COLLINS' BLACK FEMINIST EPISTEMOLOGY AS A THEORETICAL BASIS FOR MIXED METHODS RESEARCH: USING THE IMPOSTOR SYNDROME TO EXPLORE THE EXPERIENCE OF BLACK FEMALE PH.D. STUDENTS IN STEM FIELDS

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ABSTRACT

This study uses Collins' (2000) Black feminist epistemology as a theoretical framework in a transformative mixed methods design to examine how the impostor syndrome influenced the experiences of Black female students pursuing doctoral studies in science, technology, engineering and mathematics (STEM). Engaging in thorough quantitative and qualitative analysis, the study documents their experiences during their studies and how they negotiate the world around them based on these experiences. The first quantitative phase of the study examines differences between Black females and other groups on the Clance Impostor Phenomenon Scale. The in-depth qualitative analysis in the second phase of the study details how the impostor syndrome shaped their experiences as they completed their doctoral programs. This study integrated the findings from both phases of the study to explicate the intersectionality between race, gender, and the impostor syndrome in STEM fields.

DEDICATION

For Pepe, ma raison d’être.

LIST OF ABBREVIATIONS

BFT	Black Feminist Thought
CIPS	Clance Impostor Phenomenon Scale
MMR	Mixed Methods Research
NSF	National Science Foundation
STEM	Science, Technology, Engineering and Mathematics
TU	Tiger University

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I:

INTRODUCTION

Background

In an effort to achieve the academic excellence prevalent in other first world countries, former president, Barack Obama has issued a mandate to improve the education system in this country (The White House, 2010). Advocates such as Atkinson and Mayo (2010) believe that the key to equaling American educational achievement to that of the leading countries is to increase student interest and participation in science, technology, engineering and mathematics (STEM). While there is a huge impetus to strengthen participation in STEM, it is easy to note the minimum participation of minority students in these areas of study especially in higher education. Women particularly minority women are noticeably inconspicuous in STEM Ph.D. programs.

The passing of Title IX resulted in a significant shift in the experiences of women in the United States (Broido, Brown, Stygles & Bronkema, 2015). They have made notable advances in the workforce, education, and political arena (Broido et al., 2015). Higher education has not been exempt from the influx of women. Snyder and Dillow (2013) noted that female enrollment has surpassed male enrollment at the bachelors, masters and doctoral levels. Allan (2011) further reiterated that these enrollment trends however, vary by the type of institution and fields of study. While women are conspicuous in areas such education, nursing, and social work, they remain a minority in historically male-dominated fields such as law and STEM fields (Ward, 2008). A 2011 report by the National Science Foundation (NSF) detailing doctorate degrees

received by women in science and engineering indicated that the proportion of Black women receiving doctoral degrees in science and engineering was 6%; this number sharply contrasts to the 56% of White females who earned similar degrees. These statistics reveal that very few Black females pursue studies in STEM disciplines.

Black females' college dreams are often challenged by their minority and/or socioeconomic status (Hawkins, 2011). Some of the factors that negatively impact the education of African-American students noted by Moses-Snipes and Snipes (2005) include teacher expectations and beliefs, cultural awareness, testing, and equity in the classroom. Other researchers noticed that an inferior education, lack of in-school and community resources, obsolete curricula and teaching methods, dilapidated facilities, and inexperienced teachers are commonplace in predominantly low-income Black communities (Anderson, 2002; Hale, 2001; Kozol, 1991; Lewis, 2003; Oakes, 1990; Perry, 2003). As members of a minority group, these challenges often make higher education inaccessible for Black females. A Black female may not have had the social capital which would prepare her for a solid education to pursue an undergraduate college degree (Steele, 1997). A terminal degree is even more of an illusion for some of these women. There are a few however, who have overcome those barriers and are enrolled in Ph.D. programs. Their journey has not been easy and they are continually positioned not as doctoral students but as Black women (Ewing, Richardson, James-Myers & Russell, 1996; McGee & Martin, 2011).

Black women by virtue of their race and gender inhabit an intersection of oppressive structures (Caldwell, 1991; Collins, 2000). Within the social constructions of race and gender, they continue to reside on the periphery. Black feminist writers such as Collins (2000), Crenshaw (1989), Lorde (2012) and hooks (1989) noted that the gender category is complicated and

women of color inhabit an intersection of racial, gender and class oppressions which privileges White women over them. What has been epitomized as a woman is the antithesis of the Black woman. Collins (2000) noted that the historical societal notion of the woman is this beautiful, submissive, White woman who can stay at home to care of her kids. In contrast, the Black woman has been historically carved as the mammie, matriarch, welfare mother, welfare queen, jezebel, and the Black lady (Abdullah, 1998; Collins, 2000; Davis, 2011; Ernst, 2008; Kohler-Haussman, 2007; Woodard & Mastin, 2005). When she takes on post-secondary education those images coupled with negative stereotypes may influence her experiences at an institution of higher learning.

A 2011 report by the Association for the Study of Higher Education (ASHE) noted that institutional climate is pivotal in the experiences and outcomes of racial and ethnic minority college students in STEM (Allan, 2011). Some studies have shown that STEM climates have been chillier and less supportive for minority students (Harper & Hurtado, 2007; Hirschfield & Joseph, 2012). Minority students reported feeling alienated, marginalized, and isolated from the STEM cultures on their college campuses (Fetzer & Czerniejewski, 2014; Green & Glasson, 2009; Peteet, Brown, Lige & Lananway, 2015; Perna, Gasman, Gary, Lundy-Wagner & Drezner, 2009). The STEM environment can be individualistic and competitive (Guiffrida, 2006; Museus & Harris, 2010). This unfavorable climate can present challenges to Black or minority students who at times originate from collectivist orientations which facilitate a conducive environment for success. These factors may be instrumental in minority students developing impostor feelings.

"Hi, I am Angela Brown and I am an impostor." This quote was expressed by a student pursuing doctoral studies in biology during an Impostor Syndrome workshop I attended the first semester of my doctoral studies. This statement by a female African American doctoral student

clearly resonated a feeling experienced by many doctoral students. It is the feeling that they do not belong and others will soon discover that they are not capable of the level of learning exhibited by other members in their academic cohort. Clance and Imes (1978) first used the term impostor syndrome or phenomenon to describe the "internal experience of intellectual phoniness" sensed by the 150 women in their study. Some of the participants in the study also expressed that they felt worthless or fraudulent despite their stellar academic or professional accomplishments.

During their course of study many doctoral students experience these feelings. This workshop allowed me to see that many times I feel like an impostor. I questioned the legitimacy of my place in a doctoral program and became intrigued with increasing my knowledge on this phenomenon. To appease this interest, I decided to investigate the phenomenon in women who were like me, Black, particularly women in STEM fields. Researchers highlighted the lack of literature on the experiences of Black women while they pursue doctoral studies at institutions of higher education (Charleston, George, Jackson, Berhanu & Amechi, 2014; Johnson-Bailey, Valentine, Cervero & Bowles, 2009; Museus, Palmer, Davis & Maramba, 2011; Williams, Brewley, Reed, White & Davis-Haley, 2005). This calls for further research on the experience of the Black female while pursuing graduate studies.

This investigation used Collins' (2000) Black feminist epistemology as a framework to explore the experiences of Black female students in doctoral programs. The study focused on students pursuing doctoral studies in science, technology, engineering and mathematics (STEM). Hirshfield and Joseph (2012) claimed that the perspectives and privileges of the White male are particularly embodied in STEM fields. Engaging the tenets of Black feminist epistemology to

explore the experiences of Black females in STEM gave insight not only into their experiences but how they negotiated the world around them based on these experiences.

The investigation underscored the needs of the participants and used data sources to challenge injustices such as stereotype threat; gender discrimination and supply side-issues that pervade the doctoral experience of the study participants. It was necessary to provide evidence acceptable to stakeholders such as administrators, departments, faculty, and staff that are an integral part of the education of Black women in STEM fields. Data generated revealed that poverty, an inferior education, stereotypes, and institutional racism consistently work to place Black women at a disadvantage. Employing both quantitative and qualitative research methods provided reliable information on the topic which can be useful to stakeholders. There is a need to review the experiences of doctoral students and address some of the concerns that leave them emotionally and psychologically drained as they pursue higher education. Having documented their experiences, and raised an awareness of their academic challenges, it is expected that university personnel seek solutions to meet the needs of these students. It is vital that the evidence be credible and appeal to those who prefer to see numbers as well as those who pay attention to detail. A mixed methods study allowed the researcher to combine qualitative and quantitative methods to provide credible findings on this topic.

Statement of the Problem

The impostor syndrome is common among doctoral students and at times influences a student's ability to successfully complete their program without constantly questioning their proficiency to reach their academic goals (Mason, 2009; Prata & Gietzen, 2007; Steele, 2003). Black women who are a minority in STEM doctoral programs may have a more difficult time dealing with impostor feelings and this may affect their success during their studies. This study

examined the experiences of a few Black women in STEM programs and found that many of them have difficulty carving their niche within those fields. They constantly have to negotiate the intricacies of racial and gender bias and this makes their academic journey more difficult. Whereas another student may just have to focus on attaining success throughout graduate school; women of color worry about how they are viewed by their academic peers, feel conspicuous because of the lack of faculty who share their gender and race, and fight hard to debunk the stereotypes that influence others' opinion of them.

Significance of the Problem

Despite the advances made by women today, they continue to be marginalized and totter on the borders of male dominated fields. Black women are subjugated by intersecting oppressions of race, and gender. Discriminatory practices and the negative feelings associated with racial and gender biases may cause them to feel like impostors in STEM fields. This investigation focused on these practices and gathered evidence which indicated the majority of the Black females in the study dealt with impostor feelings. Data from the study showed the study participants rely heavily on family and peer support as well as their religious beliefs when they conjure these feelings. Although they were all accomplished women in their respective fields, the majority of them questioned their intelligence.

This study on impostor syndrome added to limited body of knowledge on the experiences of Black female doctoral candidates in STEM fields. This information can be used to develop adequate mechanisms to facilitate Black females' successful acclimatization into their programs. Although this study focused on STEM disciplines, the information gathered can be applied to females across academic disciplines. During the process of this inquiry, the researcher identified evidence of the impostor syndrome and explored whether the impostor syndrome affected the

experiences of Black females pursuing a doctoral degree in the fields of science, technology, engineering and mathematics. The findings from this investigation are useful to university faculty and staff in being more attuned to the needs of Black females and hopefully pique their interest in seeking solutions to facilitate their success during graduate studies.

Purpose of the Study

This mixed methods study investigated whether there was a higher incidence of the impostor syndrome in Black females when compared to other students not in that demographic at Tiger University (TU) (a pseudonym), a research institution in the southwestern United States. The investigation further explored how the impostor syndrome affected their experiences while they pursued their studies. The study used a transformative mixed methods design (Creswell & Plano Clark, 2011) in which Black feminist epistemology provided the overarching framework. This lens was chosen because it provided an avenue to explore the lives of individuals who have been oppressed by their race and gender. The study included both quantitative and qualitative data gathered sequentially. The quantitative data tested the theory that predicted that Black females experience a higher level of the impostor syndrome than other students in STEM programs at Tiger University. The qualitative data explored the how the impostor syndrome influenced the experiences of Black females at Tiger University.

Research Questions

The following research questions were addressed in this study. They included

1. Are there significant differences in the scores of Black female students in STEM Ph.D. programs compared to other STEM Ph.D. students on the Clance Impostor Phenomenon Scale (CIPS) at Tiger University;

2. How do Black females who feel like impostors perceive success while pursuing studies in a STEM Ph.D. program; and
3. What are some of the successful strategies and practices employed by Black female students who self-identify as impostors during their Ph.D. studies?

Theoretical Lens

Feminist writer Patricia Hill Collins (2000) outlined four core themes which can be used to explore what she called Black feminist epistemology or Black feminist thought (BFT): the lived experiences as a criterion of meaning, the use of dialogue, ethic of caring, and ethic of personal accountability. The first theme explores how one's life experiences influence their attainment of knowledge. Colonized individuals of African descent especially females have gone through a journey of suppression and oppression which started from the time they first came to this country up to this present day. As such they view the world differently and possess knowledge and wisdom which can only come from these experiences.

Pursuing a college degree may be difficult for many Black females as a result of their minority and/or socioeconomic status (Hawkins, 2011). These challenges often make higher education inaccessible to them as they are unable to meet the financial obligations. Other socioeconomic groups or races may not be cognizant of the barriers that impede Black females' access to higher education (Ewing et al., 1996). An individual who is not familiar with these situations may not understand Black females and the way they navigate their world. Feelings of solidarity and understanding are more likely to come from someone who has travelled a similar journey of racial and gender oppression.

The use of dialogue shows how marginalized groups through discourse establish bonds that empower the group. When they share their experiences, Black women realize that though

they go through different courses in their lives, many of these experiences are influenced by the oppression which results from their race and gender. Many of the STEM initiatives have a mentoring aspect (Alvarez, Edwards, & Harris, 2010; Hawkins, 2011; National Science Board, 2010). Mentoring of Black females gives them the opportunity to share their experiences with others and form bonds which empower them to continue on their academic journey.

These bonds encourage Black women to develop an affinity with each other, seeking a common solution to their problems thus sustaining the ethic of caring. Collins (2000) claimed that expressiveness; emotion and empathy allow one to comprehend the experiences that are unique to each individual. Although they may have different backgrounds or come from different cultures, Black females are held together by their race and gender. This common thread allows them to transcend these boundaries and develop concern for each other. This compassion fosters an understanding of their differences and a willingness to embrace their similarities. The ethic of caring can become very important to minority females in STEM fields where they are unjustifiably labeled by stereotypes that doom them as failures (McGee & Martin, 2011; Ogbu, 1992; Steele 1997). It permits the group to come together as they defy the odds which question their competence.

In describing the ethic of personal accountability, Collins (2000) noted that everyone adheres to a belief on an issue and should use this position to discuss the issues at hand. Black females in the scientific fields at times become advocates for their race. Collins (2000) believed that the ability to maintain a viewpoint which may be in agreement or contrary to that of others should be objective and justified. Females in STEM fields do not always share the same upbringing and they view life differently. The ability to validate their claims within the context

of their discussions is a remarkable quality. By doing so, they continue to encourage each other and enhance the dissemination of knowledge among themselves.

Black feminist thought proved to be an adequate framework to explore the experiences of Black females as they meander through their doctoral studies in STEM fields. It allowed the researcher to examine their lived experiences as a criterion of meaning. The use of dialogue, ethic of caring, and ethic of personal accountability explained feelings of inadequacy experienced by minority females while pursuing graduate studies in STEM disciplines.

Research Design

Mixed methods research (MMR) is increasingly becoming an effective methodological tool for educational researchers. While there are different stances on what constitutes MMR, a working definition states that it is research in which quantitative and qualitative methods are used to collect, analyze, and mix data to draw inferences in a study (Johnson, Onwuegbuzie, & Turner, 2007). Some researchers have questioned the authenticity of MMR but writers like Greene (2007), Teddlie and Tashakorri (2010) and Creswell and Plano Clark (2011) have successfully answered that call.

Greene (2007) concluded that researchers have mental modes which frame their approach to conducting inquiry. Greene (2007) described mental modes as the “philosophical assumptions about the nature of the social world, the nature of knowledge we can have about that world, and the methods that can meaningfully represent that knowledge as well as the inquirer’s own predispositions beliefs, values, and practical wisdom” (p. 12). Teddlie and Tashakorri (2010) noted that mixed methods address the false dichotomy between the dominant qualitative and quantitative discourses which rely on monolithic conceptual/philosophical foundations. Creswell and Plano Clark (2011) advanced that MMR allows the researcher to explore both singular and

multiple realties. The researchers further stated that it is a practical approach which permits the investigator to engage with the methods that work best to address research questions. Adopting more than one stance facilitates the exploration of different perspectives since both quantitative and qualitative methods are utilized (Creswell & Plano Clark, 2011).

This study employed a transformative mixed methods design as outlined by Creswell & Plano Clark (2011). They noted that this approach is useful when a researcher wishes to take a position on the needs of a usually marginalized population with the aim of providing recommendations to improve the situation of the disadvantaged group. A transformative framework describes reality within a "historical, cultural, political, and economic context" (Mertens, 2003, p. 159).

The decisions about the interaction, priority, timing and mixing were made within the context of Black feminist epistemology (Collins, 2000). The quantitative data tested the theory that Black females experience a higher level of the impostor syndrome than other students in STEM programs at the research institution. The qualitative data explored the experiences of Black females at Tiger University and examined how racial and gendered factors contributed to their impostor feelings.

Researcher Positionality

Throughout my doctoral studies I have been shrouded in doubt about my ability to successfully complete my doctoral studies. These fears have caused me to procrastinate, question my rightful place in my program, and relive a cycle of anxiety every time I completed an assignment. My fears, however, are minuscule when compared to those voiced by my friends pursuing doctoral degrees in STEM fields. I remember the calls I got during their first years; they were all sure they would not succeed beyond the first year of their programs. It did not matter

that one was at the number two institution in the country or the other two were at leading research institutions. They have all graduated and are pursuing postdoctoral studies.

When I attended the impostor syndrome workshop, I felt like the speaker was describing not only me but my friends as well. I narrowed my interest to Black women in STEM fields because of the wealth of knowledge I gained from my first interview with a female Ph.D. Chemistry student for my introductory Qualitative Inquiry class. The answers I got provided insight not only on the participants but became a means of healing for me as I engaged with the data.

As a Caribbean raised Black woman, I had some struggles conducting this research. I do not identify as African American and many times questioned the right to use my blackness to investigate their experiences. But one thing I do know is that the affinity I felt with the study participants resonates similarly with other Black women. There is an unspoken understanding that we have of each other as well as a high level of respect for each other. This study addressed a gap in the literature which does not detail the impostor syndrome in minority populations specifically on Black women in STEM fields.

As an educational research student, I thoroughly enjoyed employing both quantitative and qualitative methods to investigate the phenomena. I adopted a pragmatic stance to MMR, drawing on the strengths of different frameworks and using these methods to make salient inferences.

Definition of Key Terms

Black refers to the people of the African descent who based on their skin color have been socially constructed as Black (Takaki, 2008). For the purposes of this study Black participants may be from Africa, America, the Caribbean or any other country whose lineage traces back to

the African continent. The terms minority, women of color, and African American are used interchangeably to refer to Black women.

Black feminist epistemology or *Black feminist thought* is a theoretical approach advanced by Patricia Hill Collins (2000) which demonstrates how Black women become empowered as agents of change by confronting racial and gender oppression.

The term *impostor syndrome* introduced by Clance and Imes (1978) describes a perceived emotional experience of performance inadequacy despite evidence which contradicts this feeling. Individuals who exhibit impostor feelings doubt their abilities, attribute their success to outside factors and feel undeserving of their accolades.

*Intersectionalit*y serves as a methodological tool to examine the subjugated experiences of marginalized groups whose oppression stem from multiple angles (Caldwell, 1991; Collins, 2000; Crenshaw, 1989; Lorde, 2012; & hooks, 1989). It this study the experiences of Black women were investigated by focusing on the way their gender and race combine to influence their experiences in STEM fields.

STEM is the acronym for science, technology, engineering and math. These fields of study include a wide range of academic disciplines as prescribed by the National Science Foundation (NSF). It includes and is not limited to areas such as engineering, computer science, physical and geological sciences, and medical sciences.

Organization of the Research

This chapter introduced the topic to be explored, how the impostor syndrome, race and gender may disrupt Black female Ph.D. students while pursuing their doctoral studies despite the huge efforts being made to increase minority participation in those fields. I outlined the call for increased student success in STEM fields and provided a brief description of the factors which

may be an impediment to adequate preparation of a Black female to pursue STEM studies at the doctoral level. I presented an introduction on intersecting gender and racial oppressions experienced by Black women, followed by a brief discussion on the impostor syndrome. I communicated the problem present in the study, its significance, and research questions that address the problem. I discussed the theoretical lens framing the research as well as the research design. I ended with the chapter with my researcher positionality and a definition of the key terms.

The second chapter presents relevant literature to support the work being studied. The chapter begins with a detailed outline of the impostor syndrome. This is followed by a discussion of Black women which particularizes how the intersecting oppressions of race and gender influence the images created about them. An exploration of Black women in STEM fields follows this dialogue. The review ends with a literary analysis of how the impostor syndrome is intertwined with the negative images of Black women and how it affects them when they pursue STEM Ph.D. programs.

The third chapter discusses the methodological approach used to conduct the study. The transformative mixed methods research design is clearly outlined. Details about the instrument used in the study, participant selection, data collection and analysis, issues of trustworthiness and validity are delineated in this chapter.

In Chapter IV, I present the research findings by first giving an introductory overview of the findings then discussing the results of the two phases of the study. The first phase: identifying the impostor, examines the results from the quantitative analysis of the Clance Impostor Phenomenon Scale (CIPS). The second phase, an in-depth look at the Black female

impostor dissects the findings from the one-on-one interviews and focus group interviews. The chapter ends with a summative conclusion of the results generated from the data analysis.

The fifth and final chapter engaged Black Feminist epistemology to analyze the research findings. The chapter begins with a thorough discussion of the results in respect to each of the four tenets of BFT. I then incorporated the literature and BFT to analyze each phase of the study and answer the research questions. The implications and limitations of the study follow and the chapter ended with exploration of areas for future research.

CHAPTER II:

LITERATURE REVIEW

Introduction

Although women receive half of the STEM degrees awarded at the bachelor's level, their numbers decline significantly at the doctoral level (NSF, 2011). Black, Hispanic and Native American women are poorly represented in the less than 25% of female doctoral recipients in STEM fields in the United States (NSF, 2011). Despite the huge monetary effort put forth to increase female presence in STEM, women continue to avoid these areas of study (Espinosa, 2008). A substantial body of research demonstrated that there are various non-cognitive factors which steer women particularly Black women away from these fields or negatively impact their experiences when they decide to undertake a doctoral degree (Borum & Walker, 2012; Ong, 2011; Johnson, 2011; McGee & Martin, 2011).

Students in doctoral programs often experience feelings of insecurity termed the impostor syndrome. The impostor syndrome or phenomenon is characterized by feelings of phoniness, self-doubt and inability to take credit for one's achievement (Clance & Imes, 1978). Black women marginalized by their race and gender may experience impostor feelings while pursuing STEM studies in an arena where they are outnumbered.

Completing doctoral studies may be challenging for Black females, an underrepresented group (Williams et al., 2005). Having been ostracized by their race and gender, they are more likely to experience impostor feelings (Collins, 2000). A Black woman inhabits the crux of gender and racial oppression where she is marginalized by the societal sexist dialogue which

places women in a secondary position to men and the historical defamation of the Black race as an inferior race. She is represented in the way these different identities come to form her relationships and realities (Fukuyama & Ferguson, 2000). This literature review first explores the impostor syndrome. The intersection of race and gender will then be discussed. The review ends with a discussion on Black females in STEM fields and how intersecting oppressions may cause them to feel like impostors during their studies.

The Impostor Syndrome

The term impostor phenomenon which is also referred to as impostor syndrome describes the internal struggle that an individual has about their intelligence (Clance & Imes, 1978). The researchers hypothesized that these feelings are common in high-achieving persons who doubt their intellectual abilities and refuse to take personal responsibility for their achievements. Impostors may be diligent, hardworking, feel like fakes, or be charming and perceptive so that they gain the approval of others. The writers noted that these individuals may display some of these characteristics but rarely does an individual indulge in all of these behaviors.

Clance and Imes (1978) observed that women who experienced the impostor phenomenon did not internalize success, became anxious, lacked self-confidence, were depressed, and frustrated when the goals they set for themselves were unobtainable. The writers reported that successful women continue to deny their accomplishments and dread failure. These women convinced themselves that they were not intelligent and had done a good job of leading others to believe that they were gifted when they really were not that smart.

While Clance and Imes (1978) initially thought that the phenomenon only affected professional women, other researchers have discovered that it affects a wide range of people (Harvey, 1982; Prata & Gietzen, 2007). Research showed that the impostor syndrome affects

both genders (Buscotti, 1990; Sonnak & Towell, 2001). In their study on the parentification and the impostor syndrome, Castro, Jones, and Mirsalami (2004) concluded that there was no significant difference between the CIPS scores of the male and female graduate students in their study. The researchers established that their results were consistent with findings by Buscotti (1990), Langford and Clance (1993), September, McCarrey, Baranowsky, Parent, and Schindler (2001) and Topping (1993) who concluded that there were no gender differences.

Researchers illustrated that the impostor syndrome affects people in different occupations such as college students (Mason, 2009; Peteet et al., 2015; Prata & Gietzen, 2007), workforce professionals (McDowell, Boyd & Bowler, 2007; Vergauwe, Wille, Feys, Fruyt, & Anseel, 2015) and academics (Clark, Vardema, & Barba, 2014; Dancy & Jean-Marie, 2014; Parkman & Beard, 2008). Harvey and Katz (1986) estimated that about 70% of the general population experience impostor feelings in relation to their work during their career paths. In a previous article Harvey (1982) noted that at any point an individual may fail to internalize success and question his/her abilities; these feelings are not limited to persons who are highly successful.

