has completed three or more quarters or two semesters; (b) was over the age of 18; and (c) was attending a public community college or college that offered an associate's degree or courses in STEM. Because two contrasting institutions were selected for this study, my goal was to identify three to five participants from the institution with an active STEM program, and another three to five participants from the institution with courses in STEM but no an active degree program. I was able to get three participants from the institution with an active STEM program, and the same number from the institution that offered courses but no degree. A final participant was included who had attended both types of community colleges I targeted for this study. In a phenomenology, the abundance of important information obtained from the participants is more critical than the size of the sample (Creswell, 2007, 2009; Hatch, 2002; Heidegger, 1977; Merriam, 2002; Moustakas, 1994; Van Maanen, 1982). Understanding each African American woman's experience is more important than a large sample, and I was able to gain an understanding of the phenomena with the diverse African American women selected for this study.

A qualitative study was conducive to the purpose of the research. Percentages and correlations were not the main goals of the study; therefore, quantitative approaches were discounted. A phenomenological study was chosen based on understanding the lived

experiences and the perspectives of African American women enrolled in STEM fields related to their matriculation in the community college.

Rationale for the design. A person's motivation in a field of study and attachment to an institution or environment are complex ideas that cannot be seen or measured in a concrete manner and have to be explained by the person who is undergoing the experience (Dabbs, 1982; Heidegger, 1977; Moustakas, 1994; Van Maanen, 1982). For these reasons, I selected a phenomenological research method for this study. In-depth personal interviews were done to accomplish this research study. Triangulation was achieved based on the different perspectives of each African American woman. I developed the interview questions based on three issues: (a) the amounts of encouragement, support, and interactions the faculty at the community college gave African American women; (b) the overall environment and culture of the community college; and (c) the academic programs provided by the community college that influence decisions concerning STEM fields. A second component of the interview questions involved how encouragement and environment contribute to the persistence and retention of the African American women at the community college in the STEM fields as they prepare to transfer or obtain an associate's degree. The grouping of information from single, married, single with children, and married with children participant data were produced to achieve triangulation as a means of ensuring the research results were consistent from a number of perspectives.

Instrumentation and Procedures

The instrumentation created for this study was originally developed and conducted in research involving three African American women and two African American men who pursued degrees in STEM and are working professionals in one of these fields. The interviews were 30 to 45 minutes in length. The interview protocol was clear and the working professionals did not ask for any clarification of details; however, many of the answers that were submitted were very short or involved only one word answers. Some questions brought about an overflow of responses by the participants, while others elicited little elaboration.

In reference to university encouragement questions, 60% of participants were involved in school programs at the community college or university level, with 80% of the participants meeting with their program advisor or assistant once a quarter or semester, therefore, believing it was beneficial to their educational process. Questions that dealt with reasons for persistence were inconsistent and varied; however, the responses did give insight into what they felt was important to them and their educational goals. Regarding questions that dealt with feelings of success, 80% responded that grades were what made them feel successful, with 60% stating that praise and knowing they did their best are what made them feel successful. When asked about faculty or staff involvement and encouragement, 80% of participants stated that a faculty member either encouraged them through actions or mentoring, whether by showing them something of interest or by taking a personal interest in them.

The interview questions answered by the participants were effective in gaining information that is useful for the present study and could lead to further research. With respect to some of the responses based on certain school experience—community college, non-HBCU or HBCU—the questions generated information that was not anticipated and had to be revaluated through additional research regarding the influence on African Americans and HBCUs in their education in STEM fields.

The interviews were partitioned into sections which focused on past college or university life, university encouragement, and overall opinion based on experience. Additional categories were derived from the data that were more substantive in nature and came from the interviewee's themselves based on comments. These substantive categories were recruitment, awareness, and mentorship. The men and women interviewed had thoughts about their college and university experience that were very similar. Most attributed a mathematics or science teacher with guiding or mentoring them in the direction of the field they are now employed. The women interviewed still hold firm to past beliefs or stereotypes that males are stronger and more competent in the math and science areas of study while they are stronger in humanities professions. These women, who have already obtained a degree in a STEM field, explained the predicament that women face in entering the STEM fields. Even in 2016 some women believe that engineering and other math-related fields are not available for them. Overall, some of the questions may have been leading and others to vague.

The results of the developed instrumentation showed that both males and females felt there is little support for African Americans pursuing STEM fields and believe this

can be easily averted if a clear understanding is established and guidance given from high schools, community colleges, and universities. This guidance can come in the form of mentoring programs in the industry, research, engineering, and other career opportunities in STEM fields. People are the most valuable resource, and using them to attract other African Americans into the field was the consensus.

Recruitment

Flyers were made to solicit participation from African American women who are current students at each community college and have completed three or more quarters or two semesters. The African American women who responded, therefore, established their willingness to participate in the study.

Procedures

Once participants agreed to be in the study, they were asked to participate in a one-on-one recorded interview that would last approximately 60 minutes. When the interview was completed, the participant's involvement was concluded.

Data Collection

African American women currently enrolled as students at a community college and have completed three or more quarters or two semesters were recruited. The African American women who responded established their willingness to participate in the study. Based on the phenomenological approach, data collection was completed through semi-structured interviews. My goal was to interview three to five African American women from community colleges with a STEM program in place, and from community colleges

with courses in STEM but without a STEM program. A total of seven African American women interviewed.

I was able to get three participants from an institution with an active STEM program, and three from an institution with no STEM program, but which offered courses in these areas of study. In addition, one participant had attended both types of community colleges that I was targeting for this study. Below is a detailed step-by-step explanation of how the data were collected and the instrument for collection.

Interview Process

Questions for the interview protocol were constructed based on the research done in preparing the literature review. The open-ended questions, along with probes, create an opportunity for the African American women to voice their opinion about their lived experience and allowed the participant to deliver an answer to each question based on that lived experience. I presented a draft to a few colleagues for feedback, and made some changes based on suggestions. Lists of questions were modified to answer the research questions with a better comprehension of subject matter, simplicity, relevance, and without any redundancy.

A conference room or privacy room was appropriated to accommodate the interviews to minimize distractions and to allow for privacy with each participant. Interviews were scheduled to accommodate the participants' time frame and to allow time for reflection before the next interview. The interviews began with an introduction and their rights as participants explained to them. The participants could then decide if they still wanted to take part in the interview for the study, and if they agreed, the

interview commenced. Interviews were recorded, and written field notes taken. At the conclusion of the interview, the participants were allowed to review notes and the recording. I thanked all participants and informed them if they had any questions or concerns how to contact me by phone or with my personal and institution e-mail addresses. The interviews were all conducted face-to-face; however, a backup method was planned if a participant was not able to appear for the interview. Other means of communication were considered such as phone, Skype, and e-mail until all data collection was completed. The demographic data were obtained through self-reporting (See Appendix B) by each African American woman student. This information was used in the grouping of data from single, married, single with children, or married with children.

Rationale for grouping participants. Women define themselves by their interactions and relationships which may help determine the mindset of African American women toward educational goals and advancement based on being single, married, single with children, or married with children. These encounters may vary based on the criteria of a single woman with children rather than a woman who is single with no children in her care. This difference could be even greater between a married woman and a married woman with a child. This study determined that the phenomenon occurs with no correlation to the grouping criteria. The results were solely based on the reported lived experience of each African American woman.

The initial questions developed were modified from the original version based on results from the responses of mathematics, science, and engineering colleagues. The data

collected were based on self-designed interview questions (See Appendix C) tested with

colleagues for effective and efficient responses to questions. Permission to conduct the

research was obtained from each community college president. Each president appointed

me a college liaison, to assist with my research process on the campus. The liaison held

the position of vice president of academic effectiveness or the coordinator of institutional

research. I was also allowed access to the institutions' population records which are open

to the public. Once participants contacted me about their willingness to be in the study, I

sent each of them a copy of the invitation letter noting the purpose of the study and area

of focus, and research questions via e-mail (See Appendix A and Appendix C without

probes). I explained this again in person to make sure the participants understood the

process and purpose of the study and were able to give their full consent (See Appendix

D). Research packets containing a research invitation letter (Appendix A) and the

informed consent document (Appendix D) were handed to each African American

women participant before the interview began. After completing the consent form, each

retained a copy of the letter and consent form for their records. The participants were told

that they could withdraw from the study at any time.

Data Analysis

      The purpose of data in the empirical phenomenological approach is to obtain a

comprehensive description that can be contemplative in nature to understand the pure

essence of a phenomenon or experience (Moustakas, 1994). The process of developing an

understanding of the lived experiences of African American women interested in STEM

fields related to their matriculation in community college was based on themes that came

from their interviews (Van Manen, 1990). After the interviews, I interpreted the

participants' perceptions based on their community college experiences and their

continued choice to select a STEM field of study when they transfer to the university.

The lived experience of each African American woman provides insight into the meaning

she ascribes to the phenomenon (Van Manen, 1990). I examined the interviews for

commonalities between the African American women participants' experiences to

determine a mutual fundamental nature of the phenomenon.

Issues of Trustworthiness

Trustworthiness of a study is often viewed as the ability to validate the research

through qualitative measures. The goal is to attempt to assure trustworthiness through

triangulation. The women's stories were supported by the literature, and there was

consistency across the interviews. A peer reviewer was utilized to minimize the potential

for bias. Reliability was enhanced by recording the interviews and by checking

transcripts against the audio recordings to ensure accurate transcription. A peer review

was conducted at the conclusion of the study to determine if interpretations made during

the analysis process were free from bias and based solely on the information provided

(Merriam, 2002). The peer reviewer examined the analysis of the data, the summary of

the identified phenomenological themes, and the final statement about the African

American women's experiences at the community college which helped in identifying

transferability. If discrepancies existed, they were identified and amended.

Ethical Concerns

       The protection of the African American women who participated in the study was of the highest importance. In keeping with the integrity of the research close attention was paid to the concerns of each participant. Full disclosure of the purpose of the study, gaining informed consent, assessing and accommodating potential risks, writing notes in thoughtful language, refraining from unethical practices before, during, and after the interviews were completed, and reporting the findings in an ethical manner guided this study (Creswell, 2007). To ensure that the African American women participants were protected, an approved human research protection training course and certification was completed. Ethical concerns were also addressed by obtaining Walden University's Institutional Review Board (IRB) process approval (# 05-18-15-0145057; expiration 05-17-16). The IRB was designed to guarantee that the research complies with U.S. federal regulations and Walden University standards. All African American women participants were treated with understanding, thoughtfulness, and respect throughout collection, processing, and reporting of the data. Finally, a full disclosure of the intent of the research along with the voluntary nature of participation was made clear to all participates before, during, and after data collection. Confidentiality was assured, and all data will be kept secured.

       The procedure for providing informed consent to those I observed and interviewed commenced with each interview. Explaining what the study was about, giving each participant the option to change their minds regarding participating, informing them that they could stop at any time or did not have to answer a question if

they felt it was too personal in nature was provided. At the end of each interview, I informed them that they could review to the video recording and have a copy of the transcripts of their personal interview. I also informed them that if there was anything they felt was not what they meant to say or was incorrect I would not include it in the final write-up. None of the participants requested transcripts. Finally, if they were to change their mind about their participation after the interview, they had the option to withdraw from the study. None of the participants withdrew. Those who chose to be a part of the study could have been a former student from a secondary institution where I was once employed or could be a student in a future class as they transfer to their chosen postsecondary institution where I am currently employed. Current students were not permitted to participate due to ethical concerns. I was not employed at either of the institutions where the study took place, and therefore, no ethical concerns arose.

Summary

This qualitative phenomenological research study investigated the lived experiences of African American women in community college relating to choice of a STEM field as they transfer to the university level. The study was conducted in 2015 and was guided by the principal research questions based on the lived experience of African American women attending community colleges. The interview protocol, data analysis, ethical concerns, and feasibility were discussed. IRB approval was obtained, confidentiality was assured, and all data were kept secured. Reliability was heightened by checking the transcripts to ensure accurate reporting.

The practical contributions of this study are for both African American women and community colleges to share a role in increasing the number of applicable African American women for STEM fields. The study provides important information for community colleges as they initiate programs, and maintain funding to promote African American women in the STEM fields. Chapter 3 provided an in-depth review of the research method utilized in the study. Chapter 4 reports the results and findings of the qualitative data produced.

Chapter 4: Results

This study utilized a qualitative phenomenological study design to describe the lived experiences of seven African American women who attended community colleges and were enrolled in STEM-related fields. The purpose of this study was to understand the lived experiences and perspectives of African American women enrolled in STEM fields related to their matriculation in community college. The study was designed to explore these women's experiences with community college support systems and personnel, community college academic program offerings, and their intentions to continue to pursue STEM fields at their transfer institutions. In this chapter, I will review the research questions and expound on the interview queries that lead to the conclusions in this study. I illustrate the setting and participants' profiles, explain the process for data collection and analysis, and present the results of the research.

Research Questions

- Research Question 1: What are the lived experiences and perceptions of African American women enrolled in STEM fields while in community college?

- Research Question 2: What are the lived experiences of African American women related to supports and barriers while in community college?

- Research Question 3: What is the essence of African American women's decision making related to continuing to pursue one of the STEM fields?

Setting

The African American women that I interviewed were all current community college students and had completed at least three quarters or two semesters at the two

community college institutions used as study sites. Participants were recruited through flyers placed at each campus. To my knowledge, no events were taking place on campus that may have affected their interview participation. A conference room, privacy room, or available adjunct office was used to conduct the interviews with minimal distractions, as well as provide privacy for each participant. Interviews were scheduled to accommodate the participants' available time frame, and to allow a period of reflection before the next interview.

Description of Participants

Five of the seven participants were single; four of the seven women had one or more children. One participant attended a community college with no established STEM program and transferred to a community college with a STEM program in place. Table 1 displays the attributes of these African American women participants.

Table 1

Participant Attributes

ID	Age Range	Status	STEM Program CC
Me'Shell	18-22	Single	No
Staci	48-52	Married/Children	No
Charisma	23-27	Single/Child	No
CheRae	23-27	Single/Child	No/Yes Transfer student
Paulizae	28-32	Single/Child	Yes
TaKira	18-22	Single	Yes
DaCarla	33-37	Married	Yes

Me'Shell was a confident 19-year-old woman. She was well-spoken and

extremely polite with a ready smile and openness to sharing her experiences. She

expressed that she was nervous and excited. She informed me that she had just received

confirmation she had been accepted in a STEM program at a HBCU. She explained that

she was single and had no children. She was enrolled in STEM courses; however, the

community college she attended did not have established STEM degree programs.

Staci was a distinguished 50-year-old woman. She expressed that she was tired,

yet happy to be there to assist. She was going through a divorce and had two grown

children who did not live with her and one 17-year-old still at home. She was enrolled in

STEM courses; however, the community college she attended did not have a STEM

program established.

Charisma was a 26-year-old woman; at the time of the study, she was engaged to be married and she had one son, age 4. She was enrolled in STEM courses; however, the community college she attended did not have a STEM program.

CheRae was a 26-year-old woman; during the brief introduction period, she mentioned that she had been in the Air Force since she graduated from high school. She had attended several community colleges before coming to the community college where she is currently enrolled. In addition, she had already completed her associate's degree because her current institution accepted field experience in biotechnology and her work with OSHA. She stated that she would be transferring to a university in January 2016 to majoring in chemical engineering. She had one child, a daughter, whose age was not mentioned; because that detail was not vital to the study, I did not inquire as to the daughter's age. CheRae was enrolled in STEM courses at a community college without a STEM program; however, she is now enrolled in STEM courses at the community college she attends as it currently has an established STEM program. She is also taking classes at the partner institution.

Paulizae was a 28-year-old woman. She was well-spoken and extremely polite with a quiet demeanor and smile that displayed openness. She expressed that she was nervous, and her heart was pounding. Paulizae was very open about being single and having a 10-year-old daughter. She expressed wanting to show her daughter that anything is possible when you put your mind to it. At the time of the interview, Paulizae stated she was in her last class at the community college and would be going to a university in the

next semester. She was enrolled in STEM courses at a community college with an established STEM program.

Takira was a 19-year-old woman. She expressed that she was nervous. Overall, she was confident and well-spoken. She was single with no children, had graduated from high school at age 17 and planned to finish her associate's degree in 18 months. While she stated that her experience was probably normal, she stated that she did not feel she had anything of value to share or have any insight on life. Most of Takira's elective coursework was in technology, and she said she fell in love with the STEM fields from those courses. She was planning to transfer to the partner university of her current community college. She was enrolled in STEM courses at a community college with an established STEM program.

DaCarla was a 35-year-old. She is married but has no children. She informed that me after becoming a Licensed Practical Nurse and working in that field for several years, that she liked working with biotechnology and decided she wanted to do that job instead. After coming back to school, she switched to a different STEM field based on her courses and faculty recommendations. DaCarla was enrolled in STEM courses at a community college with an established STEM program. She was scheduled to graduate at the end of 2015.