Scholars provided evidence of the impostor phenomenon across cultures. Dudău (2014) discovered some indication of the impostor phenomenon among Romanian students. Fujie (2010) developed a new scale to measure the impostor phenomenon in Japanese students. Vergauwe et al. (2015) learned that Belgian employees with stronger impostor tendencies had less job satisfaction and organizational citizenship behavior.

Sakulku and Alexander (2011) used the impostor cycle designed by Clance (1985) to illustrate how students experience this phenomenon. The cycle starts when students become anxious when given an achievement-related task such as school assignments or vocational responsibilities. Thompson, Foreman, and Francis (2000) explained that they respond to these

anxious feelings in one of two ways: intense over-preparation or procrastination followed by overindulgence in the task. Once the assignment is completed, they experience fleeting feelings of relief and achievement. Self-doubt again resurfaces when they receive positive feedback; they attribute their success to factors other than their ability (Clance, 1985). Those who put a lot of effort into the task completion attribute the success to hard work; the procrastinators believed they lucked out reinforcing the feelings typical of the impostor phenomenon. The cycle begins once they receive another assignment. Figure 1 below is a representation of the impostor cycle.

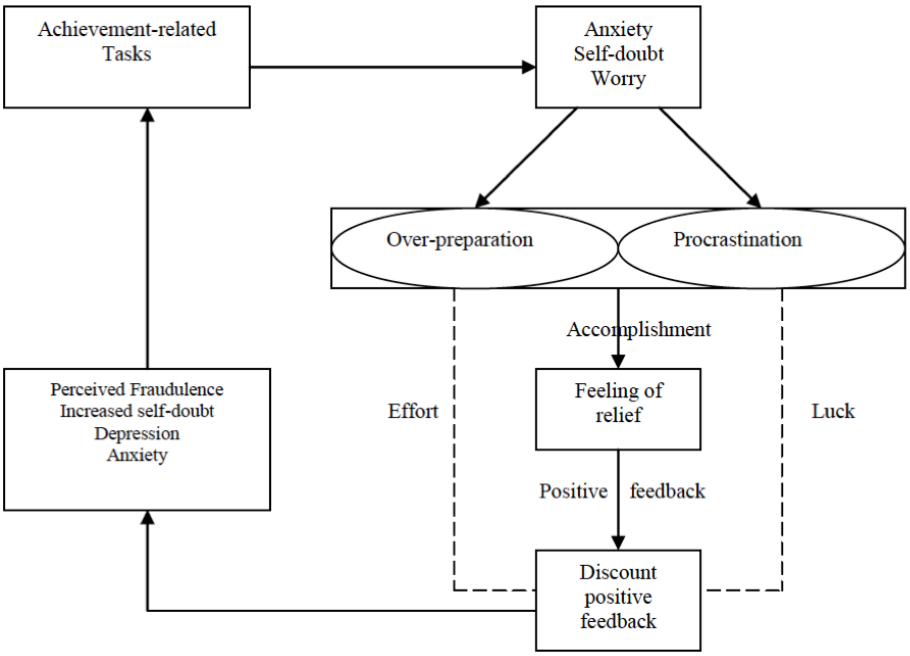


Figure 1. Diagram illustrating the impostor cycle on Clance (1985). The cycle begins with the assignment of achievement-related tasks.

Sources of the Impostor Syndrome

Some researchers believed that an individual's psychological traits may play a role in the impostor phenomenon. Gibson-Beverly and Schwartz (2008) affirmed that attachment and entitlement were strong predictors of the impostor phenomenon. Attachment theory explores how early relationships with primary caregivers influences one's view of themselves or others

(Bowlby, 1973). There are two forms of attachment which are most likely to lead to impostor feelings: anxious attachment and avoidant attachment (Ainsworth, Blehar, Waters, & Wall 1978). Anxious attachment results from inconsistent responsiveness from a parent while avoidant attachment results from a parent's rejection of a child's attempt to reach out to the parent. Entitlement refers to what an individual believes he or she has the right to expect from others (Meyer, 1991; Speigel, 1987). An individual who has a restricted sense of entitlement may have a great need to seek the approval of others (Nadkarni, Steil, Malone, & Sagrestano, 2005). This is characteristic of persons displaying impostor feelings.

Low self-esteem is also seen as a precursor to the impostor phenomenon (Chrisman, et al., 1995; Cozzarelli & Major, 1990; Henning, Ey, & Shaw, 1998; Sonnak & Towell, 2001). Sonnak and Towell (2001) concluded that self-esteem was influenced by factors such as levels of mental health, parental care and type of school attended. Thompson et al. (2000) learned that impostors tended to overgeneralize a single failing with their whole self-concept, a behavior that is characteristic of individuals with low self-esteem.

Reasons Why One May Feel Like an Impostor

In her book, *The Secret Thoughts of Successful Women: Why Capable People Suffer from the Impostor Syndrome and How to Thrive in Spite of It*, Young (2011) explored seven reasons why an individual may feel like an impostor: you were raised by humans; you are a student; working in an organizational culture that feeds self-doubt; working in a creative field; being or feeling like a stranger in a strange land; and having to represent your entire social group.

The author believed that the people that we interact with frequently can be the source of this nagging doubt. Teachers, coaches, and other influential adults are important in shaping a child's self-expectation. Due to this, they may influence how confident, competent, or successful

this child blossoms as an adult. When a child's efforts go unrecognized or these adults only praise stellar accomplishments, they may be planting seeds of doubt in that child's mind. The way parents react to a child's academic or non-academic achievements or lack thereof may be pivotal in developing impostor feelings. A child who does not develop a solid sense of him/herself from the messages about success that their parents relay may grow up continually doubting their abilities (Buscotti, 1990; Castro et al., 2004; Li et al., 2014)

Clance and Imes (1978) who identified family history as a possible origin for these feelings placed female impostors in two categories: those who have been labeled the smart one and those who have been told that they are a charming sweet person. The women who pertain to the second group strive to attain high grades to demonstrate to the family that they are just as intelligent as the other relative. The family however, does not acknowledge these achievements and continue to shower praise on the other "intelligent" family member thus evoking impostor feelings. The females in the other group who are seen as perfectionists begin to doubt themselves when they realize that they are not able to do everything and live up to the expectations of their families.

Other scholars also recognized that family plays an influential role in the development of impostor feelings. Li, Hughes, and Thu (2014) discerned that lack of parental care and overprotection correlated greatly with high scores on CIPS. These results were consistent with those found in a study by Sonnak and Towell (2001). A family environment in which unresolved conflict is prevalent may contribute to individuals developing impostor feelings (Buscotti, 1990; Langford & Clance, 1993). Castro et al. (2004) noted that children who have to assume extra responsibilities and take on the role of the parent in the family (parentification) are more likely to experience the impostor syndrome. The writers rationalized that because they have been forced

to take on tasks that they are not developmentally ready for, these children maintain these feelings of incompetence and inadequacy transmitting them into impostor feelings as they turn into adults.

Young (2011) hypothesized that students often feel like impostors when they begin their post-secondary studies. The author remarked that many students who graduate at the top of their class come into a college environment where they are not as outstanding. They begin to doubt themselves and question their intelligence. Some educators may be insensitive and give negative feedback that shrouds the confidence of the well-abled student. Students in higher education may feel unsure in an academic climate that uses unfamiliar jargon and vernacular specific to their major. This environment fosters doubts and uncertainty causing them to ponder whether they are as smart as everyone else in their field.

Evidence of the impostor phenomenon was prevalent among the group of physician assistant students studied by Prata and Gietzen (2007). The authors noted that more graduate students reported impostor feelings in their first year of work than those who were more advanced in their career. While the number of physician assistants reporting impostor feelings significantly decreased after four years, a few of them still reported feeling like frauds (Prata & Gietzen, 2007). Due to the demand and complexity of graduate education, Mason (2009) asserted that students at times harbor feelings of doubt about their ability to succeed or withstand the rigors of their curriculum. Mason (2009) advocated for the use of dance therapy to counter the anxiety, low-self-esteem and feelings of inadequacy associated with the impostor syndrome among graduate students. The writer observed that the highly competitive nature of graduate school, where students have to conform to institutional values and expectations may cause some inner conflict and cause them to doubt their abilities.

Peteet et al. (2015) proposed that impostorism was positively correlated with psychological distress and negatively correlated with self-esteem among African American college students. Congruent to other research, the authors noted a relationship between self-esteem and the impostor syndrome. Students from the study sample who evidenced the impostor syndrome also demonstrated higher levels of psychological distress.

In her study on Romanian psychology students, Dudău (2014) qualified that students with frequent impostor feelings, sought the approval of others, were sensitive to criticism, worried about any performance that is less than perfect and were overly concerned with mistakes. Some of the students reported that they harbored negative feelings about the pressure they felt to excel in order to gain their parents' approval. Interestingly, the researcher did not find a correlation between the impostor syndrome and striving for excellence. This contradicted current research on the topic but the author gives reason for this absence. Some possible reasons are the study sample was not concerned with striving for excellence; there may have been other factors influencing their responses; or some impostors have an inaccurate perception of the real level of perfection implied by their goals.

Young (2011) discovered that an impostor may be part of organizational culture that feeds on self-doubt. In a competitive work environment, an individual may not feel that they possess the level of proficiency displayed by their other colleagues. Superiors at times make insubordinates feel inferior and objectify them as less intelligent and incapable of living up to the standards of the organization. These factors may feed one's insecurities and make the environment conducive for employees questioning their abilities. McDowell et al. (2007) noticed that the impostor phenomenon played a critical role in determining one's attitude and behaviors in the workplace.

An employee may think that the qualifications and pay scale of their job exceed their perceived qualifications and abilities (McDowell et al., 2007). Self-doubt begins to surface as the individual believes that he/she inequitably matches the requirements of the job. McDowell et al. (2007) noted that the individual may feel over-rewarded on the job, holding a position for which they are underqualified and develop impostor feelings.

Hutchins (2015) observed a moderately high incidence of the impostor syndrome among a sample of faculty. She also realized that impostor feelings lessened as faculty attained tenure status making them more prevalent among non-tenured faculty. The tenure and promotion process can be emotionally taxing for non-tenured faculty conjuring up impostor feelings (Hutchins, 2015; Parkman & Beard, 2008). Impostor feelings among faculty may be due to the less desirable aspects of the academy: unfavorable competition, scholarly isolation, nationalism among disciplines, and lack of mentoring (Parkman & Beard 2008; Cope-Watson & Betts, 2007; Young, 2011)

Young (2011) conveyed that people who work alone may experience impostor feelings when they begin to question the validity of their job. Being in an isolated environment where there is no defined job description or guidelines to dictate how you work, may cause one to question whether they are really performing at all. Not having others to share ideas with or provide feedback may lead the self-employed individual to query the value in their work. In a study on self-employed individuals, Feldman and Bolino (2000) concluded that while participants enjoyed the autonomy of working alone, some of them reported social isolation and questioned the validity of their decision. The uncertainty and financial risks involved also made respondents examine their ability to handle their decision to work alone. Baines and Robson

(2001) confirmed that self-employed people rarely viewed themselves positively because of the possible social isolation and vulnerability associated with their career choice.

Working in a creative environment may also be a precursor for developing impostor feelings (Young 2011). Although these individuals have been adept at proving that they possess unique abilities that stand out, they are still veiled in disbelief about their achievement. They question their accomplishments and believe their gains will be uncovered as fraudulent. Creative individuals are novel, effective, and adhere to the standards of their profession and have proven that they stand out (Cropley, 2001). Clance and Imes (1978) noted that the women in their study who were successful and stood out in their careers attributed their success to other factors. They believed that they were lucky; they were in the right place at the right time; and/or acknowledged getting help from others and downplayed their achievements. Young (2011) cited many famous individuals such as Maya Angelou, Kate Winslet, and Don Cheadle who still believe that their success is not worthy and they will be found out.

Working in a creative field is a highly publicized career where a subjective yardstick is used to measure what stands out (Young, 2011). This may cause individuals to question their achievement and wonder if they are really deserving of the accolades they receive. Maintaining confidence and showing a brave face may be a strategy that some creative impostors use to mask their feelings.

Being a stranger in a strange land in another reason Young (2011) gave for being an impostor. The author realized that a sense of belonging bolsters one's confidence and an outsider position can lead to impostor feelings. Being in a foreign country, a first-generation student or professional, or being in a socio-economic environment atypical to what you are used has the

potential to generate impostor feelings as one begins to question their rightful place in these foreign situations.

In their study on medical residents in Canada, Legassie, Zibrowski and Goldszmidt (2008) witnessed evidence of the impostor syndrome in 85.7% of the international residents as compared to 36% of Canadian residents. The international students worried more about the intellectual adequacy and competence than did their counterparts who were in their country of citizenship. A first-generation student, Judge Sonia Sotomayor noted how she felt like a stranger in a foreign land when she first entered the Princeton campus (Lewis, 2009). When interviewed by Lewis (2009), she said that she never raised her hands the first year she was there because she was too intimidated and embarrassed. Lewis (2009) also cited Judge Sotomayor as saying during one of her speeches, “I’m always looking over my shoulders, wondering if I measure up.”

Individuals sometimes have to be the representative for their entire social group (race, gender, disability, sexual orientation etc.) and this can be emotionally taxing (Young, 2011). This is particular true for minorities who venture into a world where they stand out. They work harder and feel like they are the beacon for their group and if they fail, they will let down the entire group.

Solorzano and Yasso (2001) declared that women of color in the academy are outliers who constantly question their rightful place in the academy. Relaying the narratives of some Chicano/Chicana graduate students, Solorzano and Yasso (2001) highlighted how these successful students questioned their success when they were among the few who have advanced academically. Peteet et al. (2015) reasoned that the “othering” of African American undergraduate students contributed to the relationship between impostorism and psychological distress. Robinson (2013), an African American faculty member, described how the academy

exhausted her and she often felt alone, discouraged and disillusioned. Her feelings mirrored the same views expressed by the female African American respondents in Jackson's (1998) study where participants said that they often had to prove themselves in order to combat the negative stereotypes generated about them. These challenges often make women of color feel like impostors in their atypical environment. Some of factors which may contribute to impostor syndrome in Black students as outlined by Harvey (1982); Harvey and Katz (1986) and Harvey, Kidder and Sutherland (1981) include new role adjustments, achieving an unusually high level of education relative to one's family background, having a negative self-image, and being one of a kind or atypical in one's surroundings.

Girls who evolve into women may be part of a sociopolitical climate that requires perfectionism and characterized by struggles for success (Lin, 2008). These conditions can be precursors to the impostor phenomenon (Lin, 2008). They have to navigate an academic and professional world which deems them intellectually inferior to men (Heilman & Haynes, 2005). This bias may cause them to internalize the concept that learning should come easy and struggles or imperfection indicates a lack of intelligence or ability (Clance, Dingman, Reviere & Stober, 1995). Women of color are particularly vulnerable to the impostor phenomenon. Ewing et al. (1996) argued that racial identity and afrocentricity play a pivotal role in predicting the impostor syndrome in women of color.

Researchers deduced that people are likely to attribute a man's success to ability while a woman's success is attributed to luck (Heilman & Haynes, 2005; Swim & Sanna, 1996). Females are usually held to a higher standard than their male counterparts, and have to prove their achievements more than men do ((Heilman & Haynes, 2005; Swim & Sanna, 1996). Women are more likely to internalize gender stereotypes and this can potentially lead to the impostor

syndrome (Davies, Spencer, Quinn, Gerhardstein, 2002; Davies, Spencer & Steele, 2005; Murphy, Steele & Gross, 2007). Some authors maintained that boys receive eight times more criticism for their conduct than girls in grade school (Dweck, 2006; Young 2011). As a result, boys have learned to take criticism at face value and not internalize it as girls do. Internalization of criticism can potentially be one of the factors that cause women to question their ability or intelligence (Young, 2011).

In their study on adults with learning disabilities, Shessel and Reif (1999) observed that the participants who identified as impostors were academically and vocationally successful. Irrelevant of their accomplishments, these respondents expressed that they "cheated the system," "were wolves in sheep's clothing," or "pretended to be something that they were not" (p. 309). Students with disabilities sometimes question their intellectual ability and feel like they are in the way and do not ask questions or request the services that should be provided for them (Brown, James & MacKenzie, 2006).

Impostor Personalities

Young (2011) identified five impostor personalities: the perfectionist, the natural genius, the rugged individualist, the expert and the superwoman/man/student. The perfectionist is concerned with delivering a flawless product all of the time and when this does not come to fruition, impostorism evolves. Perfectionism, specifically self-evaluative perfectionism characterized by excessively high criteria and drive for personal perfection (Rice, Ashby & Slanley, 2007), has been associated with the impostor phenomenon (Dudău, 2014; Henning et al., 1998). Similar to characteristics of the impostor syndrome, perfectionists tend to seek the approval of others, respond sensitively to criticism, berate themselves on a performance which is not perfect, and are overly concerned with mistakes (Dudău, 2014). In their study on students in

health professions, Henning et al. (1998) illustrated that the impostor syndrome and perfectionism led to psychological distress.

The natural genius believes that intelligence and ability are inborn and success should be derived with little effort (Young, 2011). They fail to acknowledge that success comes in stages and that the trials and failures along the journey are necessary to attain their goal. A genius is defined as an individual who possesses superlative intelligence or perceived eminence (Simonton, 2012). Superlative intelligence is evidenced in high scores on standardized intelligence tests while perceived eminence is demonstrated in exceptional distinction in a particular domain (Simonton, 2012). The natural genius thinks that everything should come instinctively and doubt themselves when they do not understand a concept right away. Dweck (2012) advanced the idea of the fixed mindset, the belief that their core qualities are built in and fixed by nature. Believing that intelligence is inherent, the natural genius conjures impostor beliefs when they are unable to get a concept or succeed from the onset (Young, 2011).

According to Young (2011), the rugged individualist believes that he/she possesses the ability to do everything on his/her own and outside help indicates a form of weakness. Hsu (1983) realized that the rugged individualist is a self-centered person who frames the world in his view. Hirschman (2003) deduced that these individuals pursue self-perfection and have a deep-set desire to dominate in their field. Adherents of rugged individualism believe that if one cannot make the grade, they are not fit to be part of their field (Britzman, 1986). When they are not able to do it on their own, impostor fears surface causing them to doubt their abilities and question their competence.

The expert cares about the knowledge and skills he/she possesses (Young, 2011). These persons are never satisfied with their level of competence and believe that they should know

more. Researchers such as Garrigan and Kellman (2008) affirmed the impossibility of knowing everything and elaborated that individuals should not be consumed with a desire to discern everything. Young (2011) established that the expert is never satisfied with his/her level of competence and constantly seeks new ways to gain the knowledge. Some of them gain numerous certifications, degrees, and qualifications that they do not really need.

The superman/woman/student believes that multiple roles and assignments can be handled flawlessly (Young, 2011). These individuals play up to the modern myth of being able to do it all. An example of a superwoman is the individual who is very successful in her career while being an awesome wife and outstanding mom. The super student would juggle their academic workload expertly while taking part in sports, student government and other organizations. Porter (2006) noted that it is impossible to undergo all those roles simultaneously without error or failure. Impostor feelings surface when these individuals realize that they cannot do it all. Young (2011) also observed that even when they are able to undertake multiple tasks, they still have doubts and concerns because they believe that they could do more and are not living up to their full potential.

Measuring the Impostor Syndrome

Harvey (1982) first developed a 14-item instrument called the Harvey Impostor Phenomenon Scale (HIPS) to measure the presence of the impostor syndrome. The instrument produced low internal consistency and was an inadequate tool for distinguishing impostors from nonimpostors (Chrisman, Pieper, Clance, Holland, & Glickauf-Hughes, 1995). To address these inconsistencies, Clance (1985) developed the 20-item Clance Impostor Phenomenon Scale (CIPS). CIPS examines specific attributes such as fear of being evaluated, fear of being unable to repeat success and fear of being less capable than others (Chrisman et al., 1995).

Each of the 20 items on the CIPS is scored on a five-point rating scale. The scores are 1(not at all true), 2 (rarely), 3 (sometimes), 4 (often) and 5 (very true). The scores are added up to produce a total score, the higher scores are indicative of impostor syndrome characteristics (Gibson-Beverly & Schwartz, 2008). The researchers designed the scale to identify whether individuals had a fear of failure, discounted recognition from others, feared evaluation or were worried that previous successes could not be repeated (Langford & Clance, 1993).

Since Clance and Imes (1978) first used the term impostor phenomenon to describe feelings of incompetence or inadequacy felt by individuals who are successful, many researchers have explored the topic (McDowell et al., 2007; Clark, Vardema, & Barba, 2014; Dancy & Jean-Marie, 2014; Dudău, 2014; McDowell et al, 2014; Mason, 2009; Peteet et al., 2015; Parkman & Beard, 2008; Prata & Gietzen, 2007, Young, 2011). These scholars also summarized that it may be caused by an individual's family history, their daily interactions with other people, the academic or professional climate they may be part of, or being in an environment where they are a minority. Young (2011) categorized impostors into five personalities, the perfectionist, the natural genius, the rugged individualist, the expert and the superwoman/man/student. Understanding the impostor syndrome can be used to analyze the experiences of Black females in STEM fields. They fall into a category of intersecting oppressions of race and gender.

Black Women at the Intersection of Race and Gender

Collins (2000) noted that Black women in the United States are marginalized by their race and gender. Caldwell (1991) highlighted the intersection between racism and sexism as women of color find themselves located within two ostracized groups. Collins (2000) asserted that even within the gender paradigm, Black women are placed below White females. She proceeded to detail that racism and sexism constitute relationships of authority and suppression

in schools, businesses, workplace, and government agencies. Caldwell (1991) used different court cases to demonstrate the structures used to maintain women of color in an inferior position. By ignoring the intersectionality between race and gender, oppression of minority females continues.

In an article entitled *We Need a Woman, We Need a Black Woman': Gender, Race, and Identity Taxation in the Academy*, Hirshfield and Joseph (2012) explored the idea of identity taxation and how it affects minority female faculty in academia. While the article focused on female faculty, many of the ideas advanced in the paper can be used to understand the experiences of women of color. Identity taxation refers to the shouldering of emotional, physical or mental burden beyond what is expected of others around them due to their affiliation with a minority group. Not only are Black women marginalized by their race and gender but they have to serve as the beacon for their race. Even when they do become successful, their intersectionality continues to marginalize them. In their double minority status, Black women take of different roles, they may be looked upon to serve as role models for other minorities, be representatives for their race/gender, isolated from the mainstream around them, and constantly scrutinized (Hirschfield & Joseph, 2012).

The racial tensions which existed in the past during the days of slavery are still present today (Leonardo, 2004). Tracing the historical context of racism, Leonardo (2004) demonstrated that the representation of the ideal human being was someone who was rich, White, and male. Blacks were considered lesser beings and reduced to three-fifths of a person (Leonardo, 2004). The remnants of slavery were seen in the creation of the ghetto and the inferior housing minorities were subject to when they migrated to the North to escape Jim Crow in the South (Wacquant, 2001). In his essay *Deadly symbiosis*, Wacquant (2001) noted that people of color

were subject to inferior housing, schools, and public facilities in these spaces. The Black race maintains a position of subservience to the ruling class (Collins, 2000; Leornado, 2004; Wacquant, 2001).

Despite the fact that the role of women shifted from the passive housewife to that of an active participant in the economic welfare of the family, they still remain second to men (Williams & Cuddy, 2012). Women are usually passed over for high level jobs or seen as incompetent when they are working mothers (Williams & Cuddy, 2012). The term "glass cliff" coined by Ryan and Haslam (2005), describes the plight of women who have penetrated the glass ceiling to obtain top management jobs. In that position, they are on shaky ground doomed to fail because they do not have the resources to succeed, obtained these positions under crisis, or are not considered suitable for leadership (Ryan & Haslam, 2005). The idea of females as docile and compliant is used to bar women from top level jobs and when they do display the forceful and direct behavior needed for top management they are seen as belligerent, and abnormal (Williams & Cuddy, 2012). The persons who hold most of the top positions in society are White males and within minority groups males are still held in higher regard than women (Collins, 2000).

Controlling images of Black women have been used to mask the injustices levelled against them and sustain the stereotypes used to describe the Black woman. These negative images rather than help them blame Black women especially mothers for the moral and social decay prevalent among lower class families. Using these images perpetuates the idea of these women as lazy, fraudulent, and content with their situation. These illustrations make up the dominant narrative that is widely accepted by society while masking the realities of Black women (Lubiano, 1992). In reality, many Black women are victims of the political and economic

structural insufficiencies that plague the poor and middle class (Collins, 2000; Lubiano, 1992; Kohler-Haussman, 2007; Woodard & Mastin, 2005).

In order to understand the intersection between race and gender, it is important to examine these socially constructed categories. An analysis of the created images provides a mirror to look at the way these oppressive structures intersect to influence the experiences of the Black woman.

Images of the Black Woman

The image of the Black woman has gone through an evolution that constantly places her in a negative light. One of the persistent images that stemmed from slavery was that of the mammie/mammy "the faithful, obedient, domestic servant" (Collins, 2000). The mammy image created and defined by privileged Whites projects the idea that these women were selfless, nurturing individuals who were more concerned with caring for their oppressors and their family rather than their own families (Abdullah, 1998). In this hegemonic position, the Black woman accepted her fate and did not see the injustices of her oppressor. She was content attending to their needs and tried to emulate some of their habits.