Data Collection

I recruited seven African American women who were current students at a community college and completed three or more quarters or two semesters. The African American women responded to the flyers posted; therefore, indicating their willingness to

participate in the study. The brief interview information sheet established the structure of the interview prior to its recording. At this time, participants revealed pertinent background information and gave permission for their first names only to be used in the study to safeguard confidentiality. The interview information sheet described the attributes of each participant. The information used from these sheets was first name, age range, and marital status. Information regarding the STEM courses at the community college where each participant was enrolled was obtained from the institution's admissions and enrollment services departments to determine if the courses were a part of a program at their community college. None of the participants asked for clarification of the details of the interview process. Many of their answers were very short until I asked probing questions. Some questions brought about extensive of explanations, and an abundance of descriptions of people and places.

Data collection occurred through semistructured interviews based on phenomenological research methods. My goal was to interview three to five African American women from community colleges with a STEM program in place, and three to five from community colleges with courses in STEM, but without a STEM program. Three participants were students who attended a community college in the southern region of the United States with a STEM program in place. Three other participants were students who attended a community college, also in the southern region of the United States, without a STEM program in place but offered classes in STEM-related fields. The last participant had attended both types of community colleges.

The participants who self-identified as meeting the criteria were given additional information from me regarding the research project's purpose and expectations via the phone, and again, on the day of the interview. I stressed the confidential and voluntary nature of participation during the initial phone conversation and when I e-mailed the consent form to be signed. All seven participants provided me with consent forms and agreed to be recorded. I discussed any risks and benefits of participating in the study. Each participant was informed where the interview would take place—on or near the community college campus where they attended—and a specific time for the interview. The participants were also made aware that transportation would not be provided, and no compensation would be allocated for time and cost of travel. No data were collected during any of the initial calls with the participants.

Three of the interviews took place in a library conference room located on a community college campus; one interview took place in an empty adjunct office, and three sessions were conducted at the local public library study room. The use of the adjunct office was a modification due to a time conflict with the library conference room. The participants and I mutually determined the availability of the different room types. This agreement ensured that each space would be convenient, and provide the participants with a familiar and safe environment where they would be comfortable, encouraging them to provide honest, in-depth responses and detail of their lived experiences.

The planned time for each interview was 1 hour. Four of the interviews approximately 75 minutes; two interviews lasted 45 minutes, and one lasted 30 minutes.

A minimum of 2 hours and 30 minutes was scheduled between interviews that occurred on the same day, so as to ensure an adequate amount of time between meetings. This was done to ensure that the participants did not meet one another prior to this process and so that the interview would begin at the appointed time. The interval between interviews also permitted me time to review and maintain any field notes, and to make any specially written comments regarding the interaction. In addition, this time allowed me to prepare for the next interview.

As each participant arrived for her interview, I greeted her at the door of the chosen location, introduced myself, confirmed her identity, and thanked her for her time and willingness to participate in this study. Before commencement of each interview, I reviewed interview protocol, the research questions, and the purpose of the study to remind the participants of the reason they were there. I also requested the consent form if I had not already obtained it. I reminded each woman of the confidential nature of the study, and that she had the right to withdraw at any time from the study or refuse to answer any questions that she felt made her uncomfortable. I then activated the IPad device for video recording and the interview began.

Each interview followed the interview protocol that I created. The probing questions were used when the participant did not elaborate on the initial question. I used field notes so that I could record my thoughts during the interview, and remain impartial as I reflected on the comments after the interview was completed. I thanked each participant at the end of the interview. After each participant left, I reviewed my field notes and made any additional comments that were warranted.

Once all interviews were completed, I transcribed each and reviewed the material. Once I completed transcribing all the data from the interviews, I entered them into the Coding Analysis Toolkit (CAT) software program along with the field notes I had previously transcribed.

Data Analysis

Inductive analysis began with the field notes and repeated review of the transcribed interviews until I identified the themes that governed my findings, as suggested by Hatch (2002). Next, utilizing Moustakas's (1994) method of data analysis for phenomenological study, I reviewed the transcripts numerous times, pinpointing and combining statements. I utilized in-depth, open-ended interview questions as the research tool with probes when needed (see Appendix C). This process allowed for the correlation of statements in the data. The findings of this study revealed insights into how African American women envision the environment and the support systems that are intertwined in the community college as it pertains to the STEM program or courses they are completing.

I also took steps to ensure the quality of my data. Creswell, Plano Clark, Gutmann, and Hanson (2003), Hatch (2002), and Moustakas (1994) all suggested the use of triangulation of data, peer review, and other methods as reinforcements to ensure the highest level of quality for phenomenological research. The validity of this study was increased using a peer reviewer. The peer reviewer was provided with a copy of the transcript summary without participants' names, a copy of the findings, and my

preliminary statement about the essence of the phenomenon that was occurring at the community college as it pertains to African American women and STEM fields. When the transcripts of the interviews were ready, I entered them into CAT as the primary document. The initial codes facilitated the sorting of the data. During the process, several codes were added. Data saturation was reached. This determination was based on the interview transcripts, codes produced and themes obtained from the interviews. The complete list of the codes used is found in Appendix E.

I read all transcripts closely for key ideas and phrases and coded them accordingly. The most frequently used codes were: *faculty encouragement* (FE), *faculty involvement* (FI), *faculty mentors* (FM), *community college partnership mentors* (CCPM), and *established partnership with 4-year institutions* (EP4YI). My reviews of the transcripts led me to many questions concerning my interpretation of the interviews; therefore, I conferenced with my peer reviewer to discuss and clarify the questions generated by the review to make sure none of my known and unknown biases were present. The peer reviewer signed a confidentiality form and read through my analysis of the data, the summary of the identified themes, and the final statements. While there were no fundamental changes made, this conference was invaluable in clarifying my preliminary interpretations.

Listening to the lived experiences of each African American woman provided me with a concrete insight into the unique experience each had in the community college where they were enrolled as they pursued their STEM-related degree. The commonalities

between the experiences of the African American women participants were identified

through an analysis of the data and further described in the findings of this study.

Evidence of Trustworthiness

I followed the specified process for participant recruitment, data collection, data

organization, and data analysis to establish trustworthiness. Every effort was made to

ensure credibility, transferability, dependability, and confirmability of the data collected.

I also gained approval to conduct this study from the Walden University IRB.

Credibility

I addressed credibility for this study in my detailed selection process of the

participants. All participants were African American women who were current students at

a community college and had completed three or more quarters or two semesters of

study. The African American women were also enrolled in courses that were related to

STEM fields. The women reflected on their lived experiences as they related to the

research questions. At the conclusion of the interview, each participant was given the

opportunity to view her recorded interview for member checking and approval. This

option helped to establish the credibility of the study.

Transferability

I addressed transferability for this study based on recruiting participants who were

students who attended a community college in the southern region of the United States

with a STEM program in place, and a community college in the southern region of the

United States without a STEM program, but offered STEM courses. Transferability is

limited, and the information is not transferable to all African American women. Students

were invited to participate, and therefore, each participant was self-selected. Transferability may be possible to some African American women in community colleges in the southern region of the United States. Due to the limited number of participants, and their exclusive experiences as African American women, the findings could be applied, with limitations, to other women or minorities. The experiences that the women shared may be different from women in other varying regions of the United States, however.

Dependability

I addressed dependability of my study by giving each participant the opportunity to review her video once the interview was completed. In addition, the participants could review their transcripts if they wished to after the interviews were transcribed. I utilized a peer reviewer to minimize the potential for bias. The peer reviewer had an earned doctorate in an unrelated field and provided the study with an objective perspective. The peer reviewer read through the analysis of the data, the summary of the identified themes, and the final statement about the African American women's experiences at their community college.

Confirmability

I addressed confirmability by using the conceptual framework and research questions. The theories that govern the conceptual framework established confirmability of the study and I consistently related the data, themes, and statements back to those established structural theories.

Results

The results are grouped based on the three research questions that guided this study. In order to make the account of the phenomenon more accurate, I included participant quotes. If the interview data I coded resulted in similar statements, then one statement was chosen to represent all those with similar statements. The statement kept to the original transcript to retain the authenticity of the participants' responses. A summary of those responses is also given with the ratio of those whose statements I coded under the same theme.

Research Question 1

The first research question asked, "What are the lived experiences and perceptions of African American women enrolled in STEM fields while in the community college?" I sought to build an understanding of the essence of the participants' lived experience with the community college program offerings and in the STEM courses, they were enrolled. The following corresponding interview questions and responses are from one or more participants and were chosen to convey the overall theme that emerged from analysis of all participant interviews.