In contrast to this image is that of the matriarch, the Black mother who has not fulfilled her maternal role and is responsible for the social ills that plague the Black community (Davis, 2011). The matriarch is also seen as the "controlling, emasculating, Black woman" who runs her household with a tight fist (Woodard & Mastin, 2005). The Moynihan report was pivotal in disseminating the idea of the matriarch (Davis, 2011; Collins, 2000). The writers of the government report erroneously supported the idea that student failure in school resulted from the absence of their mothers. The report failed to highlight that those Black mothers were absent

from their homes due to laborious hours they put in to support their families in a system that mirrored the slavery that they were supposedly liberated from (Davis, 1981).

Another stereotypical image created about Black women is that of the welfare mother (Collins, 2000). When the Black woman takes advantage of the social services which are afforded her because of the poor living conditions within which she resides, it becomes a problem as well. These women supposedly do not seek employment and are content to live off the governmental dole making them a liability to the economic and political welfare of the state (Collins, 2000; Woodard & Mastin, 2005). As a single parent with multiple children, the welfare mother is seen as a moral threat to the heteronormative family structure (Collins, 2000).

On the heels of the welfare mother is the welfare queen, depicted as the avaricious, dominant, woman dependent on the state (Collins, 2000). The welfare queen classified as an unemployed deviant seeking to take advantage of the system neglects the needs of her family (Kohler-Haussmann, 2007). This racialized image perpetuated the stereotype of the lazy, hyperfertile Black woman and is used as a yard stick to measure Black women (Ernst, 2008)

Another negative representation is that of the “jezebel, hoochie, or whore” (Collins, 2000). In this persona, the sexuality of women of color is under intense scrutiny. These images portray these women as sexually aggressive females who are solely responsible for any form of sexual abuse levelled at them. They seek to take advantage of the White men and because they were so openly sexual, men cannot resist them (Woodard & Mastin, 2002).

These images highlight how racism and sexism converge to create an image of who the Black woman is. The Black woman resides within intersecting oppressions, she is part of the “lesser” race and females are always second to men. The aforementioned images that have been used to describe Black women highlight these connections. The mammy in supposedly

neglecting the needs of her family and catering to those of her master accepted her subordination and was happy to obediently serve (Collins, 2000). This image troubles the issue of classism because rather than hide the structural aspects of classism, it highlights it. She inhabits this place where she is subservient to her oppressor, the mammy is always a poor, desexualized, Black woman, and she is never of another race, class or gender. These are qualities which reduce her to less than 3/5ths of a person (Leonardo, 2004). In order to keep in her place and ensure that the White male master is glorified this image is necessary. Collins (2000) theorized that Black women who assume the mammy image may transmit these forms of oppression to their children and this helps to maintain the racial hierarchy which places her White employers at the top.

The matriarch when she takes on the burden of catering to her family's economic needs is desexualized, she is likened to a man (Collins, 2000). The author further explained that this image is pivotal in baring how race, class and gender converge to oppress the Black woman. By placing the blame for the disadvantages of Black children on their mother, the capitalist system which feeds Black poverty remains well hidden (Jones, 2009). When most Black single parent household are headed by mothers, society emasculates her, denies her sexuality and labels her as a woman who has taken on male qualities. Doing this hides the fact that many Black men are unjustly incarcerated and are not able to be part of their families (Browning, Miller & Spruance, 2001). The Moynihan report was instrumental in fostering racial oppression (Collins, 2000). It promulgated the idea that Blacks were unable to maintain a natural family structure and the absence of the father figure made them inferior.

The image of the welfare mother also highlights intersecting oppressions. This representation is demonstrative of a Black, lower class woman. When she accesses the services that are rightfully hers because of social status, she is judged and mislabeled. It should be noted

that access to these resources was a struggle and African Americans had to fight for these rights (Squires, 1994). The social ills which placed her in this position are rarely discussed but she is seen as an individual who seeks to take advantage of the political economy (Jones, 2009). This representation forbears the fertility or womanhood of these women, casting them as over fertile breeders (Woodard & Mastin, 2005). Whereas the breeder image was crucial during slavery because children became the property of the owner and added to his wealth, now that the state may have to bear responsibility for their welfare, it became an issue (Jones, 2009).

The oppression which ensued from slavery continues to affect Black women by annihilating them from the resources that would allow them get out of poverty. How can a mother get a good job if she does not possess the necessary qualifications that would prepare her for that job? And even when she does have the job, her race and gender become an issue. Black women are less likely to hold top management positions or get equal pay as their White male counterparts (Jones, 2009). The life of the welfare mother who most times is a single parent is often up for public scrutiny. She is racially categorized as an idle woman who does not want to work and passes on that principle onto her children. Raising her kids alone questions her femininity as she not fit the heteronormative family structure ideated by the White male (Collins, 2000).

The image of the welfare queen according to Collins (2000) has been conjured to mask political cutbacks which benefit the poor and disadvantaged. By portraying women as lazy, avaricious, and willing to take abuse government sponsored programs, politicians gain the right to cut back on government spending. Very few researchers explore why these people find themselves in the lower class and the capitalist systems that keep them in these subjugated positions (Tuck, 2009).

Collins (2000) illustrated the image of the Black lady, those who have advanced into the middle class, have good jobs, degrees and have made significant achievements in life. She is accused of taking away jobs from White men and affirmative action only highlights this further. Even the Black man sees her as a competitor and resents her achievement. She remains many times unmarried as she becomes less feminine when she competes with men and holds them to the high standard that they have set in the workforce (Collins, 2000). When she does not work she is considered lazy, avaricious, taking advantage of the system, when she does advance herself in her career and education she is equally stereotyped and criticized. She is constantly at the heart of intersecting oppressions of race and gender.

Affirmative action has erroneously been used to speak of injustice which disadvantages Whites. It has been labeled reversed discrimination (Kinder & Sanders, 1990) and seen as a way to supposedly take away jobs from Whites and give them to Blacks. The reality is that affirmative action has not disadvantaged the ruling class, minority groups continue to endure workplace discrimination and disadvantage (Leslie, King, Bradley, & Hebl, 2008). Blacks are usually stereotyped and deemed incompetent to carry on the workload (Leslie, Mayor, & Kravitz, 2014). So even when she works hard and gets the qualifications she needs to get a job, there are still other discriminatory obstacles she has to overcome to attain her place. Black women are constantly juxtaposed within intersecting oppressions. Regardless of the identity society ascribes to them, it is one that is fraught with discriminatory stereotypes.

Research indicated that the people that an individual interacts with may be a source for developing impostor feelings as they influence a child's self-expectation (Buscotti, 1990; Langford & Clance, 1993; Li, Hughes, & Thu, 2014; Sonnak & Towell, 2001; Young, 2011). The self-expectation and self-concept of a woman who has been labeled a hoochie, Black lady,

mammy, matriarch, and welfare mother or welfare queen may not be as strong as a woman who has not cast in those images (Collins, 2000). When students go through an education system that fails them and deem them academically inferior, they may assume those negative images (Steele, 2003). A Black female may internalize these images and constantly doubt herself when she sets herself outside of these images because of the expectations that have been set (Tracy & Sedlacek, 1984). She may ask herself how did I get here and why am I trying to portray an image of somebody that I am not. Tracey and Sedlacek, (1989) noted that positive self-concept, as well as an understanding of racism and how to deal with it, were some non-cognitive factors that affected students' ability to succeed in higher education.

The racial identity associated with these images is sometimes prescriptive for developing impostor feelings. Racial identity and afrocentricity can be instrumental in envisaging the impostor syndrome in women of color (Ewing, Richardson, James-Myers, & Russell, 1996). The racial and gendered environment in which a Black female resides may cause her to constantly doubt herself. These images have the potential to influence a Black woman's development and her adjustment. It is important to highlight that these images cast women of color in a negative light and foster an oppression which keeps them in a genderized and racialized subservient position (Collins, 2000; Lorde, 2012; hooks, 1989). These layers of oppression can cause a Black female to doubt herself, attribute success to outside factors, and feel like a fraud.

Black Women in STEM fields

Black Women in Higher Education

Hall and Sandler (1984) described the higher education climate for women as a chilly one because despite the gains and increased numbers, women are not treated the same way as their male counterparts. Lord et al. (2009) further reiterated that if the climate is chilly for all women

it is “icy” for minority women especially in STEM fields. The campus climate is instrumental in the development of the personal, academic and professional growth of female students (Hall & Sandler, 1984; Ong, 2011).

Some Black women have looked to higher education as a strategic means of combatting the racial and discriminatory practices levelled against them (Mirza, 1995). Although their numbers have significantly increased on college campuses, access and curriculum remain a major issue for Black women in Higher education (Mirza, 1995). Many fields in academia are governed by White male thinking and perceptions, making it a challenge for women of color. They struggle to find a space where they can carve out their own identity while resisting racism and sexism (Mirza, 1995). A Black woman’s journey in higher education is sometimes one into the “heart of whiteness” (Casey, 1993). They have to negotiate their identities in the dominant White environment.

Howard-Baptiste (2014) highlighted the “mammy moments” which are “are the overt and covert ways that students, colleagues, and others communicate disrespect and distrust Black women’s worth and abilities” (p.765). When Black women enter college campuses whether as students or faculty, they have to face these forms of discrimination. Their intellectual abilities are always downsized in tandem to their race. She is seen as ill-equipped to handle the rigor of higher education. This idea is no doubt fueled by researchers such as Herrnstein and Murray (1994) who advanced the idea that IQ tests proved that Blacks are less intelligent than Caucasians. This stereotype is dominant is STEM fields too; White males have historically dominated STEM fields both in their numbers and the perception of individuals who advance in this field (Buck, Clark, Leslie-Pelecky, Lu, & Cerda-Lizarraga, 2008; Reigle-Crumb & Kringle,

2010; Seymour & Hewitt, 1997). Very few women of color make it to the STEM college careers to begin with because of their low graduation rates (Johnson, 2011).

Studies showed that students' prior preparation and student's attitude toward math and science in high school are strong indicators of a STEM pathway in college (Tai, Liu, Maltese, & Fan, 2006). Tangential to these studies, other researchers illustrated that in high school girls perceive themselves as less proficient in science and math than their male peers even though they perform equally (Corell, 2001). Different researchers over time observed that when elementary students were asked to represent a scientist, the image presented was a White male, wearing a lab coat, glasses and touting facial hair (Andre, Whigham, Hendrick, & Chambers, 1999; Buck, Leslie-Pelecky, & Kirby, 2002). These ideas agree with gender-stereotypical image of a scientist. These images contradict the images that girls desire for themselves and cause them to avoid these careers (Packard & Wong, 1999).

Women and men are not monolithic groups, gender cannot be understood without looking at social class, race, and sexual identity (Andersen & Collins, 2007; Moraga & Anzaldua, 2015; hooks, 1989). It is worth delving into the intersectionality within which Black women in higher education STEM fields reside. Intersectionality identifies the way in which gender and race combine to produce multiple overlapping forms of discrimination (Collins, 2000). Women of color STEM are vulnerable to "tokenization" where they become the representatives for the larger social group they are part of and fall victim to a homogenous group which favors White males, drowning out their voices (Lord et al., 2007). They are marked as outsiders and their social identity isolates them from the homogenous climate dominated by White males (Lord et al., 2007). Graduate females in STEM fields reported that they had to "fit" into the implicit and explicit gendered spaces within their disciplines (Sallee, 2011). Women of

color do not only have to fit masculinity but assume a form of Whiteness as well (Ko, Kachchaf, Ong & Hodari, 2013).

Science, Technology, Engineering, and Mathematics: STEM

STEM disciplines have historically been revered over other academic disciplines (Soldner, Rowan-Kenyon, Inkelas, Garvey, & Robins, 2012). This is the area where discoveries and inventions have been made, human physical existence has been explained and the understanding of the universe in which we live has been generated (Fairweather, 2008). It is easy to forget how science, technology, engineering, and mathematics are encountered in most aspects of our lives. High school teachers in these disciplines often stress the importance of students succeeding in these disciplines because it is part of their daily lives. Science Pioneers (n.d.) convey an interesting summary of what STEM is.

> Science is our natural world— sun, moon and stars…lands and oceans…weather, natural disasters, the diversity of nature, animals (large, small, microbial) …plants and food…the fuel that heats our homes and powers transportation…The list is almost endless. In today's world, technology means computers and smartphones, but it goes back to television, radio, microscopes, telegraph, telescopes, the compass, and even the first wheel. Yes, engineering designs buildings, roads, and bridges, but it also tackles today's challenges of transportation, global warming and environment-friendly machines, appliances and systems. We only have to look around to see what improvements to our lives and our homes have been engineered in the last decade alone. We encounter mathematics at the grocery store, the bank, on tax forms, in dealing with investments and the family budget. Every other STEM field depends on mathematics. STEM is important, because it pervades every aspect of our lives. (Science Pioneers, 2015, para. 2)

This is such an ironical description of STEM because it conveys the idea that STEM is a very open space that everyone is privy to. It really is a hegemonic space that leaves out the majority of individuals (Ong, 2011; Powell, 1990). Most of the individuals who actually developed an explanation of our natural world, created smart phones, computers and other gadgets mentioned, designed roads bridges and buildings, and discovered how math can be used in everyday life are an elite group of White males (Hirschfield & Joseph, 2012; Nerad & Cerny, 1999). This shows

that space and place are socially and economically constructed and their meanings change based on the context in which they are used (Lefebvre, 1991; Massey, 2013). White males have not only created a field of study which largely advances their interests but they have set guidelines for who goes in and who stays out.

An influential group of individuals in the earlier part of the 20th century used intelligence tests to define an intellectual (Solorzano & Yasso, 2001; Valencia, 2012). Ideas about intelligence came into existence through the work of pseudoscientists who promoted the genetic deficit thinking model (Menchaca, 1997). The genetic deficit model posits that minorities are intellectually inferior to Whites (Valencia, 2012). Current researchers have countered this deficit model but the remnants of this movement still strongly influence educational and cultural practices today (Valencia & Solórzano, 1997). Traces of these ideas are present in STEM fields which has historically been an arena where gender and racial bias is the norm (De Welde & Laursen, 2011; Hirchfield & Joseph, 2012). Equally discriminatory is the deficit idea that Blacks and other minorities do not possess the intellectual capacity to perform as their White male counterparts in STEM fields (On, 2011; Powell, 1990).

Since STEM fields have been historically dominated by White males, they are the ones who have developed the theories which explained the world around us (De Welde & Laursen, 2011; Hirchfield & Joseph, 2012).). Historically humans all over the world have possessed the skills and knowledge necessary to survive in their environment with scant resources. Very rare have they been lauded for the success but in modern times discoveries based on the expansion of already existing ideas by a privileged group of individuals are made and it becomes STEM, a part of our daily life (Ong, 2011).

Within STEM disciplines there is also an interesting stratification of disciplines. The physical sciences, engineering, mathematics, and computer science are regarded more highly than the biological, clinical and health sciences (Espinosa, 2008). These disciplines are also gendered; biological, clinical, and health sciences called soft sciences are seen as female while the hard sciences such as engineering, mathematics, and computer science are seen as male (Mann & DiPrette, 2013; Sagebiel & Vazquez-Cupiero, 2010). There are outstanding numbers of women in biological, clinical, and health sciences while men continue to dominate in the fields of engineering, mathematics, and computer science (Perez-Felkner, McDonald, Schneider & Grogan, 2012). These researchers realized that females who had the highest 10th-grade math scores continued post-secondary studies in social, behavioral, clinical, and health sciences rather than physical sciences, engineering math and computer science (PEMC). Girls who took higher or moderate levels of math are more like to study PEMC at institutions of higher learning. The writers suggested that encouraging women to succeed in math courses in high school may help bridge the gender gap in PEMC.

This could be the result of the historical stereotypes which has deemed STEM unsuitable for women (Espinosa, 2008, Mann & DiPrette, 2013; Ong, 2011; Sagebiel & Vazquez-Cupiero, 2010). This demonstrates there are always gaps within spaces whether they are privileged or not. There are always ways to create power structures to further marginalize others. The student who is not able to successfully pursue a STEM career goes lower down the intellectual ladder as the top group is further stratified. This is the arena in which a Black female who is already marginalized by her race and gender enters when decides to pursue a doctorate degree in a STEM field.

Historically, women of color have been denied access to STEM disciplines resulting in their small numbers (Ong, 2011). In examining the factors associated with the minimal presence of African Americans in mathematics, Powell (1990) claimed that minority students have developed an inner self concept that they lack the skills necessary to succeed in mathematics and science. Steele (2003) argued that Black students constantly deal with the way others view them and this affects their academic performance. The author strengthened his argument by saying that minority students are usually expected to perform at a high level which leaves them psychologically and emotionally drained (Steele, 2003).

Graduate females have for a long time been thought to be ill-suited for research work in STEM fields (Nerad & Cerny, 1999). In a study on female doctoral math students, Herzig (2004) affirmed that women felt like they were unable to fit into the masculine culture which made them invisible while offering little guidance, moral support, and advising. In an investigation of Black women's undergraduate and graduate experiences, Borum and Walker (2012) noticed a difference between those who attend predominantly White institutions (PWI) and those who attended historically Black colleges and universities (HBCU). Faculty support and well as a caring environment in an HBCU contrasted the stories of isolation and inequity experienced by most of those attending a PWI (Borum and Walker, 2012). Researchers such as Perez-Felkner et al. (2012) highlighted the need for female adolescents to be mentored in high school to pursue STEM careers.

Steele, Spencer and Aronson (2002) determined that the social identity of Black students at institutions of higher learning is affected by their race, social class, underrepresentation, tracking etc. In a study on Black college students in mathematics and engineering, McGee and Martin (2001) recognized that there are subtle but persistent factors which reveal the racial

stratification present on college campuses which influence how they respond and perceive their college experience. Cognizant of racial discrimination in their early lives, minority students through socialization learn the preconceived notions others have about them (McGee & Martin, 2001; Steele, Spencer, & Aronson, 2002). Competent Black students constantly have to prove themselves and display academic prowess to others who think that they are incompetent. These students feel that their intellectual ability is always on trial and have to prove to others that they belong in the STEM field. Stereotype threat becomes an issue for minority students.

Stereotype threat contributes to feelings of insecurity among minority students. McGee and Martin (2011) note that when Black students prove their academic competence, they remain threatened by stereotypes associated with their race (i.e., lazy, thief, drug addict, promiscuous, substandard). Steele (1997) described stereotype threat as

> a negative stereotype about a group to which one belongs becoming self-relevant, usually as a plausible interpretation for something one is doing, for an experience one is having, or a situation one is in that has relevance to one's self-definition. (p. 616)

Steele (1997) also advanced the idea that negative stereotypes about the academic ability of women of color may be a deterrent to their achievement as they react to threats in different ways.

In STEM disciplines McGee and Martin (2011) stated that Black female students feel pressured by stereotypes because they have proven that they oppose the norms which deem them academically inferior. Steele (1997) asserted that stereotype threat is experienced by the enhanced, more secure students in stereotyped groups. These students have not allowed these labels to affect their academic ability and have succeeded. As they gain academic superiority, they are more likely to fall prey to these stereotypes because of their small numbers (Steele, 1997).

STEM and Intersectionality

Intersectionality highlights challenges for Black women in STEM education. Collins (2014) lectured that STEM education is a slippery slope and a leaky pipeline. In its slippery definition, it shows that race and gender collide to point bias about their cultural competence and intelligence. Ong (2011) conceptualized the idea of the double bind, the complex way in which race and gender intersect to affect their experiences in STEM fields. The lack of representation of women of color in STEM has led to increased diversity initiatives to increase their participation in those fields (Atkinson & Mayo, 2010). These diversity proposals however highlight the discriminatory practices which are pervasive in STEM disciplines.

The current interest in diversifying the STEM workforce is based on supply-side issues. The United States has lost its competitive edge on the global market and there is a need to improve the pipeline that prepares Americans for a viable and competitive STEM workforce (Metcalf, 2010). Researchers predicted a reduced White male STEM workforce; therefore, untapped resources, which include minority women, need to be recruited to retain the competitive edge (Lucena, 2000; Metcalf, 2010; Ong, 2011). As a result, the supply-side focus becomes very important because recruit and retain underrepresented populations helps maintain a competitive edge (Metcalf, 2010).

Programs have been developed to increase minority presence in STEM fields and guide them to pursue graduate studies in these areas (NSF, 2010). Some examples of minority grant sponsored programs outlined by the NSF (2010) are Louis Stokes Alliances for Minority Participation (LSAMP), Minority Access to Research Careers (MARC), and Research Initiative for Scientific Enhancement (RISE). Many of the programs contain a mentoring aspect and a summer internship where minority students get access to research opportunities at major

universities. There are other programs such as Center for Mathematical Achievement in Science and Technology (CMAST) which prepare incoming freshman for the academic year (NSF, 2010).

Given the mandate to increase the STEM workforce and the availability of programs intended to expand minority presence, it appears that Black females now have more access to pursue postgraduate studies. This however, is not the case while the number of females in these areas of study has increased, their numbers are still small (Espinosa, 2008; Ong, 2011). Minority females face barriers such as being first generation students, feelings of insecurity being in a world which was previously unattainable, and other discriminatory practices they have had to fight against during their lifetime (Steele, 2003). The sponsored programs supposedly give access to all minorities to pursue doctoral studies in science, engineering, technology and mathematics. The truth is that not everyone has access because there are standards such as GPA, GRE scores, and research experience which determine who gains entry to Ph.D. programs. The very idea of these initiatives generates a stir, as the idea that special programs have to be developed in order to get them in the scientific field derives a negative connotation and speaks to the deficit model which deems Blacks as academically inferior. It would appear that without these programs many minorities would not be able to pursue study in these areas.

These initiatives may be a form of what Bhabha (1984) calls mimicry, the way in which the British allowed slaves to adopt some parts of their culture such as their language and dress but when it came to the point where they could attain their own power, they were reminded that they were Black and never could fit the shoes of their master. The proposal that female students of color will have access to the same opportunities in STEM fields granted to those of the dominant race is a form of mimicry. This is demonstrated in the fact that it appears that women

of color have the opportunity to enter the scientific domain at will when the opposite is true. They are reminded of what Fanon (2008) calls the fact of blackness, that access is only contingent on the dictates of the White man. Females of color unlike their White counterparts are forced to be self-conscious, constantly contesting their purpose and place in life (Ong, 2011). One's achievements do not eradicate what Fanon (2008) called "the fact of Blackness."

These initiatives also represent interest convergence because the recruiting initiatives supposedly defend the rights of Black students by giving them access to equal schooling opportunities when the opposite is true (Alvarez, Edwards, & Harris, 2010). National efforts to increase a STEM workforce are geared toward all Americans because in theory it appears that way. Desegregation laws have caused Whites to move out of the cities and other areas with large populations of Blacks (Crowder, 2010). A direct result of this is some schools ill-equipped to adequately meet the needs of students of color. Less knowledgeable teachers, inadequate instruction, expulsions, and lack of resources are permanent fixtures in minority schools (Ogbu, 1992). The law states that people of color have been helped with desegregation of schools, when the truth is that the law has only fostered more segregation and continued oppression of Blacks (Bell, 1980). This oppression infiltrates minority female presence in Ph.D. programs in science, technology, engineering, and mathematics fields by limiting Black students' contact with an education that would prepare them to thrive in these fields. The discriminatory practices leveled against them at times hinder their educational progress and often they are not able to pursue higher education.

Minority grants and other programs are an example of the barriers created by those in power to curtail the number of Black females who enter STEM fields (Charleston et al., 2014). They take the focus away from the real issues and poverty and discrimination which keep Black

women in a subservient position and portray a good image which makes one think that everyone has access showing that the pipeline to STEM education which is in fact leaky.

The Leaky STEM Pipeline

Advocates of STEM education aver that it is a fair duct that allows everyone in. This however is erroneous, there are leaks in the pipeline. The combination of race and gender makes achievement more difficult for women of color. There are a number of factors such as gender stereotypes, pedagogical techniques, and science curricula that converge to counter a woman's willingness to develop and maintain an interest in science as well as develop a science identity (Brickhouse, Lowery, & Schultz, 2000). Researchers indicated that when compared to Whites, Black girls have less access to computers and technology at an early age leading to less interest in STEM fields (Fisher, Margolis, & Miller, 1997; Margolis, Goode, & Bernier, 2011). Furthermore, this decreased exposure to science, technology, engineering and math may leave Black girls underprepared to be successful in these fields at the undergraduate level (Espinosa, 2008; Johnson, 2011; Perna et al., 2009).

There are a number of factors that combine from elementary school to high school which contribute to the historical underperformance of Black girls in STEM. Some researchers highlight that by the time girls get to middle school, their attitudes to science and academic gains decline significantly (Barton, Tan, & Rivet, 2008). The writers added that girls take a secondary role to boys in science classrooms where teachers called on boys more to respond to questions, gave less praise to girls and devoted more attention to males (Barton et al., 2008). In high-poverty urban schools where most students belong to minority groups, Oakes (1990) identified a deficiency of rigorous and high-level science courses, lack of science equipment, inappropriate

role models, and insufficient certified, qualified science teachers. As they move on to high school these factors continue to impact girls following a trajectory towards STEM education.