Program introduction. The introduction to the programs available at the community college without a functioning STEM program allowed the participants to gauge their understanding of the majors available, courses required, and future career they would like to have. Staci mentioned that,

> When I got ready to apply here everybody was real open and welcoming. They
>
> introduced me to the programs offered and how long it would take for me to

complete them. . . . I was introduced to the people I would need to deal with, and

they gave me a booklet that dispelled reasons why I couldn't do it. No excuses!

The introduction to the programs available at the community college with a functioning

STEM program also allowed the participants to evaluate the majors available, courses

required and transfer opportunities as they continued in their studies. Paulizae stated,

The freshman orientation gave a brief overview of the information that I would

need for the future; it also told me what was available… I really liked the way

they showed me around the campus so I could know where everything was. Also,

they have several campuses which gives me options on where and what time I can

take my courses. They also have a partnership with the . . . university so that I can

transfer when I am done easier. There are tutoring labs in each concentration.

They have a STEM retention specialist, and my advisor is a mathematics

instructor here.

Program involvement. The participants reported that involvement in programs at

the community college brought about a feeling of belonging. Community colleges with

and without STEM programs produced five out of six of the participating contributors

who felt it was beneficial to be a part of the programs available. Me'Shell noted, "I am

involved in the biology club and the health and careers club. We meet once a month, and

they help me with resources that I may need in my field." TaKira stated,

I'm a member of the honor society, and I participate with the programs that the

Science department holds once a month. They have a retention coordinator, and I

speak to them and get questions answered. I really like that they either have the

answers, or they get me to a person who does. It makes it more clear to me and puts me on the path I need to take to finish here in 18 months and transfer to . . . university.

Environment. The environment set by each community college was important to how each African American woman views her importance to the institution. For example, Me'Shell offered, "It's urban. I don't get a variety of different people; it's just the same people from high school. I would like to see a variety of students and more majors offered here in math and science." Two out of four of the participants from a community college without a STEM program believed their community college was urban. Three out of four of the students from a community college with a STEM program spoke to feeling a sense of connection to their current college. CheRai noted,

Everyone is nice, and they make you feel like they want you to succeed. They know my name, and they keep up with my progress. There is a student café' and places to eat on campus. So I don't have to leave to go get something to eat. They have office hours for us and they actually are present for them. That is great because I have been at another community college and they were never where they said they would be.

Faculty involvement. When asked if faculty take an interest in them as a student, all seven participants answered "yes." Charisma stated, "Yes!! It makes me feel good that the instructors take the time to help me," and Staci agreed:

Yes, my mathematics classes and some of my science classes I had a hard time. The teachers make sure you understand and give you applications of each topic so

that you can see when and where you would use it. Made me feel good because you don't feel left behind or defeated.

Paulizae responded,

I was having some problems with my work and getting very confused about if this was really what I wanted to do. She set me up a visit to Southern Research to talk with one of the chemists there. And it was a woman; she said once I get closer to my degree that I should apply for an internship. I felt like I can really do this. I felt I had someone on my side that wanted me to succeed.

When asked if they felt successful, six of the seven students reported this when they were nominated for the honor society, and five out of seven experienced this if they achieved grades above their normal range. Staci felt successful "When I made the Dean's List three semesters consecutively," and Paulizae mentioned, "I was nominated for the honor society by a faculty member." CheRai commented, "When I made the President's List for the first time—I made the Dean's List over and over and just could not quite get to the Presidents list, so that was big for me." In addition, all of the participants felt successful when an instructor mentioned they did a good job or nominated them for an honor.

Campus activities. When asked if they participated in any on-campus activities, and if any of those campus activities were nonacademic, six out of seven of the participants stated they were not involved in activities that were non-academic. All participants were involved in academic activities such as honor societies or academic clubs. Paulizae mentioned,

I participate with the honor society it gives me an opportunity to communicate with like-minded people and network. If it is not academic I don't participate—I'm here to get an education, and if it is not pertaining to that, I don't do it.

College experience. The participants' overall comments regarding their college experience, environment, and encouragement were positive. Two out of three of participants from the community college without a STEM program mentioned they were still nervous about their future. Me'Shell stated,

I don't know what my overall feelings are. I just take it one day at a time. I feel at home here. It's cozy. I think that some teachers take an active role in me, and that makes me want to do my best. And I feel they want me to succeed as much as I want to succeed, and that makes the environment great.

One out of three felt prepared and ready for the next steps. Staci remarked,

My overall feeling when I began was nerves because it had been so long since I had been in school. But the support staff was so helpful that they put my mind at ease, and they made my experience one of comfort and ease. They had open-door policies and that made me feel encouraged that everyone wanted me to succeed.

Three of the four participants from the community college with a STEM program appeared to be more certain about their future compared to one of three from the campus without a STEM program. Takira stated, "My overall feelings change from day to day. Sometimes I am excited, irritated, enthused, scared . . . and comforted." Paulizae, a student at the community college with a STEM program, mentioned, "It has been really rewarding and I hope it continues as I transfer." DaCarla stated, "I feel that this was the

right decision, and this place will propel me into the future." An understanding of what support systems would help these students, therefore, becomes important.

The participants were asked what supports they would have liked provided for them during their time in the STEM classes and programs. Two out of three of the participants from the community college without a STEM program wanted more readily accessible information. Me'Shell stated, "More access to information and for everyone to communicate more with one another and students." While three out of four of the participants of the community college with a functioning STEM program were happy with the support provided, they would have liked for their mentor to be announced to them earlier in their program. DaCarla requested, "To know who my mentor will be earlier in my classes." The final question that pertained to the first research question asked participants to reflect on their life right now, the upcoming completion of the associate's degree, and their transfer to the university to continue their education. All seven participants felt ready for the next step regardless of whether they attended a community college with a STEM program. Staci said, "I feel ready to move forward." Charisma stated, "I feel very accomplished. Especially, since I have been trying to complete a degree for a long time." TaKira mentioned, "It means a lot and it is setting a baseline of what is to come as I move forward with my education. I have accomplished so much already and I'm so proud of myself and ready to move forward." Paulizae stated, "I'm very grateful for this opportunity to pursue my education and putting me in a position to better take care of myself and my child." This sense of readiness came from the education they obtained.

Summary of research question one findings. The first research question asked,

"What are the lived experiences and perceptions of African American women enrolled in

STEM fields while in the community college?" This question sought to build an

understanding of the essence of the participants' lived experience with the community

college overall as it pertained to enrollment in STEM courses. While many of the

responses were similar from both the community college without an established STEM

program, and the community college with an established STEM program, the main theme

that emerged was that faculty encouragement and involvement is vital to the wellbeing

and productivity of the African American females at these institutions. The women's

experiences during orientation to the community college played a major part for the

African American women, and their abilities to understand what resources were available

to them. All of the African American women were able to experience being a part of an

honor society or academic club. They envisioned themselves completing the degree, and

realized that the aspects of degree attainment are rooted in their completion of

community college and transfer to the university. This revelation was a pattern and

expressed by each African American woman in this study.

Research Question 2

The second research question asked, "What are the lived experiences of African

American women related to supports and barriers while in community college?" This

question sought to build an understanding of the issues faced by these students, and the

support systems established by the community college to aid them with attainment of

STEM degrees and opportunities for employment. The following corresponding

interview questions and responses from one or more participants were chosen to convey the overall theme that emerged from analysis of all participant interviews.

Persistence. The participants were asked what conditions contributed to their persistence at the community college. All students from the community college without a STEM program, as well as those with a functioning STEM program, claimed it was a past or present instructor. Me'Shell stated,

> An environmental science teacher who graduated from this community college and went on to get a degree in biology; she talks to me about completing my degree and how she could have went to medical school but she did not have someone to help guide her and she just wants to facilitate me in any way she can. Just allows me to have a different perspective.

Participants not only stressed benefits of having an instructor guide them through the process but also wanted the benefits of having someone to lead them by example. Paulizae explained,

> The knowledge in knowing that this is something I have always wanted to do. The faculty member who I really liked and learned a lot from was my math teacher. It showed me that women are just as smart as men. That chick was super smart. Too, smart. She tutored me. She keep telling me 'don't over think things' and that I had it 'don't give up.' She was not just here for herself I felt like she truly cared about me as a student

Class environment. Although instructors are the main driving force for success for these African American women, how these women perceive the community college

environment as it pertains to their surroundings is also critical. Participants from both community colleges—those with and without a STEM program—stated that other students were their largest distraction, with six participants emphasizing this aspect of their experience. Charisma mentioned,

> Some classes have younger students, and they are a little less motivated and therefore more disruptive. Some of my other classes are at night, and they have an older crowd, and they seem to be more focused. We help each other to get through these classes

DeCarla stated,

> It is a sense of scholarship most days. They have a sense of professional and nonprofessional atmosphere to a certain degree. Most are serious and have that seriousness, but not everyone here behavior is appropriate for what we are trying to accomplish.

Variables that determine class atmosphere include class structure, student mood, varying aptitudes, and instructor disposition. All of these variables may cause distractions in the classroom and change the learning process from day to day. The participants' statements indicate that for these African American females, other students are the largest distraction, and this type of distraction varies from class to class.

Mentoring. When asked about mentoring program availability at the community college without a STEM program, all participants observed that there was no formal mentoring program available; however, one out of three students had a mentor during the summer from a previous employment opportunity. Me'Shell stated, "No [she had not had

a mentor], but faculty have told me about partnerships that are available at . . . in STEM programs, and how I could get one for the summer." When the same question regarding mentoring programs was asked to participants from a community college with a functioning STEM program, three out of four stated there was a mentoring program, and they were encouraged to take advantage of that resource in order to prepare themselves for the challenges of the future courses required for degree attainment. The fourth participant stated that she was unclear, and that instructors inform students of what is available. Paulizae explained, "Individual instructors tell you things and they take you to get experience, and while you are there you have the opportunity to get a mentor." Three out of four of the participants had a mentor. The fourth stated she currently did not have a mentor, but instructors gave her information and she would be assigned one soon.

Contributions to success. All of the participants from community colleges both with and without a STEM program stated that faculty and staff contributed to their success in their educational program. Charisma and Staci both claimed, "Everyone has been so helpful." Takira stated, "All of them are equally important in helping me to do better and aiding in my successfulness." Because faculty members were so instrumental in student perceived success, the next question was about participant experiences with a mentor. All of the participants from the community college without a STEM program mentioned there was no organized mentoring program. Students from the community college with a functioning STEM program stated that the mentor was very helpful in the process. Most of the participants expressed views similar to the following: CheRai explained,

I have just been assigned one so far it has been good. My mentor and I discussed

my goals and aspirations and a plan on how to achieve those goals. It just clears

up some things for me, and what my next steps should be in my education.

Takira stated, "I speak to my mentor once or twice a month by phone and more often by

email it is helpful."

The participants were asked what would they have liked to see provided for them

during their time in the STEM courses and or program. The participants from the

community college without a STEM program, but with STEM classes requested

mentoring and resources to help facilitate their transition to the university. Staci

expressed, "More mentoring opportunities and more resources are required!" The

community college with functioning STEM program participants stated that the mentor

was very helpful in the process, but they would like more internship opportunities earlier

in the program.

STEM completion. The participants were asked what they thought their

institution should do that it was not already doing to aid in the participants' and other

African American women's successful completion in STEM fields. All of the participants

from the community college without a STEM program stated they would like a STEM

program in place. MeShell stated, "More resources, more opportunities for mentors, more

opportunities to shadow others in the fields we want to pursue, and if possible, have a real

STEM program that will provide opportunities for job placement or at least internships."

Two out of four of the participants from the community college with a functioning STEM

program wanted more classes with varying topics for future job opportunities. CheRai

stated, "Maybe offer a more varied array of classes geared toward specific jobs we will be able to get after we are finished with the program." Two of the four participants from the community college with a STEM program had no comment or felt everything was being done as it should except for the delivery and distribution of information. Takira from a community college with a STEM program stated,

I think connecting more with the students during the mentorship process. Sometimes I feel left in the dark trying to find my own way through these multi-facets of information out there. Some of the instructors have information but not all of them. They need to communicate with themselves and us more.

Summary of research question two findings. The second research question asked "What are the lived experiences of African American women related to supports and barriers while in community college?" This question sought to build an understanding of the issues faced and the support systems established by the community college to aid students with their attainment of STEM degrees and opportunities for employment. It is clear that the participants feel, based on their experiences, that they have made their achievements with the encouragement given to them by their instructors. The combination of environment and encouragement shown to these women aided in their self-actualization. The pattern that emerged from all of the participants was that they felt most successful when nominated for the honor societies or awarded with Dean's List or President's List notification. This maximization of gains in awards and accolades allows women to fulfill the need for self-respect, increased self-esteem, and admiration from peers. The participants also mentioned in their interviews that one or several

instructors within their field had the most influence on their success. This phenomenon can be attributed to modeling of a successful faculty member, and their involvement in these African American women's lives in order to help them achieve the desired outcome of degree completion.

Research Question 3

The third research question asked, "What is the essence of African American women's decision making related to continuing to pursue one of the STEM fields?" This question sought to understand the viewpoint of the African American woman as she finishes community college and continues to obtain a 4-year degree in STEM. The following corresponding interview questions and responses from one or more participants were chosen to convey the overall theme that emerged from analysis of all participant interviews.

One out of three participants attending the community college without a STEM program in place stated they felt ready to move forward based on the education they had received. Another participant believed that the clubs and resources were responsible for her persistence in the STEM courses. Me'Shell stated, "[The institution] provided me with the biology club, health and career club, resources, and job fairs." The last participant from a community college without a STEM program believed the institution had very little to do with her persistence, and contributed all of her resolve to the faculty. Charisma stated, "[It was] not the college, but the instructors that have taught me what I really need to be successful in the field."

All of the participants at the community college with a STEM program in place believed that the institution made it easier for them to persist because of the partnership that was in place at the university. CheRai remarked that they "made it convenient for me to see what is needed when I leave here. There is an institution that is partnered with this community college where I can finish my studies."

All of the participants felt that the community college experience affected other aspects of their life by giving them a positive outlook on the future and what it may hold for them. Staci declared, "Nothing is impossible; just don't quit!" Charisma claimed, "I'm ready to start working in my field and continue my education and get that 4-year degree." DaCarla stated, "I can do anything I set my mind to." These comments were mirrored by all the other participants as it pertained to the topic of their education affecting other aspects of their life.

Finally, when asked what the institution has done, if anything, to assist them in their persistence in their choice to get a STEM degree, all three of the participants from the community college without a STEM program believed that the instructors helped them realize their dreams were obtainable. Me'Shell stated, "The instructors helped me realize that it is possible and that I can do it." The participants from the community college with a functioning STEM program believed the courses were relevant and interesting, and the partner university allowed them to have dual enrollment after they had completed certain classes. TaKira advised, "Keep it interesting. All my classes they offered here is [*sic*] linked to the partner institution so that we can see how they correlate and they transfer so we are on track to graduate in a timely manner." The collaboration

with the partner institution made them feel more secure about where they were headed, and how long it might take to get there. This knowledge left the African American women feeling optimistic about the future and their overall educational experience at the community college.

Summary of research question three findings. The third research question asked, "What is the essence of African American women's decision making related to continuing to pursue one of the STEM fields?" The purpose of this question was to understand the viewpoint of the African American woman as she finishes the community college to continue to obtain a 4-year degree in STEM. Fundamentally, it is important to look at social cognitive theory, information-processing theory, and constructivism theories of learning used and developed in instructional classes across the United States today. Women of all races and classes come to the community college where they must be reassured that they are qualified to perform the tasks they would like to undertake. These women's experiences of reaching the point where they are ready to transfer to the university or complete an associate's degree give them that boost to assists them in pursuing a 4-year degree.

Conclusion

This study explored the African American women's experiences pertaining to community college support systems and personnel, community college academic program offerings, and their intentions to continue to pursue STEM fields at their transfer institutions. These components are structured around class, race, gender, employment, and programs in the adult education classroom having a profound effect on the learning

process and decisions to continue in STEM-related fields upon transfer. The convergence of the responses in these sections led me to develop several themes: *faculty encouragement, faculty involvement, faculty mentors, community college partnership mentors and established partnership with 4-year institutions*. Each of these themes helped describe the essence of the phenomenon that occurs at the community college as it pertains to African American women and STEM fields. This study determined that the phenomenon had no correlation to the grouping criteria of single, married, single with children, or married with children. The results were solely based on the reported lived experience of each African American woman. There was very little difference between a community college with a STEM program in place and a community college without a STEM program in place as it pertained to the participants' perception of the institution, faculty members, and involvement. The environment and mentorship opportunities were the biggest difference between community colleges with and without a STEM program.