Johnson (2011) stated that rather than incompetence, the socially constructed entities of race, gender and science identities intersect to impede a Black girl's successful transition to a STEM career. The American education system has historically disengaged, under-educated, and underutilized women of color at all levels of the educational pipeline (Johnson, 2011; Ko et al., 2013). These factors coupled with the deterrents to early exposure to science and technology make it a very leaky pipeline for effective attrition in these fields.

Some students withdraw from their studies due to factors such as the academic rigor of the STEM curriculum, social isolation, and economic difficulties (Buzzeto-More, Ukoha & Rustagi, 2010; Charleston et al., 2014; George, Neale, Van Horne, & Malcolm, 2001). Research indicated that a supportive environment in STEM fields is pivotal to student success and retention in those fields (Jakubowski et al., 2011; Palmer, Maramba, & Dancy, 2011). This is particularly vital for Black females who may not have had adequate academic preparation from the inception and possibly influenced by the stereotype that girls do not perform as well in those fields as boys do (Espinosa, 2008; Jakubowski et al., 2011; Johnson, 2011; Perna et al., 2009). Additionally, scholars theorized that academic self-efficacy predicted interest and retention in STEM fields (Hill, Corbett, & St. Rose, 2010). Black undergraduate female students in STEM many times recount interconnected tales of discrimination based on their race and gender (Johnson, 2011). Black students at times do not receive support and mentoring from their advisors (Byars-Winston et al., 2008). Other researchers verified that higher education faculty especially in STEM fields are inept at dealing with the minority students and sometimes ignore them (Ong, 2011; Williams et al., 2005).

Some writers noted that the STEM climate is particularly unwelcoming for Black women (Hall & Sandler, 1984; Lord et al., 2009). Classroom atmospheres have been reported to alienate students of color leaving them feeling like they do not belong (Jakubowski et al., 2011; Harper & Hurtado, 2007). Students stated that they do not feel as comfortable relating to people outside their racial or ethnic background and this affects their desire to persist in STEM fields (Byars-Winston et al., 2008). Some students have few roles models in STEM related fields and may not have the support from their family or communities to advise them on steering a STEM pathway (Davis-Lowe, 2006). Working in research projects at the undergraduate level is important and helps transition in graduate programs (Hurtado et al., 2007). Many Black females do not get the opportunity to participate in undergraduate research (Hurtado et al., 2007).

Researchers established a connection between a minority STEM student's decision to leave college and their economic situation (Hurtado et al., 2007; Maton & Hrabowski, 2004). College costs have risen over the last two decades while family incomes have not risen as much (Jaquette, Curs, & Posselt, 2016). This leaves many minority students who fall in the lower economic bracket unable to meet tuition costs. Students sometimes have to work off campus to address their financial needs, and this can affect their success in STEM (Allan, 2011). At times working too many hours off campus may affect a student's ability to achieve significant academic success causing them to drop out of their academic programs (Allan, 2011). Financial aid while it contributes to successful retention of minority students can also be a deterrent (Allan, 2011). When students receive grants and scholarships they are more likely to persist in those fields (Swail, Redd, & Perna, 2003). The rising costs of tuition however sometimes make those resources insufficient to meet their financial obligations encouraging the need for a loan (Perna et al., 2009). Loans discourage the success of minority students in STEM fields (St. John, 2002).

Black women in STEM fields may have an identity that is made of the multiple marginal identities. These varying socially constructed personalities continually play on each other as she finds a way through a doctoral program. The historical context of her race and gender which reasons that she is unfit for that area of study continually juxtaposes her within different identities. She is rarely seen a Ph.D. student but her race, gender, social experiences, and background are used to place her at the lower end of the STEM hierarchy. In order to repair the leaky pipeline, it is important to analyze the social, cultural and academic hindrances which continue to impair the persistence of Black women in those disciplines.

Summary

This chapter reviewed the literature and theoretical framework undergirding this study. Collin's (2000) Black feminist thought is used to explore the marginalized gender and race category. Highlighting the intersection between race and gender fosters an understanding of the multiple layers of a Black female's experience when she pursues doctoral studies in STEM fields. This investigation addressed the issues of difference, and how the historical and present social reality of women of color differentiates them and sets them apart from what is considered normal. This differentiation may have an impact on them and cause them to feel like impostors, doubting their ability and legitimacy to pursue doctoral studies. Hesse-Biber (2010) noted that a mixed-methods feminist approach highlights the significance of social transformation, social change and social justice for women and other marginalized populations. This study accentuated the call for increased minority participation in STEM disciplines but showed the power imbalances, and other non-cognitive factors which may impede a Black female's successful acclimatization into a STEM Ph.D. program.

There are three important aspects in the literature used to sustain this transformative mixed-methods study. First is the notion of the impostor syndrome which researchers demonstrated is prevalent in high achieving women. Black women in STEM doctoral programs have proven that they are successful by their stellar accomplishments thus far in their academic career. Due to their minority status, their experiences may be marred by barriers such as feeling like impostors or discrimination. The second theme of this review explored the social context of Black women. Their history has carved images that place them in a negative light which at that times can be detrimental. It is important to explore the intersecting oppressions within which they reside. The review ended with a discussion on STEM fields and the current position of Black women in Ph.D. programs.

This study answered the call for more analysis on the experiences of Black women in higher education particularly in STEM disciplines. There have been numerous studies which highlight the need for improved minority participation in STEM fields but very few have explored the experiences of Black women at the graduate level particularly as it relates to the impostor syndrome. This study engaged quantitative and qualitative methods to explore this phenomenon. The following chapter will clearly outline the research process detailing the methods used, study participants, modes of analysis and ethical issues.

CHAPTER III:

METHODOLOGY

Introduction

This study first investigated whether there was a significant difference in the scores of Black female doctoral students in STEM on the Clance Impostor Scale when compared to other Ph.D. students in STEM fields at Tiger University. Situated within the context of Black feminist thought, I conducted an inquiry into the manner in which the impostor syndrome affected Black females' perceptions of success, as well as the practices and strategies they employed during their doctoral studies. This chapter provides an overview of methodological practices which guided the study. It begins with a discussion on the Clance Impostor Phenomenon Scale, the instrument used to collect quantitative data on the impostor syndrome. I then detail the two-phased sequential transformative mixed methods design of the study. The chapter ends with an in-depth explanation of the research design and mechanisms used in analysis of the data collected.

Mixed Method Transformative Design

This mixed methods design used a transformative lens throughout the research process. In this sequential mixed-methods design, I first collected and analyzed quantitative data then engaged in qualitative methods to further explore the quantitative results obtained in the first phase of the investigation. The second, qualitative phase built on the first quantitative phase and the two phases were connected in the intermediate stage of the study. The rationale for this

approach was that the quantitative data and subsequent analysis provided a general understanding of the research problem. Exploration of the participants' views provided a thorough interpretation of the results obtained in the first phase (Ivankova, Creswell, & Stick, 2006).

Creswell and Plano Clark (2011) detailed how a transformative framework can be used in a mixed methods study. They noted that this approach is useful when a researcher wishes to take a position on the needs of a usually marginalized population with the aim of providing recommendations to improve the situation of the disadvantaged group. A transformative framework describes reality within a "historical, cultural, political, and economic context" (Mertens, 2003). Following Mertens' (2003) guidelines, I addressed the epistemological concerns within this framework by establishing a level of trust with the participants to ensure that I accurately expressed all viewpoints (Mertens, 2003). The use of multiple methods from different paradigms helped me adequately present the issues that affect the marginalized group.

I made the decisions about the interaction, priority, timing and mixing within the context of Black feminist epistemology (Collins, 2000). Quantitative methods identified the presence of the impostor syndrome in Black females, while qualitative methods explored how the impostor syndrome affected the way they pursued their doctoral studies. Figure 2 is a representation of the research design based on the work of Ivankova, Creswell and Stick (2007).

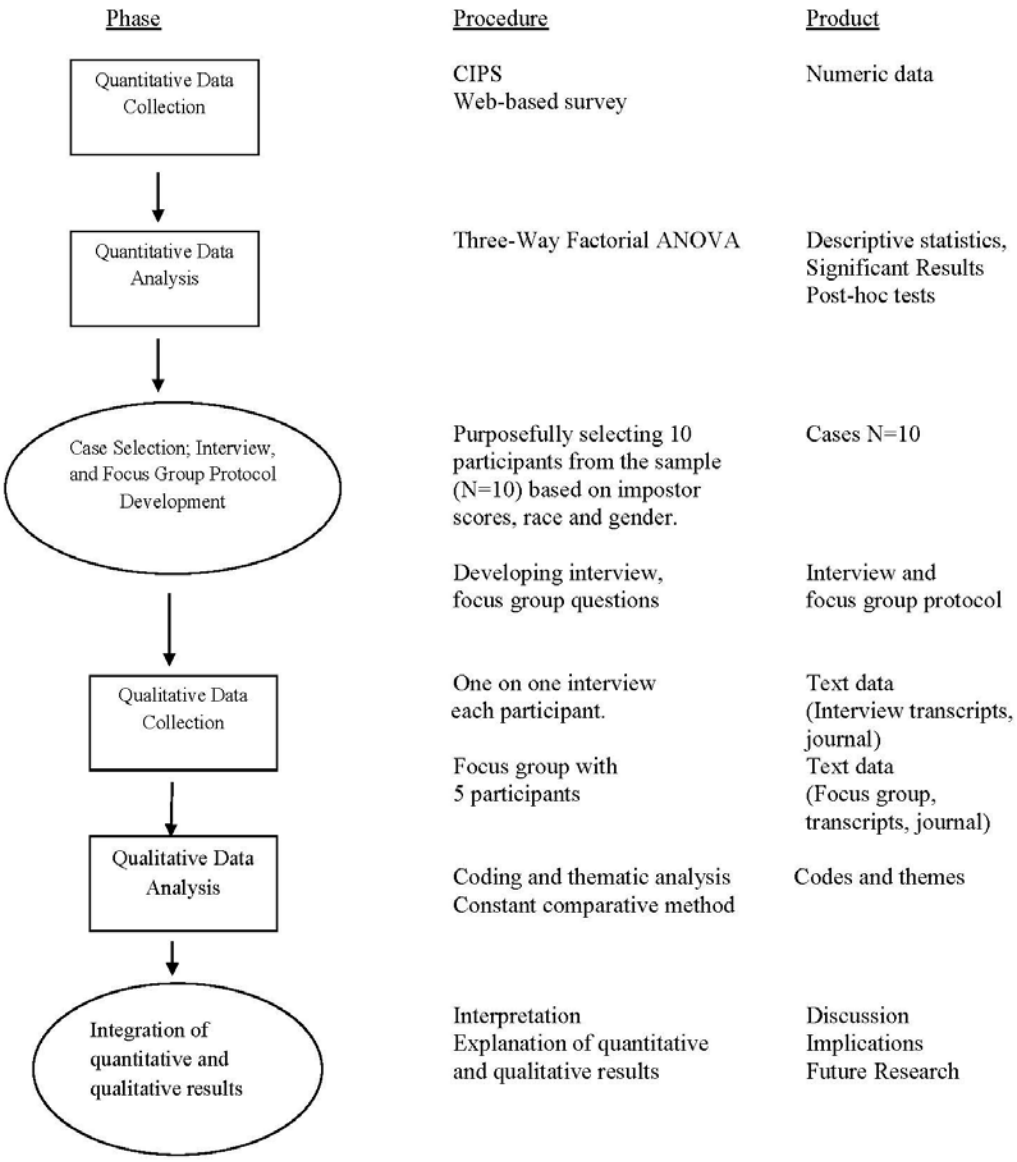


Figure 2. *Research design (Adapted from Ivankova & Stitch, 2007)*

The following research questions guided the study:

1. Are there significant differences in the scores of Black female students in STEM Ph.D. programs compared to other STEM Ph.D. students on the Clance Impostor Phenomenon Scale (CIPS) at Tiger University;
2. How do Black females who feel like impostors perceive success while pursuing studies in a STEM Ph.D. program; and

3. What are some of the strategies and practices employed by Black female students who self-identify as impostors during their Ph.D. studies?

The first quantitative phase of this mixed methods design employed a 2X2 observational design. The independent variables for this experiment were race[1] and gender. Race has two levels (Black and other races) and gender has two levels (male and female). The dependent variables were student scores on the CIPS and level. There are four levels of the impostor syndrome: low, moderate, frequent, and intense. I used a two-way factorial ANOVA and a Chi-square test for data analysis.

I conducted semi-structured interviews and a focus group interview to collect data for the qualitative phase of the study. The interviews were transcribed verbatim then coded using the constant comparative method. I used the codes to identify themes for the data analysis.

The Clance Impostor Phenomenon Scale

The Clance Impostor Phenomenon Scale (CIPS) is a 20-item instrument used to measure the impostor syndrome. CIPS examines specific attributes such as fear of being evaluated, fear of being unable to repeat success and fear of being less capable than others (Chrisman et al., 1995). The new instrument was more reliable ($\alpha = .92$) and had better internal consistency (Chrisman et al., 1995). The scale was designed to recognize whether individuals had a fear of failure, discounted recognition from others, feared evaluation, or were worried that previous successes could not be repeated (Fujie, 2010; Langford & Clance, 1993; Ross, Stewart, Mugge, & Fultz, 2001). The validity of the CIPS is demonstrated in its high correlation with similar scales in previous studies (Chrisman et al., 1995; Gibson-Beverly & Schwartz, 2008; Holmes et al., 1993; Kananifar et al., 2015; Holmes et al., 1993). Prince (1989) revealed high internal consistency on

[1] Race as defined by the NSF (2012) American Indians or Alaska Natives, Asians, Blacks or African Americans, Native Hawaiians or Other Pacific Islanders, Whites.

CIPS α = .84), Gibson-Beverly and Schwartz (2008) reported an internal consistency of. α = .90 in their study, and Holmes et al. (1993) tested internal consistency to be α = .98. These coefficients indicate a highly reliable and valid instrument for measuring the impostor phenomenon (Gibson-Beverly & Schwartz, 2008).

Each of the 20 items on the CIPS is scored on a five-point rating scale. The scores are 1(not at all true), 2 (rarely), 3 (sometimes), 4 (often) and 5 (very true). The scores are added up to produce a total score, the higher scores are indicative of impostor syndrome characteristics (Gibson-Beverly & Schwartz, 2008). The survey is available from the publisher and permission has been granted to use the survey in the study. A copy of the instrument can be found in the Appendix A. Responses are scored on a range of one (20) up to one hundred (100) points. In addition to the continuous scale, the level of imposter syndrome was also recorded. Respondents with a score of 40 or below would be identified as having very few characteristics of the impostor syndrome (low); those with scores between 41 and 60 would be identified as having moderate characteristics (moderate) while those with score between 61 and 80 would be identified as frequently experiencing impostor feelings (frequent). Those respondents who scored above 80 would be identified as having intense impostor feelings (intense).

An example of a statement which measures respondents' fear of evaluation is "Sometimes I'm afraid others will discover how much knowledge or ability I really lack." The statement "If I receive a great deal of praise and recognition for something I've accomplished, I tend to discount the importance of what I've done" measures impostors unwillingness to take responsibility for their achievements. Fujie (2010) as well as Chrisman et al. (1995) acknowledged that the instrument incorporates these individuals' fears of being evaluated, not being as competent as others and the inability to repeat success. The Cronbach's alpha for the

study sample was .85 which is greater the recommended reliability coefficient of .75 (Gliem & Gliem, 2003).

Participants

To begin the initial stage of the mixed methods design, I first administered the CIPS to all students in Ph.D. STEM programs at Tiger University. I gained an email list of doctoral students in STEM fields from the registrar's office. Students who belonged in these fields were identified based on the STEM-Designated Degree Program List available from the Department of Homeland Security (United States Customs and Immigration Enforcement, 2012). Students were sent an invitation email (see Appendix C) to participate in the study via Qualtrics. The 29% response rate was moderately higher than the satisfactory 20% response rate on a college campus suggested by Lipka (2011).

To get a representative sample of Black females at Tiger University for the second phase of the study, I used purposive sampling to identify ten (10) Black females pursuing doctoral studies in STEM fields. Researchers noted that this purposive sampling technique which uses informants to identify other cases to be included in the study increases the strength of the representative sample size (Kemper, Stringfield, & Teddlie, 2003; Miles & Huberman, 1994; Teddlie & Yu, 2007). I identified other participants for the study from two students who gave verbal consent to be in the study.

Data Collection

Before initiating the data collection phase, I sought permission to conduct the study from the research site's Institutional Review Board (IRB). After gaining IRB approval, I obtained informed consent from all participants for the investigation. I received permission from Pauline Clance to use the CIPS instrument (see Appendix E). To preserve the anonymity of research

participants, pseudonyms were used in the study and all recordings of interviews are stored in a filing cabinet under lock and key. I informed participants of the pseudonyms to which they agreed despite the option to choose their aliases. I tried my best to avoid imposing any preconceived ideas or notions to elicit participants to say what the study required. The verbal exchanges took place in the context of BFT where knowledge claims were guided by the participants' lived experiences, the use of dialogue, the ethic of caring, and the ethic of personal accountability. I kept a reflexivity journal of all activities which allowed me to keep a running record of the research process as well as critically examine the ethical, procedural and theoretical aspects of the research process.

To answer the first quantitative research question (*Are there significant differences in the scores of Black female students in STEM Ph.D. programs compared to other STEM Ph.D. students on the Clance Impostor Phenomenon Scale (CIPS) at Tiger University*), I employed the impostor syndrome survey (CIPS), which was distributed to all doctoral students in STEM fields at Tiger University via webmail. The survey is available from the publisher and permission has been granted to use the survey in the study.

For the second (qualitative) research question (*How do Black females who feel like impostors perceive success while pursuing studies in a STEM Ph.D. program),* I employed purposive sampling to identify participants for the study. I solicited the assistance of the first two participants in recruiting eight other Black female students in STEM fields. Once the students were identified, and gave their consent, they completed the CIPS survey again so I could identify where they fell along the scale. The survey given during the first phase was anonymous and there was no possible way to identify their scores in the initial phase of the study.

After inviting participants via email (see Appendix G), I conducted ten face to face interviews to discuss their experiences. The interviews took place in different quiet areas on campus convenient to the participants. I developed the interview protocol (see Appendix D) from previous literature on the topic. The semi-structured questions solicited student responses about their academic experiences. An example of an interview question is: Describe your completion process when you receive an assignment? Based on participant responses, I identified whether they experienced the phases of the impostor cycle as outlined by Sakulku and Alexander (2011).

The women in the study understood that their participation was voluntary and they had the right to drop out of the study at any time. After analyzing the interview data, I invited participants through email (see Appendix H) to complete a doodle poll for a focus group interview. Once I received confirmation for a time where five participants could convene, I conducted the focus group interview. The focus group discussion allowed me to gather rich data by moderating and observing interactions between participants (Janesick, 1994). I developed the semi-structured questions for the focus group protocol (see Appendix E) as themes emerged.

For the third (mixed methods) question (*what are some of the strategies and practices employed by Black female students who self-identify as impostors during their Ph.D. studies*), the data collection procedures were similar to those described in the first questions. The researcher responded to this question by engaging with data generated during the two phases of the study.

Data Analysis

Data analysis is at the core of mixed methods research and should be executed meticulously. The following data analysis procedures addressed each research question. To answer the first research question, I used *Statistical Package for Social Sciences (SPSS*) to analyze the data gathered from the surveys. I conducted a two-way factorial ANOVA to analyze

the continuous CIPS scores, with main effects of race, gender, and their interaction. For the categorical grouped level of impostor syndrome, a chi-square analysis was used to examine the relationship between level, race, and gender.

For the second phase of the study, I employed similar methods to analyze the data for both research questions 2 and 3. I transcribed the interviews verbatim and coded them using the constant comparative method outlined by Charmaz (2006). I coded the data in three phases in order to categorize, summarize, and analyze the data (Charmaz, 2006). The initial phase involved a thorough reading of all the transcriptions, underlining pieces pertinent to answering the research questions, and developing codes based on the literature and Black feminist thought. Once the codes were developed, I highlighted the data with different colors to represent the different codes generated from the initial analysis. The second phase included developing a data table where quotations from the interviews were place in a table which contained three columns: the code, the quotation, and the analysis. The third stage involved analysis and interpretation of the interview data based on previous literature, and Black feminist epistemology.

During the research process, I clarified any issues which appeared unclear to me or the participants by contacting them to ensure that their views were adequately represented. I continually examined the information obtained to ensure it addressed the questions asked. I engaged in member checking by allowing participants to read the interview and focus group transcripts. While coding the interview, codes were based on the information contained in the text and not on any previous notions on the topic. I merged the quantitative and qualitative results within the framework of BFT for interpretation. I triangulated the data using notes from my reflexivity journal to ensure that participant perspectives were adequately represented.

Trustworthiness and Validity

I exercised judgmental skills that enhanced the integrity of the research in an effort to protect the participants from harm which may manifest itself in a variety of forms. I continually used my reflexivity journal throughout the study to ensure that my personal beliefs were examined in relation to the research process (Ortlipp, 2008). I regularly reminded myself that my premier responsibility was to protect the participants in the study. Glesne (2010) called for "an ethics rooted in human relations, care, and socio-historical context" (p. 182). I used pseudonyms to ensure anonymity remained an important component in the research report. While the topic of ethics in research will continue to be heavily debated, the onus rested ultimately on me to protect the rights of participant. To safeguard these ethical considerations, I employed honest research practices and accurately reported the findings.

Scheurich (1996) as well as Koro-Ljungberg (2010) noted the division between what is considered trustworthy and what is not. During this inquiry, trustworthiness was reflected in the correct reporting of research findings and the absence of any form of modification. I made it my responsibility to accurately present research findings in a truthful way. Respondents' responses were not changed to suit the purpose of the study during data analysis. They were accurately represented, and I did not assume any preset notion of what the truth should be in the process.

The survey used for the study, CIPS, has been tested and found to have internal consistency reliability and construct validity (Chrisman et al., 1995). To ensure reliability and validity for the qualitative strand, I employed triangulation, peer debriefing and member checking. The unpredictable nature of this form of inquiry required me to constantly be aware of practices that enhance the representation of participants. Koro-Ljungberg (2010) asserted that it is a researcher's responsibility "to continuously stay sensitized to data and unexpected

interactions with participants and communities" (p. 605). She also warned of the predetermined validity which frees scholars of the responsibility and decisions which can result from unexpected events during the research process. These warnings were strictly adhered to during the research process.

Summary

This chapter outlined the methodological underpinnings of this mixed-methods transformative design. I first provided an overview of the research process. I then explained the content of the survey instrument used to measure the impostor syndrome in the first quantitative phase of the study. I then detailed the second phase of the sequential transformative mixed methods design of the study. The chapter ended with a thorough explanation of the research design and methods used to collect and analyze data gathered in the study. In the next chapter, I report the major findings generated from the data analysis. I first describe the quantitative findings from the first phase, and then I explicate the five major themes generated in the second phase.

CHAPTER IV:

RESULTS

Introduction

This chapter presents the findings from the analysis of the data generated in the study. The chapter begins with a discussion of the quantitative results from the web-distributed survey used in the first phase of the study. This section commences with the basic demographic data of the participants and ends with the results of the two-way factorial analysis of variance (ANOVA) and Chi-square analysis on the Clance Impostor Phenomenon Scale.

The second part of this chapter details the major themes generated from the analysis of individual participant interviews as well as the focus group interview. This section first introduces the ten participants in the second phase of the study. The chapter ends with a discussion on the five major themes (see Table 1) generated from data coding and analysis.

Phase 1: Identifying the Impostor

The study sample consisted of 216 participants pursuing a doctoral degree in a STEM field at a research institution in the southwestern United States. The genders were fairly even split, with 104 males (48%) and 112 females (52%) completing the survey. The majority of the respondents were non-Black (N = 191, 88%) while 25 (12%) were Black. These numbers reflect the institutional composition where 14% of the currently enrolled graduate students are Black. Most of the participants (N = 155, 72%) were in the 20-30 age range, 46 (21%) of them were between the ages of 31 and 40, eight (4 %) were between the ages of 41 and 50, and seven (3%) of the participants were over 50 years old.

Table 1 contains the group means (*M*) and standard deviations (*SD*) for the study sample based on their overall scores on CIPS. The overall mean was for the study sample was 59.370 (*SD* = 14.203) indicating that most of the participants had moderate impostor feelings. The scores for the subjects in the sample scores ranged from 28 to 94. Non-Black females obtained the highest group mean (*M* = 62.200, *SD* = 14.812) while Black males obtained the lowest group mean (*M* = 50.750, *SD* = 10.874). When compared across gender, females had a higher mean (*M* = 61.880, *SD* = 14.611) than males who had a mean of 56.670 (*SD* = 13.299). Table 2 details the means and standard deviations for CIPS scores based on different levels of the impostor syndrome.

Table 1

Means and Standard Deviations on the Clance Impostor Phenomenon Scale Based on Race and Gender

Race	Gender	N	Mean	*SD*
Black	Male	4	50.750	10.874
	Female	21	60.480	13.963
	Total	25	58.920	13.80
Non-Black	Male	100	56.910	13.377
	Female	91	62.200	14.812
	Total	191	59.430	14.289
Total	Male	104	56.670	13.299
	Female	112	61.880	14.611
	Total	216	59.370	14.203

Table 2

Means and Standard Deviations on the Clance Impostor Phenomenon Based on Level

Level	N	Mean	SD
Low	23	34.87	3.48
Moderate	95	52.18	5.06
Frequent	81	69.35	5.44
Intense	17	85.18	3.76
Total	216	59.37	14.20

Before analyzing differences between the groups, I evaluated the residuals to test the following assumptions for ANOVA: (1) nonconstant error variance, (2) outliers, (3) omission of an important factor and, (4) nonnormality of error terms (Kutner, Nachtsheim, Neter, & Li, 2005). The error terms had constant variance for all factor levels indicating that the nonconstant error variance assumption was not violated. None of the values on the stem and leaf plot deviated from the others signifying that outlier assumption was not violated. An analysis of the residual plot revealed that there were gender differences between the means; therefore, the omission of an important factor assumption was not violated. There was not a violation of the nonnormality of error terms as the points on the normality plot followed a straight line. None of the points was outside the range of the box on the box plot and the histogram was mound shaped. These results demonstrate that the study sample is random, independent, normally distributed, and there is homogeneity of variance among the groups. The ANOVA results are presented in Table 3.

Table 3

Results from the Final ANOVA Model

Source	df	*SS*	*MS*	*F*	*p*
Gender	1	629.19	280.503	3.181	.076
Race	5	1329.303	265.861	1.346	.246
Gender*Race	1	457.638	91.528	.463	.803
Error	204	40286.840	197.485		
Total	216				

Note.*$p < .05$.

A Chi-square analysis revealed that there was insufficient evidence to suggest a relationship between gender and level χ^2 (1, N= 216) = 7.468, $p = 0.058$). There was also a non-significant relationship between race and level χ^2 (1, N=216) = 0.959, $p = 0.811$). Analyzing the different levels based on the percentages of respondents for each group revealed that the groups responded equally based on levels of the impostor syndrome. Sixteen percent of Black students reported low impostor feelings; this is comparable to the 11.5% of non-Black students who reported low impostor feelings. The percentage of female respondents (41.1%) who reported moderate feelings did not significantly differ from the 48% of males who indicated a moderate level of the impostor syndrome. In the sample, non-Black students (44%) experienced moderate impostor feelings similarly to the Black students (40%). The percentage of Black respondents (40%) who indicated that they frequently experienced the impostor syndrome did not significantly differ from the percentage of non-Black students (36.6%). There percentage of non-Black respondents (7.9%) who reported intense impostor feelings was comparable to the percentage of Black respondents (4%) who did. Tables 4 and 5 detail the percentages generated for the chi-square analysis.

Table 4

Race Percentages for Level from the Chi-Square Analysis

Race	Level	Percentage
Black	Low	7.9%
	Moderate	22.2%
	Frequent	40.0%
	Intense	4.0%
Non-Black	Low	11.5%
	Moderate	44.0%
	Frequent	36.6%
	Intense	7.9%

Table 5

Gender Percentages for Level from Chi-square Analysis

Gender	Level	Percentage
Male	Low	16.3%
	Moderate	46.2%
	Frequent	33.7%
	Intense	3.8%
Female	Low	8.0%
	Moderate	41.1%
	Frequent	40.2%
	Intense	10.7%

The results from the initial phase on the study indicated that there are no significant differences in the scores of Black female students in Ph.D. STEM programs at Tiger University when compared to other STEM Ph.D. students on the Clance Impostor Phenomenon Scale. The overall mean for Black females did not significantly differ from that of the other groups in the study. Evaluation of the different levels of the impostor syndrome did not reveal any significant differences between genders or race. The results indicated that most of respondents in the study experience moderate impostor feelings. Black females experience the impostor syndrome on a

similar level as compared to the other groups in the study. However, their experiences may differ, even though there are not level differences. To further explore how Black females experienced the impostor syndrome qualitatively, the second phase of the study was conducted.

Phase 2: An In-depth Look at the Black Female Impostor

The ten Black females in the study were all doctoral students in STEM fields. The fields represented are biology, chemistry, math, psychology, science education, health education, and engineering. During the course of the investigation, I discovered that there were few Black female students pursuing doctoral degrees in STEM fields. Using purposive sampling enabled me to identify participants for the study who were in these disciplines. When I tried to get participants from other disciplines such as physics or computer science, participants informed me of the absence of Black females pursuing doctoral studies in those fields. When I did get recommendations for other individuals for the study, they were from the disciplines identified earlier. All of the participants were of the African diaspora, two were born in Africa, one was from the Caribbean and the others were all born in the United States of America. There was one participant who expressed a low level of the impostor syndrome based on the CIPS, half of the participants (5) reported experiencing frequent feelings, one participant recorded intense impostor feelings and three noted that they had moderate impostor feelings. It can be concluded that the majority of the sample though they hailed from different disciplines within STEM fields harbor impostor feelings. Table 6 below is a bio chart of the interview participants.

Table 6

Bio Chart of Interview Participants

Participant	Impostor Level	Undergraduate Institution	Graduate Institution	Academic Discipline	Year of Study	First generation Student (Yes/No)
Shanae	Low	HBCU/PWI	PWI	Math	2	Yes
Jane	Intense	HBCU	PWI	Engineering	3	Yes
Tiffany	Moderate	International	PWI	Science Education	4	Yes
Janelle	Moderate	PWI	HBCU/PWI	Math	4	Yes
Porsha	Moderate	PWI	PWI	Science Education	1	Yes
Allison	Frequent	PWI	PWI	Chemistry	5	Yes
Tasha	Frequent	PWI	PWI	Biology	4	No
Shauna	Frequent	PWI	PWI	Psychology	3	Yes
Carla	Frequent	PWI	PWI	Health Education	3	No
Derricka	Frequent	HBCU	PWI	Chemistry	3	Yes

Shanae, a doctoral student in math, is in the second year of her studies. She had the lowest score on the scale and appeared very calm, self- assured, and poised during her interview. She summed up her choice in the STEM field in this way “I chose math because I like it; I’ve always liked it so teaching it at the college level would be perfect for me.” Jane, a third year, first-generation engineering student was the only participant who reported intense impostor feelings. She made light of everything, laughed a lot and declared that the students in her cohort were “smarter than her.”

Tiffany, a Ph.D. candidate in science education, and Janelle, a math major, reported that they had moderate impostor feelings. Tiffany, who is in the fourth year of her program, noted there had been challenges during her academic journey but due to her unwavering faith in God

and the support of her family, she overcame them. Janelle, also in the fourth year of her doctoral studies, was grateful for the support from her department and peers. Despite a few bumps during her studies, she averred that her journey has "been alright, it's definitely been hard at times." Porsha, a science education major, expressed moderate feelings. She described herself as anal-retentive and stated that she needed organization so that things balanced out as she completed her studies.

Five of the participants reported that they experienced frequent impostor feelings. Allison is a first-generation college student in the fifth year of her studies in chemistry. Unsatisfied with her performance, she undermined her achievements and remained convinced that she made it thus far by sheer luck. For Tasha, a fourth-year biology doctoral student, her journey took an unusual turn when she became a mother during in her third year and experienced a change in attitude from her advisor and other faculty. Tasha reported that she no longer felt supported by her advisor and other members of faculty. Her doctoral journey became more challenging as she had to prove her continued academic competence as she took on her motherly role. Shauna, also a first-generation college student, is a third-year doctoral student in psychology. She questioned her rightful place in her program and surmised, "Sometimes I think about who am I to be here," when asked about her academic journey. Carla, a third-year doctoral student, successfully defended her dissertation at the time of her interview. While this is an admirable feat, she reported a high score on her survey. Derricka, a first-generation student in chemistry, was by far the most entertaining participant. She made fun of everything and laughed. Despite her cheer, she noted that she experienced frequent impostor feelings in "the very isolating chemistry environment."

A little over half of the participants wanted to pursue faculty positions in higher education. Some wanted to make a difference influencing the lives of the students that they taught so that they in turn can make a difference. Shauna added that she would like to do research while Jane said that she would be content with just a teaching position. Janelle intended to pursue a faculty position, but noted that she would also be content with a job in industry. Tasha wanted to go into industry.

These five women who reported having frequent impostor feelings, four of whom were first-generation, noted that they procrastinated, refused to accept responsibility for their achievements and attributed their success to factors outside of themselves. Similar to the women in Clance and Imes' (1978) study, the impostor syndrome was prevalent among the study sample who by virtue of gaining acceptance into a Ph.D. program proved that they were high-achieving individuals. Thompson et al. (2000) noted that some individuals who experience the impostor syndrome respond at times to achievement-related tasks with procrastination. Some of the ladies in the study indicated that they procrastinated when they had to complete their assignments. The inability to internalize their success is one of the key components identified by Clance and Imes (1978). Other researchers have also documented evidence of the inability of impostors to accept their success and their willingness to attribute their accomplishments to other factors (Harvey, 1982; Prata & Gietzen, 2007; Young, 2011).

The participants who demonstrated evidence of the impostor syndrome were fully aware of the oppressing gender and racial intersection, which according to Collins (2000) contributes to impostor feelings. Based on the impostor personalities outlined by Young (2011), the researcher identified the following personalities: the perfectionist, the natural genius, the rugged

individualist, the expert, and the super student. Tiffany is definitely a super student; she has been successful while juggling multiple roles. In her own words,

> And for a full-time student as well as a full-time worker, I had a full-time job, a full-time parent, a full-time wife, it was quite a journey but I think I did pretty well. Considering all the circumstances around me that could have tugged me either way, pulled me out of the program, I think I did pretty well.

Carla, also a super student, noted, "I'm very active on campus, I actually received a service award not too long ago in campus, for my service to TU. I overly participate in everything so..." While she did not highlight areas of failure in her interview, she recorded frequent impostor feelings on her survey.

Another impostor personality outlined by Young (2011) is the natural genius. Deducing from her interview, Jane fit the description of a natural genius who believes that intelligence and ability are innate and success comes with little effort. She does not use her hurdles along the journey as steps to success, but rather thought that she is not smart enough, or doing well enough because she is not able to get it from the onset. Young (2011) posited that some individuals with the impostor syndrome may fit the description of a perfectionist. Allison is a perfectionist; she wants to deliver a flawless product every time. When describing her academic journey, she stated, "I felt that … the first time I took a test and I got a really low grade I immediately said this was a mistake I should not have come here, (laughs) I'm not smart enough for this." Allison felt that receiving the low grade indicated that she was not worthy of being in her academic program, that one grade was enough for her to label herself "not smart enough." There was an indication that she went through the impostor cycle, and stressed herself at the thought that she might get less than an 'A' on an assignment. When she got those 'A's however, she believed that it was because "my parents just prayed enough and God had mercy on me." Honing on the one 'B' she received, she countered that GPA did not matter; rather it is how successful one is in the

field in terms of getting results and publishing. The following excerpt is an interesting exchange during the interview which sums up Allison's impostor feelings:

> Well trust me every day you'd think, well at least for me. Like you'll hear students talking and they'll be like oh I think I did really well, I never ever had that feeling, I never got that feeling, I never felt that I was good enough, I never felt that oh, I knew what I was doing. I always felt like oh I probably... I would hear people talking after test, they'd be like oh I knew this and in my mind, I'm like I didn't know this, I didn't remember this, did I put this? It was always second guessing, always doubtful. I never felt I knew enough. I mean I did well, I only got 2 Bs and those were because I had extra work packed on those semesters. No I got one B in one class, just one class ever I got a B (laughs).

The final impostor personality that could be ascribed to a study participant is the rugged individualist. Tasha, equated to a rugged individualist, interpreted seeking help from professors as a sign of weakness especially because of her race and gender.

> Tasha: I would be there trying to figure it out on my own struggling because I don't want to approach the professor and appear like I'm incompetent. Already I'm feeling like they think I'm incompetent.
>
> Interviewer: Because you're Black?
>
> Tasha: Why reinforce in by going and ask them questions. So that was a major problem I had, if I would have just not had that feeling and ask them for help maybe it would have helped me do better. There was only once, twice I remember going to professors for help and one out of the two was a negative experience, which reinforced my desire to not ask them for help.

Although there were other interviewees who reported moderate or frequent scores, there was insufficient evidence garnered from the data, which aligned them to Young's (2011) impostor personalities.

Coding and careful analysis of the interview and focus group data generated the following interrelated themes: family background, academic journey, success, the impostor syndrome, the double bind: race and gender (see Table 7). Some of these themes were revisited during the focus group interviews and the responses were more detailed but similar.

Table 7

Thematic Findings from Qualitative Analysis

Theme	Findings
Family Background	First generation status Family support
Academic Journey	Coursework and other challenges Advice
Success	The successful Ph.D. student Success defined Factors contributing to success
The Impostor Syndrome	Impostor cycle Impostor personalities
The Double Bind: Race and gender	Intersection between race and gender Academic background: PWIs and HBCUs

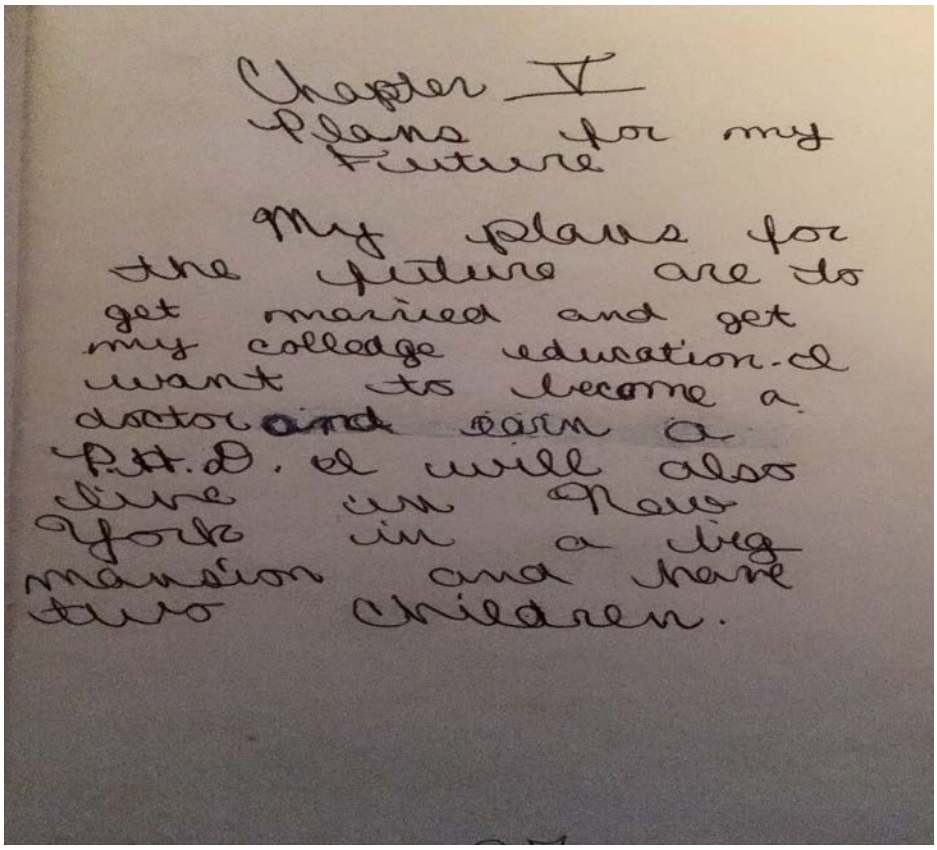
Family Background

First generation status. All but one of the research participants were first-generation college students. When asked the first interview question, *tell me a little about yourself,* some participants highlighted this without any prompting. It could also be that they had been used to that classification since labels are often used to create an identity. Some of them were also low-income students, or came from rural areas. An interesting quote from Shauna was "Really no one, my mom, dad, grandmother, brothers and sisters, aunts and uncles, no one in my immediate family has even gone college. Most didn't even graduate high school." Since most of the participants in the one-on-one interviews were first generation students, the researcher further probed the topic during the focus group interview in which four of the students were the first ones in their family to obtain a college degree.

The members of the focus group did not believe that there was any negativity associated with the term first-generation and were proud to be "pacesetters" for the rest of their families. The one student who was not first generation felt that she belonged in that category because her parents attended college out of the United States. She was not very knowledgeable about the transition from high school to college as her parents who were not Americans were incognizant of the process as well. The excerpt below highlights their views on their first-generation status:

> Interviewer: So, do you think there's a negative connotation associated with that term?
>
> Jane: No. I wouldn't say negative.
>
> Tiffany: I don't think so.
>
> Porsha: I don't think it's negative but there is certain, did your parents go to college? It's not necessarily negative but it's more so, a well, their parents went to college and yours didn't.
>
> Others: Umm hmm.
>
> Porsha: …. like TRiO, that's one of their things is like are you first generation, you are more at risk if you are first generation.
>
> Jane: cuz I think with the first generation, we don't know, like we didn't know what to expect…

The participants identified that the most salient aspect of their first-generation status was being unaware of what to do or expect as they began their college careers. They were not sure how to complete their Free Application for Federal Student Aid (FAFSA), make rooming arrangements, and were unaware of the expectations when they got to college. Porsha noted that when she was seven years old, she wrote a book and included the line "I am going to be a doctor (Ph.D.)." The other participants were impressed and she actually had a picture on her phone of the book. Figure 3 is copy of the page from the book the she wrote and still possesses.


Chapter V
Plans for my
Future

My plans for
the future are to
get married and get
my college education. I
want to become a
doctor and earn a
P.H.D. I will also
live in New
York in a big
mansion and have
two children.

Figure 3. Porsha's book page

Being first generation came with benefits as participants gained access to support programs geared to minorities in STEM fields. In many institutions, there are support services for students who are the first in the family to seek postsecondary education (Higgins, 2017). Research shows that first generation students are most likely to be from underrepresented groups which include females and Blacks (Engle, 2007). These students are considered at risk because few of them graduate within four years (Higgins, 2017). To help minimize these statistics, institutions of higher learning provide support services to improve retention and assist students in completing their degrees.

Jane explained how the support services she received paved the path to her graduate studies. She indicated that the department contacted her to be part of their graduate program even though the deadline had passed. Although she was getting ready to attend another school, the

well-supported financial offer she received from TU made it a better choice for her. Janelle elaborated that academic institutions target first-generation students, inviting them to participate in programs or to be mentors. She added, “I think sometimes they ask you about that [first-generation status] too so that they can give you a support group, like you don't know what FAFSA is, so let me tell you before you get there.” Jane and Janelle participated in NSF sponsored grants that facilitated a bridge to STEM doctorate, while Porsha took part in a bridge-to-teaching in STEM.

The sponsored programs were beneficial because it increased their awareness and gave them access to individuals who assisted them in furthering their careers. Jane noted that the program she participated in “paid for me to be in bridge to doctorate and since I made these connections when I left and came back, I had all the connections so I knew who to talk to, I knew where to find money at that's how I got into the program.” They knew where to look for funding and, who to talk to when the opportunity to advance in their academic careers arose. When these two participants spoke about those programs during the focus group discussion, Tasha who attended a PWI admitted that she had no idea that these support systems existed. They admitted that they would be the first in their families to earn doctorates and Janelle concluded that they were a “newer generation, a generation of lifelong learners.” The participants had not let their first-generation status deter them from achieving their academic goals.

Family support. Except for three of the participants, most grew up in nuclear households and had the support of both parents. Many of the participants spoke of their parents pushing them or encouraging them to pursue higher education. Carla had an interesting history; her mother’s family completely ostracized her when she was born. Her mother was an international student at the time of her pregnancy. As a result, Carla grew up in a single parent

household where they struggled financially and moved frequently. This however did not deter her success, because her mother worked hard to ensure that she received a good education and sacrificed so that she went to private elementary and middle schools. Jane from a nuclear unit, who grew up in one of the big cities, noted, “I grew up in a bad neighborhood, like drugs, drive-bys, things like that… uh gangs stuff like that.” Despite all these odds, she overcame and rose to the top in her academic field.

Some of the participants acknowledged the support that they received from their families. A few joked about their parents questioning their degree completion, and their entry into the world of work, but admitted that their support had been unwavering. Tiffany credited her success to her dad, who she said

> had implicit confidence in me, as a child growing up, he always told me the sky was my limit, he just had this confidence in me that I can do all things if I put my heart in it to do it, if I desire to do it. So, he always encouraged me to say anything you want to be, you know you can be it.

Family support played a significant role in encouraging the women in the study through their academic careers.

During the group discussion, some of the younger participants who fit in the 20-30 age category and had gone straight through their college career without entering the workforce noted the wavering support of their family after their bachelor’s degree. It was not that the family did not support them; they were ready for them to graduate and enter the world of work and have a real job. Jane noted while most of her family had been there for her bachelor’s graduation, only her parents attended her graduation from her master’s program but she joked that her family was saving for her doctoral graduation because they were going to “shut down the auditorium” as everyone in her family was going to attend her doctoral graduation ceremony. It was not that the

families were not proud of them or supportive; they did not understand the intricacies of obtaining a Ph.D.

The two participants who were married noted the encouragement given by their spouses. Tasha stated that “I have a really good support system, there are many times that I just wanted to leave with a Master’s but my husband is very supporting, my mom has been very supporting, so having a support system.” Tiffany declared, “My husband encouraged me when I told him I wanted to pursue this even though he felt it was not needful financially but he encouraged me, has always encouraged me.” Family support is one of the factors that encourage minority groups in higher education to succeed.

Academic Journey

The participants were all pursuing doctoral degrees in STEM fields, while most of the participants had gone straight through college, undergraduate, master’s and now doctoral studies, four of them had life experiences where they pursued a career in a STEM field before enrolling in a doctoral program. Three of them had frequent impostor feelings and one had a moderate score, indicating that the impostor syndrome may not necessarily be present when students leave the workforce to return to school. The student with the moderate score was the oldest participant. Young (2011) noted that individuals may feel like an impostor when they are older students returning to the academic sphere with classmates who are younger than they are. While Tiffany was the oldest participant her score on the instrument was at the lower end when compared to the other participants in the second phase of the study. During her interview as well as the focus group discussion she did not express any doubt about her rightful place in her program. The three other participants with frequent impostor feelings, although they were returning from the

workforce had reported feelings similar to those who continued their higher education studies without any breaks.

The student who had low feelings was the youngest participant. Students who were pursuing doctoral degrees in math had lower scores than the students in other disciplines. Those students praised the academic support they received from their department. Peer support seemed to be a pivotal factor as well. Some programs were more demanding in terms of dedication and it was there that students had frequent impostor feelings. Strong academic support contributed to the level of the impostor syndrome experienced by participants. Shanae spoke highly of her academic advisor, when asked about the factors that contributed to her success so far, she said,

> …my advisor that I met my junior year when I came here, he's the one, I wasn't going to stay here for Grad school, I was going to go somewhere else, I applied to a lot of different places, and then he told me to apply here so I stayed with him to do the research.

When I asked Tiffany about the academic support she received from her department she elaborated,

> I did receive support from my advisor, he actually offered me a graduate assistantship the very first year I applied but I had a full-time job and I was enjoying my job and felt I was making a difference where I was so I didn't jump at the offer then. Along the way, he has pointed me to job opportunities outside this institution, and pretty much I took most of his classes and I gained tremendously from the coursework.

Shanae and Tiffany felt well supported by their respective departments and this made them feel less like outsiders in the fields. It should be noted however, that a few participants who had strong support reported high impostor feelings. Allison praised her academic advisor and summed her academic journey in this way:

> You know and so, it's been very trying, sometimes you think that certain professors don't like you or they don't think you belong here, you get that feeling sometimes but you know my boss is very nice to me and very supportive and so that makes a huge difference.

While she may have had the support of her advisor, there were other professors who were not as supportive causing her to constantly doubt her intelligence. Jane, the student with intense impostor feelings acknowledged that "this department is pretty nice and supportive, it's good. Like they good." Jane had previously left an academic with a master's degree instead of her doctoral degree due to the lack of support from that department.

The other participants who had frequent impostor feelings did not feel encouraged in their respective programs. Although Tasha received financial support from her department, she countered,

> But as far as my actual mentor, my advisor, he's not very understanding of that fact that I have a family. So, he kind of expects me in the lab all day, every day and if you're not in the lab all day every day, you get punished indirectly.

Shauna disclosed, "I don't feel like I have support from my department. My advisor is, I don't know, selective about his responses and meeting with students." An interesting exchange with Derricka about departmental support follows:

> Interviewer: Okay so can you tell me about the support you receive from your department? Do you get a lot of support from your department?
>
> Derricka: Umm this department is something special; you mean what kind of support?
>
> Interviewer: I mean academic support, emotional, do they encourage you do you feel like you have somebody you could talk to. Like you said you're isolated but I'm assuming that it's because of what you're studying but in terms of somebody you could reach out to, talk to do you have that?
>
> Derricka: No.
>
> Interviewer: You're just all on your own?
>
> Derricka: Umm I talk to my advisor but my advisor is different from me so some stuff I have I can't talk to him about.

Derricka's exchange revealed the need for support beyond the academics, there is a salient part of Black women's experiences for which support is lacking.