In reference to themes that emerged about community college, five out of the seven participants were involved in school programs, with six out of seven meeting with their program advisor or assistant once a month. The participants believed it was beneficial to their education process to stay in contact with program advisors. The themes that emerged for reasons for persistence were consistent in that six out of seven attributed their persistence to an outside source that motivated them to continue. Regarding the responses to feelings of success, all the participants responded that grades were what made them feel successful, with six out of seven stating that praise from an instructor and knowing they did their best are what made them feel most effective. The themes that

emerged regarding faculty or staff involvement and encouragement were based on the responses of all participants who stated that a faculty member either encouraged them through actions or mentoring. These individuals either showed them something that inspired interest, or they took an interest in them personally. Most attributed a mathematics or science teacher with guiding them or mentoring them in the direction of the field they are perusing. Themes that pertained to transferring or continuing education beyond the community college showed the biggest difference between the community college without a STEM program and the community college with a STEM program. Two of the three participants from a community college without a STEM program were preparing to transfer to a university, compared to all four of the participants who were preparing to transfer, or transferring to the established partner university of the community college with a STEM program in place.

Chapter 5 discusses how these findings were interpreted and the essence of the phenomenon. Recommendations for future research studies will be explored, along with the final conclusions of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to understand the lived experiences and perspectives of African American women enrolled in STEM fields related to their matriculation in community colleges. Community colleges are an essential component of degree attainment in STEM fields. To accomplish this, I conducted a phenomenological investigation of African American women's experiences related to community college support systems and personnel, community college academic program offerings, and their intentions to continue to pursue STEM fields at their transfer institutions. I specifically interviewed seven African American women enrolled in STEM courses at a community college. It was imperative to explore this phenomenon because there is little research information available regarding African American women who major in STEM fields and attend a community college.

The findings of this study revealed insights into how the seven African American women perceived the environment and support systems that are incorporated in their community colleges as they pertain to STEM programs and courses. These findings include:

- Faculty encouragement is influential in providing a positive learning experience that increased the participants' sense of belonging to the institution.

- Faculty involvement is instrumental in supporting continued persistence in STEM-related fields as these African American women moved through the curriculum. The women also observed this has a positive impact on their

understanding of the information, and how it relates to them as they move forward in STEM.

- A mentor, faculty member, or community support is an important component in the positive perception of these African American women, particularly in STEM-related courses and in guiding these women in the form of a role model.

- Established partnerships between a 4-year institution and the community colleges increase the likelihood that these African American women will continue their studies in a STEM-related field. When options to transfer are readily available the likelihood of persistence also increases.

Interpretations of Findings

The findings include four major parts. The first section is an interpretation of theory regarding faculty encouragement and a sense of belonging by using humanist, social learning, and action theories. The second section will analyze faculty involvement and persistence by using attrition theory and action theories of compensation. In the third section, I will focus on faculty and community mentors. The fourth section discusses 4-year institution partnerships. All sections are interpreted in light of the research from Chapter 2.

Finding 1: Faculty Encouragement and a Sense of Belonging

Faculty encouragement is influential in providing a positive learning experience that increased the participants' sense of belonging to their respective institutions. The conceptual framework of this study draws from the work of several researchers and theorists. Humanist, social learning, and action theories were applicable to the comments

made by the participants. For example, Staci remarked, "The teachers make sure you understand and give you applications of each topic . . . made me feel good because you don't feel left behind or defeated." Me'Shell noted, "The instructors helped me realize that it is possible and that I can do it." In support of these participants' claims, Clifton et al. (2008) and Lloyd and Eckhardt (2010) stated that women's interpretation of themselves is grounded in their relationships and interactions with others. The participants lived experiences have led them to glean a better understanding of themselves from other students, faculty, and staff. Along with the resources available to them, these African American women feel they are better equipped to move forward to degree attainment.

Finding 2: Faculty Involvement and Persistence

Faculty involvement, according to the participants, was instrumental in supporting these African American women's continued persistence in STEM-related fields as they moved through the curriculum. The women also observed that this had a positive impact on their cognitive skills. Tinto's (2012) student integration model and Tinto's (1993) attrition theory suggested that the experiences students have with others students, instructors, and the institution as a whole will either integrate them into the learning process or alienate them from it. The African American women's perceptions of the supports and barriers in the community college were based on their environment and faculty involvement. They produced an assortment of information as they discussed their instructors and classroom environment. TaKira stated, "All of them [instructors] are equally important in helping me to do better and aiding in my successfulness." This

statement is supported by Lerner (2002) and Noddings (2004) who explained that instructors can contribute to modeling a successful field career, and their involvement in the lives of African American women can help to elicit the desired outcome of degree completion.

I hypothesized that support through faculty involvement and support through mentoring would foster a healthy environment that would increase participation, retention, and persistence in African American women. Instructors' encouragement provided support for the participants that were visible when the participants proclaimed that they feel most successful when they were nominated for honor societies or awarded with Dean's List or President's List notifications. The importance of these awards could be understood through the lens of the action theories of compensation (Maslow, 1973).

Finding 3: Faculty and Community Mentors and Perception

A mentor, faculty member, and community support are important components in the positive perception of these African American women, particularly in STEM-related courses and in providing guidance in the form of a role model. Students who have a positive experience with a counselor or faculty member remember when that individual made an impact on their life and helped them believe they were cable of achieving their goals (Blake-Beard et al., 2011; Laanan & Starobin, 2008; Vieyra et al., 2011). Women's development involves actions concerning specification of goals and creating a hierarchy based on a commitment to the result (Belenky et al., 1986; Gilligan, 1982; Lerner, 2002). For these women, the result is a degree in a STEM field.

Advisors, program coordinators, and mentors are vitally important. Academic and career success is a factor in the mentoring relationship (Blake-Beard et al., 2011; Vieyra et al., 2011). CheRai stated, "My mentor and I discussed my goals and aspirations and a plan on how to achieve those goals." Paulizae remarked, "My mentor clears up some things for me and what my next steps should be in my education." Mentors can be faculty, guest lecturers, community volunteers, university liaisons, and business leaders. Faculty encouragement and involvement were reiterated as important by every participant as they explained their lived experiences at the community college, and it was the number one occurrence these women claimed contributed to their persistence in STEM field degree attainment goals.

Finding 4: Partnerships With 4-Year Institutions and Transfer

Established partnerships between a 4-year institution and community colleges increase the likelihood these African American women will continue their studies in STEM-related fields. Transfer is one of the central missions of the community college (Brawer & Cohen, 1987). Recognizing the programs that help preserve and enhance transfer is one of the organizational strategies for community colleges (Campbell et al., 2010). The participants were influenced by the knowledge that an established partnership existed between the community college they were attending and the 4-year institution they could transfer to once they completed their associate's degree or transfer was warranted. CheRai stated, "There is an institution that is partnered with this community college where I can finish my studies. . . . [This] made it convenient for me to see what is needed when I leave here." When students are presented with a consistent course

schedule, faculty involvement, ample information regarding transfer requirements in advance, good academic advising, and convenient options to transfer then transfer is possible and more likely.

Limitations of the Study

The brief interview information sheet revealed pertinent background information and explained the attributes of each participant. The main criteria used from the information sheets were first name, age range, and marital status. This information was obtained as a part of the study based on the knowledge that women define themselves by their interactions and relationships. This information may help determine the mindset of these African American women as it relates to educational goals and advancement along with the different experiences each group has had based on being single, married, single with children, or married with children. These encounters may vary based on the criteria of a single woman with a child(ren), rather than a woman who is single without child(ren). This could change the lived experience of the individual, and demonstrate a greater difference compared to a married woman or a married woman with a child(ren). The patterns that are evident across the individuals in this study showed that the presence of children was not a factor and marital status did not change the essence of the participant's experience. This study determined that the phenomenon occurs with no correlation to the grouping criteria. The women did not refer to their child(ren) as being a major factor in their educational pursuits. This result may be based on the sample size or the individuals that were participating in the study.

Information regarding the STEM courses each participant enrolled in at their respective community college was obtained from the admissions and enrollment services departments to determine if the courses were a part of a program at their community college. Courses differ from one institution to another, and therefore may not be considered a part of another institution's STEM program.

This study only focused on African American women and is not applicable or transferable to other minority women or African American men. In addition, this study was conducted in the southern region of the United States and may not be applicable to African American women in other regions; therefore, generalizations cannot be made.

Recommendations for Further Research

As more women in the United States are entering college and seeking majors in STEM-related fields, factors that contribute to the attrition rate of African American women are a concern for all colleges and universities, including community colleges (Borum & Walker, 2012; Colatrella, 2014; Gayles & Ampaw, 2014; Jackson et al., 2013; Smith, 2011; Zimenoff, 2013). My data show that African American women's experiences provide insight into those conditions that encourage and discourage African American women from STEM field degrees. Borum and Walker (2012) noted that a more nurturing environment contributes to women's continued desire to proceed into the university to complete a STEM-related degree. Mentors are also beneficial to women in STEM fields (Borum & Walker, 2012). Taking this study a step further to find ways to expand or initiate mentorships for African American women students could be beneficial in increasing the number of African American women in the field. Other studies that

recommend similar steps include (Frehill & Ivie, 2013; Jackson et al., 2013; Mack et al., 2013; and Zimenoff, 2013). Creating initiatives for 4-year institutions to implement mentoring networks between themselves and the community college and vice versa could allow for a greater support system, and create exposure that may lead to opportunities for further research.

This study underscores previous research conducted by Jackson et al. (2013) that stated women could benefit from articulation agreements, a better support system, an established transfer partnership with 4-year institutions, and opportunities to complete undergraduate research. In addition, some type of faculty collaboration and university visibility on the community college campus can have a positive impact on the experiences and expectations of women who decide to transfer (Jackson et al., 2013).

Increased corporate partnerships connecting students to professionals in the field at an earlier stage in their education is another possible implication of this study and warrants further investigation. Zimenoff (2013) stated that allowing corporate partners to increase their presence with inquiry-based learning activities, real world problem solving, early introduction to STEM, and engineering activities could increase STEM field degree completion.

Borum and Walker (2012) stated that when discussing mentors in their study that the gender and race of the individuals doing the mentoring was mentioned. Studies suggest that mentoring seems to be the leading component in retaining women in STEM programs (Borum & Walker, 2012; Byars-Winston, 2013; Gayles & Ampaw, 2014; Jackson et al., 2013; Mack et al., 2013). Most of the mentors mentioned in my study's

data were women of color and not necessarily African American women. Women of color can be classified as African American, Asian American, American Indian, Hispanic American, and any other ethnic background not identified as Caucasian (Frehill & Ivie, 2013). Another future study might include the percentage of mentors who are women of color, specifically African American women, and how this affects the overall percentage of African American women mentees' continued persistence in their STEM field degree attainment. Based on the findings of this study, I recommend that future research examine the transfer process of African American women from a community college to a university with a partnership established, and the transfer process of African American women who move from a community college to a university without a partnership established.

Another future study may be based on the quality or quantity of faculty interactions and involvement with African American women who enroll in STEM fields. This study might explore if those interactions or involvement will produce the most favorable outcome of STEM degree attainment, and whether those interactions need to be faculty-student versus mentor-student in nature. These are suggestions based on this study's finding. Many studies have declared that how women feel about themselves is very important to how they see their future and their ability to complete a degree. Knowing how to improve the overall experience of African American women and their self-concept and self-efficacy while they work on a STEM field degree may be what is needed to ensure a greater percentage of African American women attain a STEM degree.

Implications for Social Change

The implications for social change related to African American women, the community college, and STEM programs or courses involve increasing the number of these women who complete a degree in STEM fields. Changes in this area may also decrease the disproportion of women and minorities in these fields (CCRC, 2012; Morganson et al., 2010). By increasing mentors or mentorship opportunities, African American women can gain a clear understanding and guidance in programs that prepare and assist them in obtaining a STEM degree. This additional understanding and guidance may be provided by the community college staff, faculty, community mentors, university partner mentors, and through internships.

It is clear that the community college conditions and environment, faculty involvement, and mentorship opportunities are important to African American women's educational programs, the ability to persevere, transfer to a 4-year university, and the final step of degree attainment within the STEM fields. All of this is contingent upon the initial influences of all the components that make the community college where they began their education. Administrators can model programs to be more conducive to the needs of African American women, and in doing so will retain more women and men in those programs. The outcome that any institution wants to achieve is retention and increased participation in the programs they offer. By getting the faculty involved in the implementation and mentoring, the community college system can maintain the African American women who are currently present, and increase the participation of future African American women and other minorities. The successful development,

socialization, and retention of African American women can take place, and increase

participation and persistence, which leads to the attainment of degrees. The following are

suggestions to increase African American women participation in STEM programs:

- Faculty mentors

- Mentors in the workforce

- Internship opportunities sooner in the educational process

- Peer-to-peer mentors

- Tutorial services

- First-year enrichment programs

- Individualized advisement

- University–community college partnership

Reflections

Many STEM students have limited knowledge of the common barriers they will

face as students entering into these rigorous disciplines. This situation is complicated

even more if that student is an African American woman. Research has identified a host

of STEM-specific academic support programs that help improve women's success and

learning. Implementing and surmounting these instructional curriculums can be a

challenge, specifically, when searching for sustainable efforts. The African American

women in this study stated that just knowing that they can do it, and having someone

behind them encouraging them is imperative to their success. The importance of being in

an environment where institutional support is readily accessible, and the social

atmosphere is welcoming to African American women is essential to increasing African

American women's STEM degree attainment. Improved instruction and performance by faculty as they become more vested in the accomplishments of African American women students, will, in turn, promote career and technical education participation. These factors, in conjunction with increasing corporate partnership to offer internship and community mentoring opportunities earlier in African American women's programs, could substantially increase and sustain that increase over the years. The NSF (2011) reported that 32.3% of women of color who were college freshmen in 2010 stated their intentions to major in science and engineering fields; however, only 10.6% of all recipients of bachelor's degrees in STEM disciplines were reported in 2013 (NSF, 2013). A better understanding of how to recruit, motivate, retain, and graduate African American women in STEM fields is essential. This can be achieved with a mutual sense of responsibility and commitment by community colleges and universities for ensuring the transition and success of transferring African American women in their desired STEM field of study.

Conclusion

The deficiency of empirical information regarding African American women's lived experiences, and the perspectives of African American women enrolled in STEM fields related to their matriculation in community college served as the problem for this study. As a result of this problem, I researched and interviewed seven African American women. Based on the analysis of the data, the findings of this study revealed insights into how African American women envision the environment and the support system that is interconnected in the community college as it pertains to STEM programs and courses.

This study highlights important factors related to African American women at community colleges and their pursuit of a STEM degree as they transfer to the university. Moreover, the study shows that mentorships and faculty interactions are important for African American women to continue in STEM fields and STEM degree attainment. The results of this study will help faculty, deans, community college staff, and university partners understand the value of investing in African American women as a resource in STEM field programs and degree attainment.

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Appendix A: Invitation Letter

Greetings,

My name is Loretta Westry. I am a doctoral candidate at Walden University. I am working on completing my Doctor of Community College Leadership degree with a concentration in mathematics and science development. I am conducting a dissertation research study on community college experiences and perceptions of African American women in science, technology, engineering and mathematics (STEM) majors. I hope you will agree to participate in the study.

I understand that your time is valuable. The questions will take approximately 45 minutes to 1 hour on a date and time mutually agreed upon by both of us. The questions asked will focus on the perception of the environment, encouragement, and programs at the community college you are attending. Your participation and experiences will be essential to the research being conducted.

Your will receive a copy of your responses and a summary of the results to help you understand how the environment, encouragement, and programs at the community college affect the progress made in your STEM major. All information will be confidential and protected.

If you are interested in participating in this study, please contact me directly email at Loretta.westry@waldenu.edu or by cell XXX-XXX-XXXX.

I look forward to talking with you further.
Thank you,

Loretta Westry

Appendix B: Interview Information Sheet

The purpose of this phenomenological study is to understand the lived experiences and the perspectives of African American women interested in Science, Technology, Engineering and Mathematics (STEM) Majors related to their matriculation in community college. Since women define themselves by their interactions and relationships which may determine the mindset of the African American woman as it relates to educational goals and advancement along with the different experiences each group will experience based on being single, married, single with children, or married with children. These encounters may vary based on the criteria of a single woman with a child(ren) rather than just a woman who is single. This could change the lived experience overall and undergo an even greater difference with a married woman and a married woman with a child(ren). This study may determine that the phenomenon occurs with no correlation to the grouping criteria. The results will be solely based on the reported lived experience of each African American woman.

Part One: Identifying information

Name _____

Email _____

Phone/cell _____

Part Two: General demographic questions

What is your current age range? (Select one.)

☐ *18 to 22*

☐ *23 to 27*

☐ *28 to 32*

☐ *33 to 37*

☐ *38 to 42*

☐ *43 to 47*

☐ *48 to 52*

☐ *53 or older*

What is your college status?