When asked to describe their academic journey so far, responses were both positive and negative. While some have had the support of their advisor or department, some students have had to quit a program due to the lack of support. Shanae who had low impostor feelings noted, “I have taken advantage of many opportunities that I’ve been presented and it’s worked out well so far and you know I’m not behind or anything so I’m just a… I’m just right on track with everything.” Participants who had frequent or intense impostor feelings noted that their academic journey has been “trying,” or that “professors felt that they didn't belong here,” “they struggled,” “it has not been a smooth journey,” “a difficult transition,” “it's been hard at times,” or “crazy.” When asked about her academic journey, Allison who recorded frequent impostor feelings heaved a sigh and said “Jesus Lord. How has my academic journey been?” She then laughed and continued, “very trying. It’s never easy, I always thought that I would not be able to do it.” Tiffany who had moderate feelings stated, “It’s been alright, it’s definitely been hard at times, but it got better.” Jane who had intense feelings and had to change programs noted that her first program “was kind of hell for me at the time but this department is pretty nice and supportive, it’s good. Like they good.” Those who had low or moderate impostor feelings had a more positive outlook on the academic journey. Those with frequent or intense feelings were more concerned with the negative aspects of their academic journey.

With the exception of one participant, respondents lauded the financial support they received from their respective departments. They had graduate assistantships that covered their tuition costs and provided a monthly stipend. When asked why they chose to attend this institution, many of them laughed and said because of the financial support they received whether it was through graduate assistantships, fellowships or scholarships. The one participant who did not receive an assistantship from her department procured an assistantship outside of her

department and received financial support throughout her studies. She also received a prestigious fellowship award in her last year. The institution played a significant role in financially sustaining doctoral students in STEM fields during their tenure as students.

About half of the females in the study indicated that they received academic support from their respective departments while the other half felt that support was lacking. Jane noted that her department was supportive and her advisor always encouraged her to keep working and "[pushed her] to publish papers." Tiffany, Shanae, Allison, and Derricka also praised their support of their advisors and spoke highly of them.

While Tasha admitted to having support from her department and advisor, she pointed to a shift once she had a child. She noted that she was expected to continue being in the lab daily and negate the needs of her family. She observed that there were indirect methods of punishment because she could no longer devote as much time in the lab. She declared, "There are ways that he has of punishing us. It's not obvious, it's more covert than obvious but you know the reason he's acting this way is because he's punishing you." Her mom currently cares full time for her daughter so that she can complete her studies. Shauna noted that she received no support from her department and most times, she chased after her advisor who is selective with his responses. Janelle acknowledged that her professors were helpful but were not the ones you could talk to about issues outside of coursework or build a relationship with. Carla highlighted that there was an inadequate number of graduate faculty in her department and as a result, students' research interests were limited based on faculty interest. She had to reach out to faculty outside of her department to get the support. The issue of advisor support was again explored during the focus group interview.

The female scholars all agreed that having a good advisor is very important for succeeding in graduate school. They acknowledged the politics that went on in different departments, and the critical role an advisor played when it came to issues such as choosing your committee, or a research topic. Tiffany the oldest participant cautioned the other members in the discussion that they need to be mindful of their advisors and listen to their spoken and unspoken words. Some of them had encouraging advisors who pushed them to publish and encouraged them on their academic journey. During her interview, Tasha stated, “before I had a child, everything was fine, my advisor was really nice. He was very helpful with research and now his attitude toward me has changed a lot.” The relationship she shared with him became strained after she became a mother. Despite that shift, Tasha acknowledged that she gained a wealth of knowledge from her mentor owing to the fact that he was one of the most respected individuals in his field. Janelle noted that her relationship with her chair is already better than the one she had with her previous advisor who was a general advisor. Jane detailed a negative experience during her Master’s program where none of the professors refused to work with her because she studied at a HBCU. She got help from a professor who held little regard within the department. She noted that despite that, he was tenured and he really helped her get through her studies and graduate within a year and a half. She declared, “So I had a lot of, it was just discrimination and just like racism. It was like, it was tough.” Jane had an unsavory experience when she first started her graduate studies, and was quick to use it as a reference to the more positive experience she now had.

In one particular department where two of the students belonged, they underscored the importance of the peer support. Janelle established, “so I think the thing that has sealed us together so far, supportive wise was our peers.” Shanae equally sang the praises of her peers and

affirmed that they were all equal as their program was not competitive, “everyone pretty much helps each other.” She further affirmed that as long as a student was willing to do the work and work with everyone else, they would succeed.

Participants pointed to cultural and racial differences, which at times made the advising experience a little difficult. They felt judged based on their minority status and there were times when they could not reach out to their advisors because they did not understand the social context of being a Black female. Jane countered that even though her current advisor was great and pushed her, she believed that Jane wasted time participating in voluntary activities. Jane disagreed and explained that she had to give back to her community; she had to help mentor someone. She also pointed a racial difference when choosing her committee, given a recommendation by a professor she laughed and said, “he’s a perfectionist, he’s also Mormon, he’s White, and a male. I’m like no; it’s not going down.” Black women have to take a different approach in the academic sphere; the intersection within which they reside cause them to negotiate the academic sphere differently.

Advice. When asked whether they would advise their friends to follow their academic path, most students answered in the affirmative. Tiffany who had started her doctoral degree online and switched to a physical campus highlighted the challenges of an online program, which she thought catered to a specific set of individuals. She advised that students not pursue an online degree if they are not perceptible to the virtual environment. She further stated that she appreciated the interaction afforded to her in a physical classroom environment. Jane had a very interesting response when asked if she would advise others to follow her academic path, she argued, “I don’t think school is for everybody, I don’t think school is the answer for everything. I don’t think being institutionally educated is necessarily the answer.” She did not feel that

pursuing higher education especially graduate studies led every individual on the path to success. Shanae who had low impostor feelings responded “of course” when asked that question. Janelle and Derricka were also positive about encouraging others to follow a similar academic path. Other participants believed that students had to make sacrifices such as finding a supportive advisor even though it may not be what you love and make the best of their academic environment in order to succeed.

Challenges: Coursework. Coursework seemed to be challenging for a little more than half of the participants. Tiffany noted that having to balance coursework while being a full-time employee, wife and mother at times made the completing assignments quite challenging and regretted that she took too many classes at one time because it caused her to “race against time.” Jane insisted that she performed terribly and stated that she stopped checking her GPA because it was so low. She further acknowledged that her GPA must not be that bad because “I’m like I’m still here so (laughs)… I’m still here they ain’t put me out yet so it must be looking good.” Jane indicated that she felt lost and no matter how much she learned, she was still behind because she had changed majors from math to engineering. She did go on to say that at the end of the day, GPA did not really matter, getting the Ph.D. was what counted. Allison also expressed similar sentiments about GPA not being as important as actually earning the doctoral degree. Allison felt challenged by her coursework throughout her tenure, she repeatedly said she was not smart enough, did not know enough, and always second-guessed herself.

Tasha acknowledged that she felt academically challenged at the beginning of the program and summed her academic journey in this way: “I struggled in the beginning because I didn’t have the highest grades in biology, umm but I think through hard work and dedication my mental capacity has significantly improved since I’ve been here. So, I’m doing well.” Although

she had gotten to the level where she academically comfortable she faced additional challenges when she assumed the role of a new mother. In an effort to devote more time to her studies, her mother who lived in another state had to take charge of her child. She asserted that her studies required a lot of time and devotion that she could not give if she had to fulfill her motherly role. While it is hard being away from her infant, she realized she had to make the sacrifice to complete her studies.

Janelle conveyed that she had trouble when she took some classes with her first advisor. He tried to get her interested in his field of study and when she did not express interest, he made it difficult for her. Her first year as a doctoral student was particularly challenging because she redid classes that had already taken in her Master's program. An interesting exchange during her interview follows:

> Janelle: So, none of my credits counted and so what my advisor at that point in time told me, he said that the school that you went to for your master's program does not offer as many math classes as we offer here.
>
> Interviewer: Umm hmm.
>
> Janelle: However, as I go later into the program, I started to think huh that doesn't sound right. I thought maybe you should question this, they should have counted. But it was okay, he gave me a little bit of problems. I had to take a class up under him and it just wasn't very good and I found out, cuz I was applied math and I was taking… he tries to skew us into taking pure math classes.

She realized that there was injustice in her taking over the classes which made her academic journey more challenging. She also acknowledged that her journey was a lot better now that she had a new advisor.

When asked if she had whether she had problems keeping up with her studies, Derricka noted that the only time she was unable to keep up was when she had a health issue. She had to undergo major surgery because of temporary blindness but acknowledged that her professors worked with her and she was able to get back on track. She was very open to learning and stated

that her ability to admit that she does not understand a concept and seek assistance has been pivotal to her advancement in her field. She described her experience in this way:

> Derricka: but because I think I'm a little bit more progressive,
>
> Interviewer: Umm hmm.
>
> Derricka: if I don't know, I'm not afraid to say (stresses), I don't know and then you tell me what it is.
>
> Interviewer: Umm hmm.
>
> Derricka: At this point it got to the point where I walk into my advisor's office and I'd be like I really, really don't know
>
> Interviewer: Umm hmm.
>
> Derricka: what water is made of and instead of him… and this is an example, he'll be like water is made out of hydrogen and oxygen, alright. And I'll be like okay, I'm going to remember that.
>
> Interviewer: and you're able to retain it, yeah.
>
> Derricka: So, he has gotten to the point where like any silly… if it sounds like a silly question he'll just stop and answer it.

Derricka also indicated that her undergraduate studies had not adequately prepared her for her graduate studies. Her ability to acknowledge that shortcoming, and work toward overcoming that hurdle made coursework which could have been an obstacle to her success, less challenging.

Intersectional challenges within the academy. Tasha had an interesting and unique case which highlights the challenges that women especially women of color face in the academic sphere. She concluded that the way she was viewed and her academic experiences significantly changed after she had her child. She described how she tried to hide her pregnancy by wearing oversized clothing, faced rumors that she would not return, and her advisor's attitude toward her changed since her pregnancy. When talking about her experience, she articulated,

> So, I have to work extra hard, work harder than a White female who may have three kids to prove that yes I want to be here one and two I deserve to be here and three I am

> intelligent and capable of doing it even though I had a child. So, it's been a very rough year for me (snickers).

When I asked if any other student experienced pregnancy during her time as a student, she answered in the affirmative. Tasha explained that unlike her, the other student who is married to a professor and Asian was just breezing through with no hurdles in her path. She further reiterated,

> Tasha: Yeah, I only had seven weeks leave, then came back to defend my candidacy, so I became a candidate after the pregnancy leave and ever since then, it's just been … they've changed. They don't like… I think what it is, is that they felt like I got pregnant that was their way of seeing that I was going to leave. Oh, she's pregnant, she's Black. Black females don't do very well in my program.
>
> Interviewer: Umm hmm.
>
> Tasha: There are very few of them that have gotten Ph.D.s so immediately when you do something like get pregnant, automatically they think that you're not going to come back. And when you do come back it's like a surprise to them so there's just roadblocks, they're putting in your path to see how strong you are and how much you can do to make it out. At least that's how I feel.

Intersectionality of race and gender continuously shaped the academic and non-academic experiences of Black women and depicted the power structures that continuously place them in subservient positions in STEM fields.

Shauna believed that her job search in the future might be daunting because she did not have any real-world experience in the job market. She transitioned directly from her undergraduate to her graduate degrees and claimed that she had book knowledge and no real-world experience. Carla also jumped through some hoops during her time as a student. Having not received an assistantship from her department she was incognizant of what was going on because disseminated information excluded her. She is very grateful for the support she received outside of her department as she felt isolated at the beginning because "[she] didn't have a space, [she] didn't have access." The women in the study who did not receive support from their academic

departments did not let it deter them on their path to success; they found support in other spaces such as their peer groups, churches or families.

The Impostor Syndrome

With the exception of Shanae and Tiffany, all the participants expressed doubt about their ability to undertake their studies. Tiffany boldly stated that she never doubted her abilities because her abilities come from God. Shanae verified, "only if something was really hard but I don't think it was really doubting my abilities, it was just like uh I can't figure this out and eventually I figure something out." When asked whether they doubted their abilities to undertake their graduate studies, the other participants gave a range of responses. Jane replied, "Yeah two days ago" while Allison confirmed, "Yes, oh yes. All the time." Tasha laughed when she said, "Yeah many times, still to this day." Shauna admitted that she constantly doubted herself and questioned her right to be in the program. Janelle assumed that she had experienced a little doubt while taking classes she was sure it would increase now that she had entered the research phase of her studies. Carla was doubtful at the beginning of her program because she felt that other members of her cohort were sure and secure in their research interests while she had no idea of what her research would entail. Derricka confirmed that she sometimes doubted her abilities to undertake her studies because her undergraduate academic preparation was not well grounded. Porsha declared that while she did not doubt her ability to successfully complete her Ph.D., she questioned her ability to finish in the time that she anticipates.

A key feature of the impostor phenomenon is an individual's unwillingness to take responsibility for their achievements. They usually attribute their success to factors outside of themselves. During the focus group interview, the participants were in unison that God was a major factor in their current level of achievement. Porsha took it upon herself to summarize it for

the group, "I'm telling you it really was, we can all sit here and joke about it, and I don't know if you're going to write about it in in your Ph.D. but we've all said it was God." The others laughed and agreed. Many of them claimed to be in the right place at the right time. Individual interviews revealed that some participants appreciated the role their family, advisors and former professors played in their success.

The impostor cycle. Clance (1985) explained that the impostor cycle begins when one is assigned an achievement-related task such as an assignment. Students respond to the task in one of two ways, intense over-preparation or procrastination. Once the student completes the assignment, they experience temporary feelings of relief until the individual receives positive feedback. Rather than taking responsibility for their achievement, the individual attributes it to other factors. The researcher asked participants to describe their completion process once they received an assignment in order to identify whether they went through the cycle when given an achievement related task. There was no evidence of the impostor cycle from the interviewees who had low or moderate impostor feelings. Shanae indicated that she did not stress, procrastinate, or overindulge when given an assignment. She calmly noted that she did not like to stress herself out so did not wait last minute to complete assignments. She stated that she focused on her more challenging classes first then worked on those that were less challenging. When asked whether she was always on top of her academic game, she smiled and said yes. Tiffany and Janelle who were moderate impostors also expressed similar sentiments. Tiffany stressed, "I am not a procrastinator; I am absolutely not a procrastinator so I do my work as soon as I get it." She revealed that she had never been late with an assignment. Janelle relayed that she always started on her assignments right away and when faced with a difficult assignment, she would try it on her own first then seek the help of her peers if she needed to.

With the exception of Derricka, students who had frequent to intense impostor feelings described the impostor cycle when faced with an achievement related task. Derricka who had frequent feelings did not go through the cycle; her jovial nature influenced her approach to her studies. When asked whether she procrastinated, she replied that she did one time, received a F and never procrastinated again. She specified that did not stress over assignments if they did not require a lot of effort. An interesting part of the conversation went like this:

> Interviewer: So, if you're getting a good grade you won't put too much effort into the class?
>
> Derricka: If it's like I didn't try and I got a B, I'm not finna try.
>
> Interviewer: (laughs)
>
> Derricka: If I didn't try and I made a low mark I'd be like maybe I should actually try.
>
> Interviewer: Oh good but you won't just try on your own?
>
> Derricka: It's a balance, how hard the class is versus how much energy expended.

Although she reported having frequent impostor feelings, Derricka did not procrastinate or over-prepare when given an achievement related task.

The other students defined anxious states when they received their assignments; they appeared puzzled when first faced with these assignments and questioned the legitimacy of their knowledge. They all said that they poured over the question numerous times trying to understand what was required. Tasha, Shauna, Janelle, and Carla intensely prepared to complete the task, they put their all into it, trying to solve in on their own initially and sought help if necessary. Jane, Allison and Shauna who admitted to being procrastinators began working on their assignments when the deadline loomed over and they embarked on an overindulgent spiral until they completed the task even though it meant staying up all night. They did experience fleeting feelings of relief when they succeeded on the task and noted how lucky they were to make the

grade, or thanked God for helping them succeed. They did not acknowledge that they had earned the grade through their dedication and hard work. This happened every time they needed to complete an achievement related task.

Comparison to other students. Researchers conclude that individuals may feel like impostors when they compare themselves to others in their academic cohort and feel that they are not as capable as they are (Clance & Imes, 1978; Mason, 2009; Peteet et al., 2015; Prata & Gietzen, 2007). To identify how participants rated themselves in reference to the other students in their programs, the researcher asked them how they compared themselves to other students in the program. The participants who had low or moderate impostor feelings were less likely to compare themselves to other students. Tiffany acknowledged that she had the opportunity to work with some great students and though during class discussions she noticed there were students who were more knowledgeable than she was, she felt that she was 'up to the task." Shanae affirmed that she tried not to compare herself to the other students in her class and smiled when she concluded that they "were all on the same level." Janelle felt that although there would always be someone who is going to know more or feel more comfortable with the material, she and the other students were "pretty much right there together." She did however note that sometimes she felt she had to work harder because she was a female.

Although Tasha had frequent impostor feelings, she felt that she was just as capable as her peers were. She emphasized that she was in a discipline where others judged you based on your assigned advisor. Tasha had the privilege of working with one of the most difficult and well-known professors in the field. Shauna also indicated that she felt that she was just as capable as the other students were. She affirmed that when she had doubts because they seemed more knowledgeable on a topic, she reminded herself that she was not as advanced in the

program as they were. Derricka summed her feelings on the topic in this way: “umm I think one of the things that happened for me is that I realized at some point that we are all different.” She theorized that they studied different topics and possessed expert knowledge in those areas so comparing herself to them was not applicable.

When asked how she compares to other students in her cohort, Jane conceded, “I’m definitely different. I definitely think that they’re smarter.” She argued that they knew more because they had a more solid engineering background than she did. When I pointed out that, she was not failing and doing well she, laughed and said that it was by grace. She did not believe that her hard work and effort foster her advancement in her field. Allison contemplated, “I always think that I’m not as good as they are.” She wondered why people always praised her accomplishments and complimented on how smart she was. She stressed, “Do they not realize how much I really don’t know.” Carla who neared the end of her tenure as a student suggested that she might have failed at something because all her friends had acquired jobs and she had received an offer. While those positions did not align to the career path that she intended to take, she still felt a little despondent.

Success

The successful STEM Ph.D. student. When asked to describe success in their individual programs, the participants had a range of views. Most of them validated publishing and completing their programs in a timely manner as an indication of success in the different fields. Tiffany described a successful student in this way:

> Well if you are able to go through the coursework and being able to conceptualize what you’re learning and being able to improve on yourself, being able to grow intellectually, being able to see the world differently. I believe we are all change agents, so being able to contribute to the larger society.

Jane believed that a successful student read a lot, retained the information, published papers and performed experiments that benefitted the scientific community. Shanae concluded that a successful student in her discipline "finishes within five years, and stays on track." She further stated that this individual "takes the qualifying exam one time and passes and most get a job straight out and if not, our department does work with you to at least maybe get a job even here as an instructor until you find a job." These descriptions are aligned with the expectations within the academy, therefore their ideas about the student who is succeeds would be framed within this reference. Allison determined that in her field a successful student may not be the smartest student, she sustained that results yielding research is key. She further stated,

> And it's not the people who are the smartest so to speak because you can be really smart but if your research is not working then you still don't have anything. So it's just about being lucky enough to get research, lucky enough to get a good advisor that will kind of steer you in the right direction for your research and being disciplined and….

She believed a successful, disciplined student generated significant results from their experiments. She concluded that good results are the base of publications and dissertations.

Tasha laughed when she identified the successful student in her field as a "lab rat." In her own words, "Yeah you have to love lab, you have to love biology, those are the people who do really well, those are the people who get research done and you get really good results." She denied being a lab rat when asked whether she would describe herself as one. Shauna believed "that the students that are focused and dedicated are the ones that are going to do well." She reiterated that perseverance was instrumental in attaining success. She identified the successful students in the program as the ones who were involved in activities such as publishing, presenting at conferences or serving on committees in addition to excelling academically. Janelle expressed that success in the program was "making it." She explained that when a minority student attained an advanced degree in a "slim type field," it was a huge accomplishment. She

added that self-discipline is a key factor to achieving that goal. These students all defined success in terms of personal effort, discipline and motivation.

Carla discerned that success is dependent on an individual's goal. She justified that classroom teaching experience would benefit as student guided by the desire to be a faculty member while a student like her who was determined to work with people in the field did not benefit from that kind of experience. She made an interesting observation about the successful student in her department. She reflected that the idea promulgated of a successful student was changing; it was no longer the individual who stood silent and followed the status quo. In her own words, "the person in my program who will be successful knows when to shut up and take the status quo but knows when to push." She attributes this to the fact that there are now more Black students in the program, who have changed the dynamics by challenging the status quo and voicing their opinions. Ever the happy, jovial individual, Derricka laughed and joked that the successful student in her program is "someone who got no common sense." She noted that her field is quickly isolating because of the individuality of students' research interest and the successful student has to be independent, hardworking and determined. Porsha believed that the successful student is the individual who completes their studies and leaves a footprint either through a career in research, or a career in teaching.

Success in general terms. For many of the participants, their view of overall success did not necessarily match what they opined on academic success. Tiffany who prefaced her definition with "this may be politically incorrect" identified a successful individual as one who has God in their life. She added that a successful individual made a difference by doing little things at a time rather than big accomplishments. Jane stated "I don't think me getting this Ph.D. is going to equal success for me." She further reasoned that success had little to do with

schooling and identified living stress free and family support as indicators of success. She did not believe that her success would rely on another person. Shanae believed that her ability to do what she likes, ensuring that she does it well so that she could proceed in that area or field reflected her view of success.

Allison initially laughed and said that success was getting everything done in a timely manner. When asked to define success, Allison stated,

> Oh Jesus, I don't have a definition for success. For me I get to a level of comfort, I never feel like I'm successful enough. For real I never do, I always look at people, I don't compare myself to people but I look at others and see what they've done and I'm like I'm not near that so I'm not successful in my mind.

She noted that when she was younger she had clearly stated goals of how great she was going to be, but now she just wants to be comfortable. Getting a job where she is happy and being able to provide for her family now equated success to her.

Tasha had an interesting view of success, she boldly stated, "so the problem in this country is that success is measured according to one standard and it's the White man's standard." She clarified that success is defined by an individual's standards and one is successful when they do well and help those around them. In her opinion, someone who makes a positive impact in his or her community is successful. Shauna indicated that success looks like being better than she was the day before, doing more than she did before.

Janelle thought that being happy, trying your best and being satisfied with the effort put in defined success. She elaborated that when an individual got to a level where they were proud of themselves, they will push themselves to be even more successful. Derricka responded, "success is going from failure to failure without the lack of enthusiasm, who said that quote that's like stuck in my head for like forever." She looked up who was the originator of the quote and discovered it was Winston Churchill. Based on that quote she added that if you are trying to

do something, you are going to fail but if you keep going then that is success. She concluded that she would have quit a long time ago if she had not encountered periods of failure.

The researcher further probed the idea of success during the group discussion. When individually asked if they were successful, all participants responded tentatively that they were, while halting the response with a "but." Jane doubtfully replied, "I guess," then asked in what area of my life. When told in general, or academically, she answered that it was dependent on the day someone asked that question. Tasha stressed, "I'm successful but I'm not as successful as I want to be in this particular area but yeah." Porsha believed that she was successful but not fully accomplished. Janelle agreed with everyone else and summed, "I think it's a combination of my hard work and God just working for me to be in the right place at the right time." Tiffany who had a moderate impostor score reasoned that based on the different definitions of success, she was successful because she had good health, which enabled her to accomplish anything. She further reiterated that she was a success because she could do all things by His grace and concluded that she was a success. Wood and Breyer (2017) have contested that success in higher education occurs at different levels and may change as individuals traverse their academic journey. On a personal level, which defined many of the ideas delineated by the participants, success may include acceptance to a program of study, a dream job, a great experience, happiness, being challenged, or growing as a person. Kinzie (2012) explained that success in higher education is not only contingent on degree completion, but includes the quality of students' experiences, student engagement, preparation for life and as well as personal growth and development.

Factors contributing to success. Most of the participants attributed their success to the support they received from their family. Tiffany believed that her dad played a pivotal role in

her achievements as he always encouraged her to do whatever she set her heart on. She also acknowledged the support of her husband and kids. Jane recognized the encouragement she received from her family. Shanae confirmed that she had a good support system and her parents were always helpful. Similarly, Tasha affirmed a good support system, which includes her husband and her mom. Allison was adamant that her parents' prayers had kept her going and reiterated, "It's not my own measure because I'm not smart enough." Carla who had a tumultuous early life sang the praises of her mother who made many sacrifices during their time of hardship to ensure that she got the best education. Derricka noted that her mom has always supported her dreams and encouraged her. Some of the participants joked that though their parents chastised or teased them at times for their longevity in higher education, they continued to encourage them.

Belief in a higher power was pervasive throughout the interviews and most participants were grateful to God for their success. Janelle boldly stated that it has definitely been her faith in God that kept her going. Allison was convinced that she remained in her program because "God had mercy on her." She believed that He guided her and she was in the right place at the right time, having the best advisor she could have.