☐ Part-Time

☐ Full-Time

☐ Graduated

What is your marital status?

☐ Single

☐ Married

This information will be filled out by the participant before the interview.

Appendix C: Interview Protocol

My research is focused understanding the lived experiences and the perspectives of African American women interested in Science, Technology, Engineering and Mathematics (STEM) Majors related to their matriculation in community college. The major questions to be examined in this study are:

1) What are the lived experiences and perceptions of African American women enrolled in STEM fields while in community college?

2) What are the lived experiences of African American women related to supports and barriers while in community college?

3) What is the essence of African American women's decision making related to continuing to pursue one of the STEM fields?

Interview Questions

1. Query: Please describe the introduction you received to the programs available here at the community college?

    a. Probe: What parts of the induction to the programs did you find valuable?

    b. Probe: How did you feel after you were introduced to the programs available?

    c. Probe: Did the programs mention what support would be provided?

2. Query: Are you involved in any of the programs here at the community college that you mentioned or did not mention?

    a. Probe: If so which ones?

    b. Probe: How often do you meet with the program advisor or assistant?

    c. Probe: How have they helped or hindered your progress?

3. Query: What has kept you persistent here at the community college?

    a. Probe: What faculty, mentor, or staff was instrumental in that persistent?

    b. Probe: Could you elaborate on what actions made that

        _____ important to you?

    c. Probe: Can you give me an example when that person assisted you to

        _____?

4. Query: Explain the environment here at the community college?

    a. Probe: How is this environment helpful?

    b. Probe: What would you like to see to improve the environment?

5. Query: Do you think that the faculty takes an interest in you as a student?

    a. Probe: Describe or give an example of instance where they showed or took an interest in you as a student?

    b. Probe: How did that make you feel?

6. Query: Please give me some examples of times when you felt successful at the community college?

    a. Probe: Did a faculty member or mentor have a key role in that moment of feeling successfulness?

    b. Probe: If so how did that contribute?

7. Query: Are mentoring programs available for you here and are you encourage taking advantage of this resource by the faculty?

8. Query: Is there any special faculty or staff here at the community college that contributed to your success of your educational program?

a. Probe: How did that person help you with your current success?

b. Probe: Did it make you feel connected to the institution?

9. Query: Are there any activities on campus in which to participate?

a. Probe: Are they academic in nature?

b. Probe: If so, why do you participate?

c. Probe: Are there any non-academic activities you participate in on campus?

d. Probe: How do you mix your social life and academic life on campus?

10. Query: Please tell me about your experiences with a mentor?

a. Probe: How often did you meet with your mentor?

b. Probe: What topics did you cover during your meetings?

c. Probe: How do you feel about the support provided to you by your mentor?

d. Probe: Did your work with your mentor contribute to your success in the program?

11. Query: What are your overall feelings on your college experience? Environment? Encouragement?

a. Probes: Could you elaborate on _____?

b. Probes: Can you give me an example of _____?

12. Query: What supports would you have liked to have provided for you during your time in the STEM programs?

a. Probes: Could you elaborate on _____?

b. Probes: Can you give me an example of _____?

13. Query: What has the community college done to assist you in your persistence in your education in STEM programs?

    a. Probes: Could you elaborate on _____?

    b. Probes: Can you give me an example of _____?

14. Query: How does your community college experience affect other aspects of your life as you move forward with your education?

    a. Probes: What are your perceptions regarding the effect of mentors in the community college?

    b. Probes: Could you elaborate on _____?

    c. Probes: Can you give me an example of _____?

15. Query: What has the institution done if anything to assist you in your persistence in your desire to get a STEM degree?

    a. Probes: Could you elaborate on _____?

    b. Probes: Can you give me an example of _____?

16. Query: As you reflect on your life now, what does it mean to you to have completed an associates' from this community college and or transfer to the university to continue your education in _____?

    a. Probes: Could you elaborate on _____?

    b. Probes: Can you give me an example of _____?

17. Query: What do you think this institution should do that it is not already doing to

aid in your and other African American women successful completion in science,

technology, engineering, and mathematics?

a. Probes: Could you elaborate on _____?

b. Probes: Can you give me an example of _____?

18. Query: Is there anything you would like to add to this interview?

Thank you again for participating in this study. Your responses and your identity will be

kept confidential.

Appendix D: Consent Form

You are invited to take part in a research study of community colleges, African American women, and science, technology, engineering or mathematics (STEM) fields. The goal is to understand the lived experiences and the perspectives of African American women enrolled in STEM fields related to their matriculation in community college. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by Loretta Westry, who is a doctoral student at Walden University.

Background Information:
The purpose of this study is to explore the African American women's experiences related to community college support systems and personnel, community college academic program offerings, and their intentions to continue to pursue STEM fields in their transfer institutions.

Procedures:
If you agree to be in this study, you will be asked to:
- Participate in a one-on-one recorded interview which will last approximately 60 minutes

Voluntary Nature of the Study:
Your participation in this study is voluntary. This means that everyone will respect your decision of whether or not you want to be in the study. No one at your institution will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind during the study. If you feel stressed during the study you may stop at any time. You may skip any questions that you feel are too personal.

Risks and Benefits of Being in the Study:
There is no risk to your privacy or to your ability to complete your course work at your institution of study; however, this interview will take approximately an hour so please allow yourself enough time to complete the interview. The only personal benefit to this study is the knowledge you have contributed to a better understanding of the role that certain institutions may play in environment, encouragement, and involvement.

Compensation:
There is no compensation for your time.

Confidentiality:
Any information you provide will be kept <u>confidential</u>. The researcher will not use your information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in any reports of the study.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via XXX-XXX-XXXX or email me at <u>Loretta.westry@waldenu.edu</u> or the advisor at <u>Thomas.Rasco@waldenu.edu</u>. If you would like to speak to someone in the Research Center at Walden University regarding your rights and responsibilities, you may contact the Research Participant Advocate at 1-800-925-3368, extension ***3121210***.

The researcher will give you a copy of this form to keep.

Statement of Consent:

I am 18 years of age or older, a self-identified African American woman who has completed 3 quarters or 2 semesters at a community college/2-year institution. I consent to participate in the study and to be recorded (video/audio) during the interview process.

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By <u>signing below</u>, I am agreeing to the terms described above.

Printed Name of Participant

Date of consent
_____

Participant's Written or Electronic* Signature
_____

Researcher's Written or Electronic* Signature
_____

Electronic signatures are regulated by the Uniform Electronic Transactions Act. Legally, an "electronic signature" can be the person's typed name, their email address, or any other identifying marker. An electronic signature is just as valid as a written signature as long as both parties have agreed to conduct the transaction electronically.

Appendix E: Codes

Code	Meaning
AAW	African American Women
STEM	Science Technology Engineering and Mathematics Fields
CCIA	Community College Interaction
FE	Faculty Encouragement
FI	Faculty Involvement
FM	Faculty Mentors
CM	Community Mentors
CCE	Community College Environment
CCPM	Community College Partnership Mentors
STEMP	STEM Programs Established
NSTEMP	Non-STEM Programs
TCC4YI	Transfer from Community College to Four-Year Institution
EP4YI	Established Partnership with Four-Year Institution
TPC	Transfer Papers Completed
C4YICC	Collaboration with Four-Year Institution while at Community College ongoing

Appendix F: Confidentiality Agreement

I, _____peer reviewer, transcriptionist, statisticians, research assistant, etc. agree to maintain full confidentiality in regards to any and all audiotapes and/or documentations received from Loretta Westry related to her research study on the researcher study titled The Lived Experiences of African American Women in Science, Technology, Engineering and Mathematics (STEM) Majors in Community College.

Furthermore, I agree:

1. To hold in strictest confidence the identification of any individual that may be inadvertently revealed during the interviews transcription, or in any associated documents.

2. To not make copies of any audiotapes or computerized titles of the transcribed interviews texts, unless specifically requested to do so by the researcher, Loretta Westry.

3. To store all study-related audiotapes and materials in a safe, secure location as long as they are in my possession.

4. To return all audiotapes and study-related materials to Loretta Westry in a complete and timely manner.

5. To delete all electronic files containing study-related documents from my computer hard drive and any back-up devices.

I am aware that I can be held legally responsible for any breach of this confidentiality agreement, and for any harm incurred by individuals if I disclose identifiable information contained in the audiotapes and/or files to which I will have access.

Peer Reviewer's name (printed)

_____

Peer Reviewer's signature _____

Date _____