The focus group participants all agreed that God was pivotal in their success. They also believed that they knew the right people, or were in the right place at the right time. Porsha put together what most of the others felt "“I kind of summed it up to being you are in the right place at the right time having the right conversation with the right person, who connected you to the person that can help you really achieve your final goal." Tasha agreed because she intended to build a career first then return for a doctorate but things took a different turn, God helped her be in the right place at the right time and here she was pursuing her doctoral degree.

Some participants recognized the support they received from their academic advisors or other academic faculty in their department. Jane attested to the support she received from her advisor who pushed her to work harder and publish papers. Shanae acknowledge the support of her advisor who she met when she was an undergraduate, she said that she applied to graduate school elsewhere but he encouraged her to stay here and his support has been unwavering. Shauna noted that she had been academically successful because she was willing to take risks and "acknowledge when [she doesn't] understand something or [doesn't] know something." This attitude allowed her to reach out to faculty members and her advisor who supported her when she did not understand a concept. Janelle, who completed her master's degree at a historically black college, expressed that most of her support came from the faculty she met there.

The Double Bind: Race and Gender

As women of color participating in this study, the intersecting oppression of race and gender was a topic brought to the fore without any prompting. Jane opined:

> I honestly think that the education system takes advantage of Black people and puts them in debt. And then they get these degrees and they have nothing to do. A lot of times people don't work in their major. So really I feel like if you don't go to graduate school and get at least a Master's or a Ph.D. you really just paying for the college experience.

Her college experience especially at the graduate level had not been void of racial issues. Having a program chair who, refused to accept the merit of the HBCU she attended as well as being the only Black female there at the time bared institutionalized racism. She noticed the scarcity of Black professors in her department. She observed that the two Black professors in the department who were highly successful, were not married or had kids. She remarked, "All the White people you see, my Chinese advisor, married, kids you know…. They get everything." She added that her options for dating in this primarily White college town were slim to none and stated, "I'm at a point where it's like that whole aspect, this biological clock is ticking is

completely having to be suppressed, you know what I'm saying." She did, however, acknowledge that in her current program, her female advisor was very encouraging and pushed her to publish and conduct research.

Jane brought forth the issue of Black women's reproductive health. She noted that Black women who decide to pursue an academic career have to choose between a career in academia or having a family. She thought that the option of succeeding in both worlds was limited to women of color. Tasha asked when was really a good time to have a child because a woman did not feel comfortable having a baby their first or second year on the job. She relayed that she wore oversized clothing for the first five months of pregnancy to hide it. She decided one day to stop hiding, accept her blessing and prove to everyone that she was capable of being a mother and succeeding at her studies.

Tasha who had a unique case in her department laughed when I observed her case was very interesting. She declared,

> Tasha: (Laughs) Yes it's not common for a Black woman to be bold enough to get pregnant in a STEM program
>
> Interviewer: Yeahhh
>
> Tasha: and then have the child and come back, it's not very… Because of all the challenges that you end up facing, they look down on you. They don't do it outright but you know within yourself.
>
> Interviewer: Umm hmm
>
> Tasha: that they're looking at you differently, you can't prove it but you know.

When asked if she would do it differently if she had had a choice, she replied yes. She disclosed that her decision been encouraged by her mom who being a strong-willed African, believed that "no one can stop you from living your life" and she should go ahead and do what she desired. Tasha countered that her mom "doesn't understand the nuances of being Black and being a

female in something like this." Her unsavory experience had her regretting her decision and confirming that she would have waited if she had the opportunity to revisit her decision.

Shauna reasoned that she sometimes felt like an outsider because she was a minority student and a female. She observed that most of the male faculty on campus were in leadership positions and had tenure track jobs while there were more females on clinical or teaching positions, focusing less on research. Janelle noted that most of the students in her program were White and there were a few Asians but Blacks were definitely outnumbered. These two women noted the absence of Black female faculty to look up to or relate to on matters they felt could be better understood by someone who was like them. Carla explained that she chose a Black female professor to be her chair because "she cared about me beyond the research aspect." Carla elucidated that academia is called a White tower for a reason because Whites hold the preeminent positions there. She surmised that when students explore the underlying issues of race and gender and how it affects all the issues discussed in class, most faculty do not get it. Being a Black female with a doctorate is an anomaly for many students and Derricka contended that one has to overextend themselves in that position to show that they are capable or knowledgeable.

One participant remarked that faculty members are sometimes not attuned to the intersecting oppressions that plague women of color. She highlighted,

> Because a lot of these different interactions, being a black woman, being first generation, studying sex, being a victim of sexual assault, you know all of these different things is something that especially the White males, they don't ever think about.

The students at times highlighted the 'us versus them' binary that exists between Black women and White faculty especially males when it comes to understanding their issues and how these issues indirectly and directly affect their studies.

Carla noted that the experiences of Black men are different to that of Black women. She discerned that her Black male colleague was breezing through the program, had little issues and was loved by the faculty. Although he is currently the only Black male student in the program, he did not sense the isolation and marginalization that she experienced. Janelle noted an interesting gender disparity in her program. She told of assignments that she completed with a male colleague where they had the same answers and submitted similar assignments. Janelle remarked, "it seems like his grade is always one or two points higher and I feel like we have the exact same steps, exact same wording but sometimes it feels like…" She added that she heard that a lot with women in mathematics. In the male dominated specialty, similar to the old way of thinking, some still harbor the thought that women are not as capable as men are.

During the focus group discussion, the researcher asked participants whether they think that Black women are marginalized by their race and gender. They laughed and agreed it was an understatement because it was something they constantly faced. Their academic life was not immune to the double bind within which women of color exist. Porsha disclosed that people automatically assumed that she was getting a lower degree once she indicated that she was in graduate school. Jane confirmed that she experienced the same. Janelle noted that people were shocked to discover she was a doctoral student and often mistook her for an undergraduate student. The following excerpt highlights some of the issues the participants faced in the academic educational setting.

> Porsha: And so if someone doesn't realize that you're an accomplished person, and that you're here with a purpose, it's a very strange feeling like I have looked at some people and I know they think, she's just a Black girl going to class, like I do, I feel like….
>
> Jane: I don't trip off of that though no more.
>
> Porsha: I don't trip off that anymore, I kind of got used to it at my PWI, especially when you get to your higher level classes and you're the only Black female in an advanced

> genetic molecular classes, you're one out of twenty, and you're looking around, you look to the left and you look to the right and the only other person in the room that nobody likes is the gay person, I'm not being funny, I'm being serious…
>
> Tasha: Yeah.

Stereotypes erroneously cloud a Black doctoral student's right to exist solely as the intelligent, accomplished person she is.

Most of them are in departments where they are few in number and therefore more conspicuous. Janelle recalled a situation where she had not received her stipend during her first year and was stigmatized as the angry Black woman when she did ask for her money and refused to work until she got paid. Her advisor untruthfully conveyed that she did not want to work and failed to tell the truth about her decision. She had to retrace his steps all the way to the highest administrative level to correct the error, which she had not made. Jane relayed being asked how many kids she had on her first day, fitting in the hyper-fertile stereotype of the Black woman. Tasha made a very interesting observation where she noticed that her professors treated her like an African American before finding out that she was African when their demeanor changed. When asked to elaborate what treating you like an African American meant, she responded,

> So my whole life I have noticed, how African Americans are treated because, so how do I say it? They think you're dumb, like I hate to be just brutally honest but they just think that African Americans are not as intelligent as White people or whoever else. They think the African Americans are belligerent, loud, rude, ghetto, you know. When they find out you have a good job, or whatever they are like shocked or whatever but if they already know that you're African, the conversation is completely different. It is entirely different, there is no ignorance, there's no really making rude and ignorant assumptions, so I've noticed that, sometimes I let the person think that I'm African American and then I'll be like I'm actually African and I'll noticed how their tone, everything changes.

This exchange feeds into all the stereotypes that Black people battle their whole lives in this country. It shows the dominant thinking about Black women particularly African American

women in STEM fields are deemed unintelligent, and a misfit to the male culture. To acclimatize into the STEM culture, they must possess an identity different to that of an African American.

This comment immediately led to a heated discussion, where participants highlighted that Blacks who are not originally from the United States are treated differently to African Americans. Porsha made an interesting observation, where said look at the researcher "But you're not Black, but you are Black, she's St. Lucian." Jane immediately disagreed and said irrelevant of where you are born, you are Black, she did not like hearing foreigners saying, I'm Jamaican, I'm Haitian or I'm African, you are Black." The others disagreed and tried to explain why a foreigner is treated differently. In the academic sphere, foreign Blacks who study in the U.S. are usually some of the top academic performers in their field, perpetuating a stereotype that they are all intelligent. The foreigners in the discussion quickly diffused that stereotype, letting the participants know that as foreigners they cling to their national identity and since the majority of the people in their countries are Black, they do not make distinctions based on socially constructed race descriptions. Tiffany clearly outlined that when a foreigner invests so much financially to pursue an education abroad, they do not waste time or their parents' money. The students who usually leave their countries to study overseas are usually at the top of their educational cohort to begin with. Janelle observed that when students hear a foreign Black person speak, they immediately set them apart from African Americans; she said, "Yeah I think when her students look at her or once she starts speaking, she's not Black anymore, they don't see that, like you already, you good." As an African American female, Janelle was fully aware of the stratified layers existing with the racial/gender intersection.

These narratives demonstrate that Black females are aware of the racial and sexist divide that continually intersect to shape their lived experiences. Collins (2000) reasoned that the

wisdom gained from these experiences gives credence to their narratives and substantiates their knowledge claims. These personal tales provided symbolic examples of how race and gender significantly influence the participants' journey in their respective STEM disciplines.

Academic background. Most of the participants attended predominantly White institutions (PWI) and seemed to have positive experiences there. Four of them had experiences at a historically Black college and university (HBCU). There were interesting disparities raised during the interviews. Shanae who started at an HBCU indicated that she transferred to a PWI because it was "just a bigger school, more opportunities." Janelle who completed her master's program at an HBCU spoke highly of the support she received there. Derricka who was not as prepared other students in her graduate class, noted that during her undergraduate years the resources at her HBCU were limited. The department lacked a lab and she did not have the opportunity to do as many experiments and gain important foundational knowledge.

Four of the women participated in fellowship programs geared at increasing the number of first-generation, low-income and/or underrepresented students in Ph.D. programs. Two attended at a PWI while two participated at an HBCU. Shauna who attended a PWI acknowledged the meaningful impact of her participation in the program. She noted she had many research opportunities from her tenure as an undergraduate and was able to attend graduate school easily. She got support from her mentors who still play a significant role in her life. Porsha participated in a bridge to teaching program geared to increasing the number of minority STEM teachers in high school. Jane who went to an HBCU also realized the benefits of the program but highlighted some problems once she transitioned to a PWI for graduate studies. Her fellowship program worked in partnership with Tiger University and she turned down an offer from another HBCU to pursue her doctoral studies there. She related that she had a professor

who refused to work with her because she went to an HBCU. He would help the other students but not her. She spoke of another Black female from her undergraduate institution who entered the graduate program with her but left because of the hostile environment. Janelle praised the HBCU she attended for her master's degree for the support and preparation she received as part of their fellowship program.

Using a statement from one of the interviews, the researcher asked participants whether there were more opportunities at a PWI than a HBCU during the focus group discussion. Those who went to PWIs had a different approach to the discussion than those who went to HBCUs. Porsha, who attended a predominantly White institution, believed that Blacks perpetuated the stigma about HBCUs because some of them thought PWIs were better. Jane refuted that claim and expressed that she could speak on the issue based on her experience, she highlighted, "I've had professors who wouldn't work with me because I went to an HBCU." When Porsha again reiterated that she thinks, the distinction is "really a divisiveness we [Blacks] create amongst each other." Jane replied, "I can't say that because I think a lot of it always stems from White people saying Black people aren't good enough so of course your Black school isn't going to be good enough." To reiterate her point on the oppressive racial structures that work against Blacks, Jane indicated she had done research and found out that HBCUs got less funding than PWIs. She traced the history of Blacks in education, noting the existing preschool to prison pipeline resulting from the unfair public education system, which fails Black kids from the onset of their schooling.

Janelle gave an interesting example; she noted how people were always impressed when she mentions the prestigious PWI she attended for her undergraduate degree but when she tells them that she went to an HBCU for her Master's they are not as impressed. She conceded that

she learned more during her two years at the HBCU than she did in her undergraduate studies. She noted that the classes were smaller; and as a student, you were not just a number. She got opportunities to present at conferences and conduct research in her field. She revealed that she never had these opportunities when she attended the PWI. She elaborated that she could talk to her advisor at any time and Jane interjected that she missed that as well. Jane gave an example of a lecturer who spoke her language while teaching. She admitted that she did not speak "proper" English and society classified her as "hood, ghetto, loud, whatever." She appreciated the fact that he ignored the technical jargon and relayed the information to the class in her way of speaking.

Janelle clarified that there were White and Asian professors in her program, the faculty was not all Black but the scope was different. She surmised, "like you weren't that lower-class student anymore." Jane attested that her Chinese professor was the one who pushed her to go beyond her limits, encouraged her to do research and read more so she could expand her knowledge because she "had those opportunities at the undergraduate level." Tiffany noted that all the experiences described were part of institutional racism. She said that she completed a thesis during her specialist degree on the struggles and challenges of African graduates in the United States. She discovered that if you did not attend an American college or university "your education is degraded and downgraded, so basically when we come here, for most of us Africans, we have to start all over." These examples highlight the challenges that Blacks face when they attend higher education institutions.

One of the participants asked Tasha whether she attended an HBCU and she replied that her father did not let her attend because of the stigma that PWIs were better. She added that she wished she had attended a HBCU because at a PWI, "You're just a Black student, they don't

expect much out of you so they don't cater to you, they don't try to give you resources. They do not tell you about research opportunities. I had to figure that out on my own." She discerned that White faculty catered to the White students not students like her or the other African American students. The few Black faculty at her institution "were too busy trying to boost up their research program and unfortunately sad for them, they also ignored the Black students." Porsha added that she observed a deficient number of African Americans especially women in higher education institutions.

Janelle spoke of a proposed bill in her state intended to reduce tuition costs for students attending historically black colleges and universities. The ultimate goal however, was to shut those schools down. The proponents, however, were unable to pass the bill. The researcher spoke of her HBCU experience where students hardly came to class but other students countered that argument. Porsha noted that, at her institution, no one came to class either. Porsha and Tasha agreed that regardless of the number of students in your class at a predominantly White institution, if you are Black, you attend class. The lecturers noticed when you do not come to class and called you out but did not reprimand the White kids who did not come to class. Jane enumerated the roadblocks that low income Black students had to overcome in order to succeed and remarked that PWIs were not necessarily better. She summed the discussion in this way:

> and you think these White kids necessarily deserve these degrees? Hold on you think these White kids necessarily deserve these degrees? These white kids party, and do all that stuff, you think they go to class? They study like that? No! Their daddies donate a lot of money.

The racial and gender divide continues to be a prominent feature in all aspects of the lives of women of color.

The themes explored above provide an insight into the experiences of Black females who experience the impostor syndrome while pursuing doctoral studies in STEM fields. While most of them are first-generation college students or the first ones in their family to attain a Ph.D., they all acknowledge the importance of their family and support they receive from them. As individuals situated within intersecting oppressions of race and gender, their experiences are often marked by that double blind. Although many doctoral students experience the impostor syndrome, race and gender are intertwined in the experiences of women of color. Their doubts about their abilities are many times influenced by their minority status in their respective fields. Most of them were aware of the gendered and racialized stereotypes and resisted those narratives by their academic achievements.

While most participants defined academic success within the dominant discourse of academia, many of them did not think that academic success equated success in life. Academic support especially advising appeared to be important to all participants. Those who did not have advisor support displayed more impostor characteristics than those who had a good relationship with their advisor. Despite the lack of Black female mentors or advisors within their departments, or the continued presence of the impostor syndrome for some, these individuals have resisted the intersecting oppressions and continue to excel during their academic journey.

Conclusion

The findings discussed above sum the results generated from the two phases of the study. The first phase of the investigation revealed that most participants have doubts about their intelligence. Race and gender were not significant indicators of the impostor syndrome. Black females in STEM fields did not have a statistically significant score on the CIPS when compared to the other groups in the initial stage of the study. They like other students in the study

experienced the impostor syndrome while pursuing their doctoral studies. This evidence served as a precursor for exploring the experiences of Black females in STEM fields.

Dependent on the level of impostor syndrome indicated on the four scales, Black females had different experiences. Those who had low or moderate scores tended to have a smoother academic journey, had little doubts about their abilities and faced less challenges while completing their studies. Those who had frequent feelings and the one participant with intense feelings were more doubtful, questioned their rightful place in the program, and gave an indication of experiencing the impostor cycle. They were very mindful of the intersection of race and gender and the ways in which they intersected to shape their experiences.

In the next chapter, I further examine these results and demonstrate how they answer each of the research questions. I incorporate Black feminist thought to explicate the findings.

CHAPTER V:

DISCUSSION

The final chapter begins with a discussion of how the tenets of Black feminist epistemology framed this study. I initially address the research question one, which guided the first quantitative phase of the study. For the discussion on the second phase of the study, I first engage the literature to further probe the themes presented in Chapter IV. I then respond to the two remaining research questions I conclude the chapter with the study's limitations, topics for future research, and discuss the implications of the study.

Black Feminist Epistemology/Black Feminist Thought

As a Black woman conducting this study, Black feminist thought (BFT) or Black feminist epistemology was always an integral part of this investigation. Collins (2000) noted that higher education is a major arena for Black feminist intellectual activity. Interactions and daily conversations construct Black feminist consciousness. This dissertation served as a means of constructing Black female consciousness of how intersectionality influences the impostor syndrome in a sample of females in STEM fields. To raise this consciousness, it is important to delve into how the four tenets of this theory framed this study.

The first tenet of Black feminist epistemology is the lived experiences as a criterion of meaning. Black women gain wisdom from their experiences where they negotiate the intersecting oppressions that are pervasive throughout their lives. Knowledge of this intersectionality framed the design of the study, data collection, and data analysis. The first part of this sequential mixed-methods design identified that Black females experience the impostor

syndrome while the second phase thoroughly explored the impostor syndrome shaped their experiences. The personal narratives of participants like Jane, and Janelle allowed them to recognize racist and sexist attitudes and gave them a symbolic representation of how these oppressions play out in their fields. Janelle expressed the oppressions inherent in intersectionality in this exchange when asked how do you see yourself in comparison to the other students in your field:

> Janelle: And then there's always those people in the program that are at the exact same step and level that you are so I just feel like... I do feel like sometimes I have to work harder
>
> Interviewer: Umm hmm.
>
> Janelle: because I have noticed that even if it's because I'm a woman maybe it's because of my race but because I'm a woman
>
> Interviewer: so it's majority men.
>
> Janelle: It's majority men.

She underscored the oppressive structures when she talks about her experience. Her lived experience became a criterion of meaning for intersectionality in STEM fields. This is also reflected when Jane disclosed a professor undermining her undergraduate degree from an HBCU:

> Well I had a professor who refused to work with me because I went to an HBCU. He actually…, he worked with a White girl we took all our classes together like we made our schedules together. He actually told me, you're taking the easy way out, you're taking the easy classes to graduate and I'm like you're working with …. You know,

Their experiences equipped them with wisdom that they use to negotiate their academic lives. They were fully aware of the absence of White, male skin protection and learned how to survive in their fields (Collins, 2000).

Some theorists believed that Black women have two modes of knowing, one within the body and the space around it and the other, which goes beyond a bodily experience (Belenky,

1986; Hartsock, 1983; Smith, 1987). These sources of knowledge allow women to use their lived experiences to make knowledge claims. When Tasha contended that she has to "work extra hard, work harder than a White female who may have three kids to prove that yes I want to be here one and two I deserve to be here and three I am intelligent and capable of doing it even though I had a child," she came from a place of knowing. The subjectivity between the knower and the known rested within her and her encounters. Tasha did not make that claim off a higher authority but substantiated her knowledge based on her own experience. Sharing their experiences allowed the study participants to sustain their awareness of what it means to be a Black woman in a STEM Ph.D. program. Sharing their narratives with other Black women allowed them to build relationships that sustain and provide support throughout their studies.

The use of dialogue fosters a connectedness that allows Black women to validate their knowledge claims (Collins, 2000). According to hooks, (1989) dialogue denotes a speech exchange between two individuals; it does not include the subjectivity of one person by another via spoken word. This humanizing speech confronts and fights hegemonic practices (hooks, 1989). Dialogue allows individuals to become empowered within their respective communities (Collins, 2000). The verbal and nonverbal interactions between the speaker and listener where the listener responds to the speaker's words stems from African-based oral tradition (Kochman, 1981). Most of the exchanges between enslaved African Americans was done orally. They gained wisdom by listening to others and passing on the stories to validate their knowledge claims. The use of dialogue was also a place of resistance where they strengthened and encouraged each to fight their oppressor (Kochman, 1981). This oral tradition has remained an intricate part of Black culture where harmony is sought within discourse.

The exchange between the researcher and the interview participants symbolized the use of the dialogue. The participants had the freedom to relay their narratives, expressed in an atmosphere of mutual respect. The dialogues characterized by humanizing speech allowed them to talk about discriminatory practices within their disciplines and empowered them to resist these oppressive structures. As Black women, we were able to connect through exchanged stories as can be seen in the following discussion when we spoke about Black women in academia most times not having a family.

Interviewer: Like you to choose a career, like we're not allowed to have both worlds.

Jane: I don't think you can necessarily have both like that.

Interviewer: As a Black female or generally?

Jane: I think it's difficult as a woman to be honest.

Interviewer: umm hmm

Jane: usually as a woman, you have to pick right?

Interviewer: umm hmm.

Jane: but then as a Black woman it's difficult, let's just be real.

Interviewer: umm hmm

Jane: Me finding a husband in this town right now, what are the chances of that?

Interviewer: Umm hmm.

Jane: It's a college town, they young, I took two years off and then I came back.

Interviewer: Umm hmm.

Jane: So I'm older than these people.

Interviewer: umm hmm

Jane: You know what I'm saying and then it's White, this place is White, you know

Interviewer: Umm hmm.

Jane: Am I attracted to White men, are White men attracted to me? Cuz white people don't approach me , White men don't approach me, I don't want them to approach me anyway but you know what I'm saying. So right now I'm in a place in my life where I will have to enter a long distance relationship right? So how do you do that starting off? So I'm at a point where it's like that whole aspect, this biological clock is ticking is completely having to be suppressed, you know what I'm saying.

Interviewer: It's like you have to choose, you can't do both.

Jane: Yeah.

Interviewer: wow that is just so interesting.

Jane: Yeah

I: Yeah because I'm a single parent, well you see I made the decision to come here so I'm here with my son, it's just the two of us, his dad is in another state, it's like you said I had to choose because if I had to stay there, I wouldn't be doing what I'm doing. I never thought of it that way, I'm just thinking that I am so much in control of my life but I don't realize… because I think I do want like a family like I wish his dad was here… that's very interesting. So you're saying that those very successful women are single, no kids

P: yeah

I: That they're very successful.

P: Yeah. But white people get married though,

I: Even if they're female or male.

P: White people get married.

It was never a case of the interviewee telling all, but I offered shared experiences be it personal or that of a close friend that I could refer to in support of their narratives.

Collins (2000) clarified that new knowledge claims advance from dialogue with other members of the community. When the participants underscored the merit of their HBCU experience during the focus group discussion, and a participant who attended a PWI realized the value of these institutions and acknowledged the opportunities she missed, they sustained new knowledge claims. They debunked the myth that HBCUs are not good enough and proved that this is an erroneously perpetuated stereotype. Participating in the discourse on advisor

relationships helped Porsha who is at the beginning of her doctoral journey learn the importance of listening and heeding the words of her academic advisor when those nearing the end of their academic journey highlighted how critical an advisor is on that journey.

It was important that ideas be tested and validated through verbal exchange between all members of the group. When participants or the researcher nodded, laughed or spoke all at the once they were responding to the speaker. The non-verbal hand gestures or head bobbing for agreement or disagreement, smiles, facial expressions helped validate the knowledge claims developed during the interviews. When participants laughed, spoke in a heightened or lowered pitch, continuously said umm, hmm or spoke all at once on a topic such as racial and gender discrimination in response to a speaker, they supported meaning making through dialogue. The following is an example of an exchange during the focus group discussion when participants spoke of different teaching experiences:

> Tasha: I don't know if you guys have noticed and that's to answer the stereotype question, so we have to teach biology labs, every semester I kid you not, this is a 78% White school so, most of my kids are going to be White, as soon as they see that I'm their instructor, demeanor changes
>
> Jane: Um hmm. (Expressively)
>
> Tasha: (Whispering) They're like she's probably going to be like really angry.
>
> Interviewer: (exclaims) Oh wow.
>
> Tasha: I've actually had some of them say to me, I've had had some of them at the end of the semester come up to me and say, you were really cool, I thought that you were going to be like really intimidating and I'm like me? What's so intimidating about me? I'm not really...
>
> Porsha: Your skin color
>
> Jane: You're Black
>
> Janelle: I'm on the good side because they come to me because I'm like one of the only Americans.
>
> Interviewer: Ooh yeah because you have a lot of foreigners in your department.

Tasha: Interesting.

Jane: Let me share this since we are talking about teaching, I do have different experiences with teaching, I've taught kind of like, I've taught some Black kind of, what is it?

Porsha: Low SES

Jane: Low class

Porsha: Low socioeconomic status

Jane: High risk (exclaims, remembers), like high risk. I taught like the Black high risk students and I've taught some white that's like lower class

Interviewer: Umm hmm.

Jane: and so teaching both, it's an experience but I did learn when I teach the White students regardless of how much money they make, you have to kind of almost, I don't if it's because I'm a short woman, I'm petite but I almost have to like show them that I'm smart.

Porsha: It's not that you're short; you have to crush their spirit to let them know that you are intelligent.

Tasha: You're a black woman, you can't be that smart

Jane: like you have to kind of like, I have to say they hired me for a reason, I'm qualified to be here.

Interviewer: Umm hmm.

Jane: Like you have to kind of show them that, whereas with the Black students I had to kind of, just wouldn't say crush their spirit but I want to say check them one time, like don't get smart with me, like you just got to check them

Interviewer: umm hmm.

Jane: but with the White students, you kind of have to kind of be like I'm hired me for a reason, I'm smart and trust me I've got the red ink baby, don't mind me, I don't mind making hell for you.

Janelle: There is something like that going on when I'm teaching, I had a student email me, this was like the 2nd day of class, you taught us how to do this problem in class wrong, I got this answer wrong and I did it just like you did it on the board. I was like no, you copied it wrong. I had to stop him in his tracks before he said I don't know what I'm doing.

Interviewer: Umm hmm.

> Janelle: Everybody else in your class got it right how did you get it wrong? You know that's your problem, that's not me.
>
> Interviewer: umm hmm
>
> Janelle: You're going to have to or they're going to run over you.
>
> Interviewer: Oh yeah, I think as a teacher anywhere, you just have to set the pace from the onset of the class or they are... but imagine having not only those classroom management issues but also having to do that because of your race and gender.
>
> Jane: Umm hmm.

The Black women in the study actively participated in the interviews and eagerly talked about their experiences. There were never moments of cajoling respondents into telling their stories and many times, they addressed the interview questions on the protocol even before that question came up. Belenky (1986) argued that women seek autonomy through connectedness and ground their epistemology in finding a voice, speaking and listening. Dialogue between Black women afford them ways of knowing that is supported and pivotal to their survival and resistance to their intersecting oppressions. Verbal exchanges among Black women is most often distinguished by the ethic of caring.

The third tenet of BFT demonstrates that personal expressiveness, emotions, and empathy are central to the validation of knowledge claims (Collins, 2000). Personal expressiveness concerns the individual uniqueness of Black women. Whereas they fit into the Black female category, they are all uniquely different. When Shanae said that she does not compare herself to anyone because they are all different, she acknowledged her individual uniqueness. Whereas all the participants were Black females pursuing doctoral studies in STEM fields and they shared similar intersecting oppressions, they were each distinctive. They expressed their personal beliefs about their experiences differently. Emotions were an integral part of the dialogue between the researcher and the interviewees. Jane was particularly expressive when she told her tale, she

laughed with gusto, expressed anger when she spoke of discrimination, and lowered her voice when she talked about her GPA. Shanae was poised and relaxed during her interview; she smiled as she spoke calmly and confidently. A lack of emotion would have diminished the meaning derived from the analysis of the participant narratives.

The third component of the ethic of caring explores Black women's ability to empathize with each other. Collins (2000) proposed that without the belief in the listener's empathy, the speaker would find it difficult to relate their story. My ability to empathize with the participants allowed them to open up and tell their stories, some of which were very personal. As women of color cognizant of our intersecting oppressions, we understood each other and felt comfortable talking about issues that affect us. Narratives punctuated with phrases such as "girlfriend" or "sister" and including high fives and hand waves showed the importance of the ethic of caring in in sustaining knowledge claims. The use of expression, emotion and empathy provided an avenue for connected knowing. Collins (2000) elaborated that with connected knowing; personality adds to an individual's ideas and appreciates the diversity that these personalities bring to a collective understanding within the group. Black women must be accountable for the knowledge claims made through dialogue and sustained through the ethic of caring.

The ethic of personal accountability supports knowledge claims through individual discourse (Collins, 2000). Ideas are more credible when relayed by an individual who has a moral and ethical obligation to the correctly disseminate the information. Every idea has an owner and the owner's identity is significant in making knowledge claims. The need for support of minority students in these academic disciplines is echoed when Shauna stated, "so, I think that students of color when they're first generation, low income, minority all those kinds of things, they need a support system to help them." She used her own experience as a Black female to

highlight not only the intersecting oppressions but the consequences and challenges that lie therein. Black women pursuing doctoral studies in STEM fields substantiated the knowledge claims made in the study. Although many of them feel like impostors, they are respected students within their academic disciplines. Allison spoke of a prestigious opportunity that she received in her department yet she doubted her ability to undertake the task. This is reflected in the following excerpt from her interview:

> Like I have this job, my TA duty for the summer, is one that any analytical chemist or would kill for. I can't even believe I got that because it's not something that's done. It was my boss who went to the department chair and asked for me to get that assignment…. So I'm going to be learning how to maintain instruments, how to run samples, sort of an industry like feeling. But all that's in my mind is oh my God do these people not know that I don't know these things. I'm going to screw up. I'm going to mess up somebody's sample, I'm going to give them wrong information…

Her advisor realized her potential and was certain that she was capable of fulfilling that role but she did not internalize her success or ability. The researcher validated knowledge claims about the impostor syndrome with evidence derived from data analysis. The participants' narratives sustained the conclusions made about the experiences of Black women pursuing graduate degrees in STEM fields.

These four tenets of Black feminist epistemology provided an avenue to validate the knowledge claims made in the inquiry of how Black women in STEM fields experience the impostor syndrome. The dialogue between researcher and the participants about their lived experiences gave credence to the conclusions drawn in this investigation. The ethic of caring articulated through personal expressiveness, emotions and empathy was fundamental to the knowledge validation process. As Black women in doctoral programs, we rejected the dominant oppressive Black female discourse and provided ideas sustained by our character, value and ethics. Black women produced the majority of the knowledge claims made in this study. Their

unique views contained similarities in perception shared as a group. The observations and interpretations about the Black women in the study described different expressions of the common themes. The next section will detail the quantitative findings.

Phase 1: Identifying the Impostor

Research Question 1

The first research question asked: Are there significant differences in the scores of Black female students in STEM Ph.D. programs compared to other STEM Ph.D. students on the Clance Impostor Phenomenon Scale (CIPS) at Tiger University? The first question framed the quantitative phase of the study, which sought to identify whether intersectionality contributed to differences in the impostor scores of Black females and other groups. Researchers note the chilly climate for Black women in STEM fields because of their small numbers (McGee & Martin, 2011; Ong, 2011). Other researchers hypothesized that their underrepresentation may make them feel like outsiders and internalize stereotypes (Steele, 2003). The gender distribution among the respondents was fairly even with 52% being female and 48% being male. Only 10% of the survey respondents were Black females.

Due to their small numbers and aligning to chilly climate purported by the aforementioned researchers, I expected to find a significant difference between the scores of Black females and that of Black males, Non-Black females and Non-Black males. The two-way factorial ANOVA indicated a non-significant difference between the groups. Race and gender were insignificant main effects and there was not a significant interaction between them. The overall scores of the Black females on the Clance Impostor Phenomenon Scale were not significantly different from that of the other groups.

Data generated from the analysis of the impostor phenomenon survey given to students indicated that most of the study participants experienced impostor feelings. From a total possible score of 100, the study mean was 59.37. This average is not very different to the average scores in the extant literature where researchers used CIPS. In their study, Castro et al. (2004) reported a mean of 55.19 in their graduate student sample. Gibson-Beverly and Schwartz (2008) found a mean score of 54.37 in their study. Legassie et al. (2008) discovered a mean of 61.2 in their sample of medical residents. Researchers have identified graduate students as a demographic that is susceptible to the impostor syndrome because of the rigor and demands of the doctoral program. Clance and Imes (1978) theorized that the impostor syndrome was prevalent in high-achieving individuals who did not internalize their success. Doctoral students in STEM fields are a successfully academic group who surpassed the academic rigor of their undergraduate curriculum, the dreaded Graduate Record Examination (GRE) and the institutional guidelines that dictate entry into the different programs. Mason (2009) noted that graduate education can be demanding and highly complex leading students to question their ability to meet the expectations set before them. Similar to the results of this study, Prata and Gietzen (2007) found a high incidence of the impostor syndrome in their sample of graduate students. Young (2011) noted that intellectual phoniness may surface in the higher education climate where students may encounter insensitive professors, unfamiliar academic jargon, and competition. STEM fields dominated by White males can be isolating to females and other minorities.

Gender was not a significant main effect, indicating that there were no significant differences in the way males and females experience the impostor syndrome. Similarly, other researchers did not find a significant difference between genders. Castro et al. (2004) did not find a gender difference in their study. There were no gender differences in the study by Sonnak and

Towell (2001) on British university students. Although there were differences in percentages for the effect of race and gender on level (low, moderate, frequent, and intense) they were not significant. Having identified that Black females experience the impostor syndrome and recognizing the small percentage of Black females in the study, it was important to highlight how the impostor syndrome influenced their doctoral experience.

Lord et al. (2009) noted the icy climate for women in STEM fields which are dominated by males. The fact that women have a slightly higher overall average score on CIPS than the males in the study are indicative of the uncomfortable atmosphere that they might be faced with. Young (2011) advanced that the higher education climate can foste r doubt and uncertainty due the rigor of the curriculum. Studies in STEM are rigorous and have gained the notoriety of recruiting the best and brightest (Soldner et al., 2012). Black females enter a sphere where they are defined as a minority, have to combat the deficit genetic thinking model and successfully complete their studies. This a breeding ground for developing impostor feelings, one cannot help feeling like an impostor if everyone around them looks different. Young (2011) proposed that being a stranger in their environment fostered an individual to feel like an impostor. Black females are an anomaly in the STEM playing field and the results indicate that most of them feel like impostors. The qualitative phase of the study further explored these quantitative findings.

Phase 2: An In-depth Look at the Black Female Impostor

In this section, I use the literature to explicate four of the themes discussed in Chapter IV. I first examine how the participants' family background influences their experiences. I then review their academic journey in tandem to previous literature. I discuss the impostor syndrome and the way it shaped their experiences. I conclude with a discussion of the double bind: race and gender.

Family Background

Clance and Imes (1978) confirmed that family history played a pivotal role in developing impostor feelings. Castro et al. (2004) concurred that parentified children were more likely to develop impostor feelings. In her interview, Carla who practically grew up parenting herself because her mom had to work reported having frequent impostor feelings on her survey. The writers believed that parentified children took on the role that they were not ready for and developed feelings of inadequacy or incompetence which translate into impostor feelings when they turn into adults. A family environment void of unresolved conflict does not foster impostor feeling. Many of the participants praised the support that they received from the families and acknowledged the instrumental role that they played in their success thus far. Young (2011) postulated that a child who does not develop a solid sense of themselves due to a lack of parental support is more likely to develop impostor feelings. Tiffany and Shanae who had moderate and low impostor feelings noted the unwavering support of their parents who had confidence in them. Whereas Jane who had intense impostor feelings acknowledged the support of her parents, she highlighted that her mom always asked when she was going to finish with school and start her life. This statement indicated her mother did not fully support her decision to earn a Ph.D. The participants who had low or moderate feelings were self-assured from the time they were children and blossomed into confident, competent, and successful adults. Those who reported frequent or intense feelings did not appear to have as much confidence and were for the most part not as intrinsically motivated as the other group.

Participants who were the first in their families to attend college received less academic support from their parents. The parents were not able to help them with higher education coursework or assist them in making academic decisions, as they will be able to do with their

own children. Some of them highlighted that being first-generation came with being ignorant of how to navigate the higher education climate. Without parents who can adequately relay messages about their success, it is possible that they may have grown up continually doubting their abilities (Castro et al., 2004; Li et al., 2014).

Being a first-generation student placed students in an outsider position where they questioned their rightful place. They did not have the confidence associated with attending their parents' alma mater or receiving parental advice on navigating that sphere (Li et al., 2014). They do not have that sense of belonging which comes with entering the familiar. Despite their stellar accomplishments, students like Jane still wondered whether "they were still going to me this degree." Black women consistently reside within the "us versus them" binary leading some of them to question their intelligence.

One of the erroneous stereotypes perpetuated about Blacks is that they come from broken, single parent homes (Steele, 1997). Most of the participants were from nuclear households. By virtue of being in their respective doctoral programs, the two participants who were from single parent households defied the myth of Black single mothers being responsible for society's ills. Carla's mother was never dependent on public assistance and worked very hard to ensure that her daughter had the best education. While they moved a lot, it was always to a brighter start or an area that could elevate their economic status.

Similar to the national average of Black female doctoral students in STEM fields, the number of Black female students represented in the study is very small. While some were happy to be pacesetters, others like Shauna who had frequent impostor feelings questioned her right to pursue a doctoral degree. A poignant part of Shauna's interview is reflected in the following statement: "Even being here where I am, sometimes I think about it and I feel like okay maybe

I'm not supposed to be here." This quote directly contrasted with Shanae's response of "I'm just right on track with everything" when I asked about her academic journey. Low or moderate impostors felt assured in their current role as doctoral students and believed they earned their right to be there.

Academic Journey

There has been a substantial amount of research done of the impostor syndrome in college students (Castro et al., 2004; Gibson-Beverly & Schwartz, 2008; Mason, 2009; Prata & Gietzen, 2007; Sonnak & Towell, 2001). As indicated earlier the majority of the Black females interviewed had frequent of moderate feelings. Young (2011) hypothesized that students in college may feel like impostors when they realize that they are not at the top of their class. Jane the intense impostor, blatantly declared that the other students in her program were smarter than her. Allison who reported frequent feelings also agreed that she was not as intelligent as the other students in her cohort.

Black women in higher education particularly predominantly White institutions usually stand out because of their minority status and are even more conspicuous in STEM fields. Despite the conveyed idea that everyone has access to higher education, in reality minority populations are left out (Ong, 2011; Powell, 1990). It is an unwelcome climate that alienates women of color. While a few of the participants were content with their departments, many of them felt alienated. Tasha's story is particularly salient in exposing the unwelcoming atmosphere. She noted that Black women did not do well in her program and if they are brave enough to get pregnant they are ostracized and punished. Steele et al. (2002) noted that the social identity of Blacks is always under scrutiny and they have to prove themselves. Tasha's case particularly speaks to these issues when she declared that she has to "work extra hard, work

harder than a White female who may have three kids to prove that yes I want to be here one and two I deserve to be here and three I am intelligent and capable of doing it even though I had a child." Race and gender interconnected and influenced the experiences of a Black female.

Byars-Winston et al. (2008) realized that the STEM environment alienates students of color because they may not feel comfortable relating to people outside of their racial and ethnic background. The responses of Jane, Janelle, Tasha, Derricka, and Carla illustrated this notion when they recognized there were few or non-existent Black female role models in their respective departments. While it did not foster a departure from their studies, it made the journey a little harder for them. Hurtado et al. (2007) concluded that there is a strong correlation between a minority student's decision to persist in higher education and their economic situation. Students who receive grants and scholarships are more likely to persist that those who do not (Swail, Redd & Perna, 2003). All the women in the investigation received financial assistance and persisted in their respective programs. Kaba (2013) noted that financial support in the forms of graduate assistantships and grants have contributed to the slow growth of Black American students. The financial support along with the presence of Black faculty members in STEM fields at institutions of higher who serve as mentors and role models encouraged students of color to enter and succeed in those fields. While most of the participants experienced the impostor syndrome, they worked diligently to complete their studies.

The Impostor Syndrome

Clance and Imes (1978) hypothesized that the impostor syndrome describes an internal struggle than one has about their intelligence. The participants in the study especially those who had moderate to intense feelings had a hard time grasping the concept that they were intelligent and just as capable as their academic peers. For example, Jane stated that the other students in

her cohort “are smarter than her” and Allison averred her success thus far has not been by “[her] own measure because [she’s] not smart enough.” They did not internalize their intelligence and had trouble accepting that they are in fact, gifted individuals. Clance and Imes (1978) surmised that impostors may be diligent, hardworking, feel like fakes or be charming and perceptive so that they gain the approval of others. While there was no evidence of the study participants being charming or perceptive to gain the approval of others, there was sufficient evidence indicating that the women in the study were hardworking, diligent and some of them felt like fakes. None of the participants risked failure in their programs; about half of them successfully completed their comprehensive exams and were currently working on their dissertations. Those who were still taking classes were succeeding and moving along their doctoral journey. A third-year doctoral student already defended her dissertation. Despite these outstanding achievements, some participants downplayed their accomplishments and thought they were fraudulent or undeserving of these accolades. Ninety percent of the participants experienced the impostor syndrome. While Shanae was hard working and diligent, she had no doubts about her abilities or felt fraudulent. Unlike Clance and Imes (1978) description of impostors, she was self-confident and did not appear anxious or frustrated.

Gibson-Beverly and Schwartz (2008) believed that attachment and entitlement were strong predictors of the impostor syndrome. Evidence of these two psychological traits were not generated from the analysis of the data. Nadkarni et al. (2005) posited that persons who have a restricted sense of entitlement tend to seek the approval of others. None of the study participants appeared to need the approval of others. Many of them praised the parental support they received signifying the absence of any form of avoidant or anxious attachment. Inconsistent parental responsiveness was not evident in participant narratives. Ainsworth et al. (1978) explained that

anxious attachment or avoidant attachment characterized by a parent's rejection of their child reaching out to them. While these psychological traits may have been present, thorough investigation was beyond the scope of this study. Other researchers claimed that low self-esteem may contribute to the impostor syndrome (Chrisman et al., 1995; Cozzarelli & Major, 1990; Henning et al., 1998; Sonnak & Towell, 2001). The self-esteem instrument which measures the construct was not used in this investigation. As a result, I could not draw viable conclusions about self-esteem and the impostor syndrome in the study population.

Thompson et al. (2000) observed that impostors overgeneralized their failures and attributed it to themselves. Some of the participants were more concerned about their "failures" than they were about the accomplishments that they made. Jane kept referring to her low GPA during her interview and remained adamant that grace substantiated her continued presence in her discipline because she viewed herself as incapable of withstanding the rigors of her curriculum. Allison remembered the one B she received rather than the many A's she achieved. These obstacles continue to haunt them as they continue on their academic path and cause them to constantly doubt themselves. Although the disappointments Shauna spoke of were those of her family rather than her own, she internalized those failures. She consistently questioned her right to be in a doctoral program when no one in her family had gone past high school. The failures that they stressed were not real, because they had not failed their coursework; it was below the high bar that they had set for themselves.

The features of the impostor cycle were prevalent when frequent or intense impostors described how they approached a given assignment. Similar to Clance's (1985) description of the cycle they become anxious when faced with an achievement related task. Most of them responded to the task with procrastination rather than overindulgence in the task. When asked if

she became anxious when given an assignment, Shauna responded “I do, I actually do. Umm (laughs) I procrastinate because a lot of the time, I feel like I don’t know if I’ll do well on it.”

The following extract from Allison’s interview demonstrates the impostor cycle:

> Interviewer: Did you ever procrastinate?
>
> Allison: Oh I’m a heavy procrastinator, heavy and that is part of my struggle here in Grad school. Some professors breathe down your neck every day, my boss is not like that, she’s not the type to let you go down, she’ll want an occasional well not occasional but weekly reports we have to put in our weekly reports and we have to always present at group meetings, but I find myself always procrastinating, just before, look I’m just doing my weekly report, it was due at noon, I just don’t know….
>
> Interviewer: And then you overindulge in the task, you just put everything into it.
>
> Allison: Yes to the point that when I was writing my first publication, my fiancé and I got into to this huge fight, because he said I was killing myself and he would not sit there and let me kill myself……. Because I would leave here at 4:00 go home and be back at 8:00 working on the paper again. I was really tired. But I still procrastinate. I just don’t know how to get out of it. It’s just one of the hardest things for me to conquer in life.
>
> Interviewer: And then when you hand in the assignment, you feel relief for a while
>
> Allison: Just for a while
>
> Interviewer: and then you start to worry about the assignment.
>
> Allison: until I get back the grade and when I get the grade I’ll be like wow it was worth it. But then I have another assignment coming up
>
> Interviewer: and the same process.
>
> Allison: And the same process.

They stayed up all night completing the task as the deadline drew near or even submitted it past the deadline if their professor was not a stickler for deadlines. They reported short-lived moments of relief when they completed the task but began to question their intelligence once they received positive feedback. They attributed their success to luck or the mercy of God. The cycle recommenced once they received an assignment, as they admitted to approaching all assignments in the same manner.

Young (2011) outlined several reasons why an individual may feel like an impostor. Some of the explanations are salient for the research participants. She first stated that the people that we interact with such as family, teachers, and coaches influence and individual's doubt about their abilities. Being first-generation students and not equipped with the knowledge to navigate post-secondary education caused some of the participants to feel like impostors in their respective programs. Castro et al. (2004) noted that a child who does receive positive feedback from their parents might not develop a solid sense of self, which can cause the impostor syndrome. Tiffany who had a moderate score described the way her father's "implicit confidence" in her abilities, motivated her. She developed a solid sense of herself based on the positive feedback she received from her dad. Castro et al. (2004) also noted that parentified children were more likely to experience the impostor syndrome. Carla took on extra responsibilities and assumed the role of a mother due her mom's frequent absence when she worked. She had frequent impostor feelings and fit the impostor personality of super student someone who takes on multiple roles while maintaining good academic status. She learned to juggle multiple roles from the time she was a child.

The professors who Jane met when she first began her doctoral program may have been the source of her intense feelings. Evolving from the supportive HBCU environment, she now faced a hostile environment, which disregarded the merit of her HBCU education. Tasha's unsavory experience with her advisor and other professors after her pregnancy may also have contributed to her frequent impostor feelings. The analysis did not identify any negative childhood experiences with family, teachers or other people in their early years that may have influenced the self-expectations of the study group.

Young (2011) theorized that graduate students often feel like impostors due to the rigor of the post-secondary curriculum. She surmised that students who graduate at the top of their class now enter into a competitive academic sphere where they are no longer the most outstanding student. When Jane and Allison are indignant that they are not as smart as the rest of their academic cohort, they doubt themselves and question their intelligence. Shanae and Tiffany on the other hand, who have low and moderate impostor feelings are confident in their abilities and believe that they are just as intelligent as the rest of their peers. Young further stated that professors are sometimes insensitive and give negative responses to students, which dismantles their confidence. Some of the participants spoke of incidents where their professors or advisors were insensitive to their needs, unfairly graded their assignments or felt that they were incompetent because of the race and gender.

Graduate school is oftentimes a competitive working environment, which can possibly feed into self-doubt (Young, 2011). In such a setting, an individual may feel that they are not proficient as the rest of their peers. Some of the young women in the study noted the competitive nature of their respective fields and elaborated that they worked extra hard to prove that they belonged and withstood the rigor of their studies. Some believed that they were not as competent as the rest of their colleagues. The competitive environment fed into their insecurities and encouraged them to question their abilities. It did not help participants like Jane, Allison, Derricka and Tasha that they like most of the students around them worked hard, completed successful experiments and published papers. Rather their achievements encouraged their self-doubt as they questioned their rightful place when they compared themselves to others. It is needful to interject here that although these participants succeeded with their experiments and

published articles, they still believed it is not enough because other students accomplished more than they did.

One of the final reasons outlined by Young (2011) applicable to the study population is being a stranger in a strange land. Solorzano and Yasso (2001) averred that women of color in academia are outliers who question their rightful place because they are outnumbered. Some of the participants were the only Black female in their respective programs, and even when they were not the only one; the numbers were still very small. Similar to the participants in the study by Ewing et al. (1996), racial identity and afrocentricity predicted the impostor syndrome in women of color. Harvey and Katz (1986) concluded that a negative self-image, first-generation status and new role adjustment contributed to the impostor syndrome in Black students. Graduate studies are more rigorous than undergraduate studies and the goals to withstand those demands may be taxing. This new role caused some of the participants to question their decision and wonder whether they were prepared assume the role of a doctoral student. All of the participants were full time graduate students, a little over half of them were transitioning from an undergraduate degree while some were returning from the workforce. They were definitely adjusting to a new role, for those returning from the workforce, they had to get used to the student status and the financial implications involved.

The majority of the students in the study were first-generation students who were attaining a level of education, which no one in their family attained. For Shauna, the source of her impostor feelings is revealed when she expressed “Really, no one, my mom, dad, grandmother, brothers and sisters, aunts and uncles, no one in my immediate family has even gone college. Most didn’t even graduate high school.” Some of the participants hinted their awareness of the negative stereotypes that Black women were academically inferior, hyperfertile,

lazy, angry and knew that they had to combat these stereotypes in their pursuit of academic excellence. When Tasha remarked that Black women did not do well in her program or Jane disclosed that some professors refused to work with her because she came from a HBCU, they bare the genetic deficit model, which posits that Blacks are academically inferior to Whites. Janelle's advisor labelled her an angry, Black woman when she spoke up about the injustice levelled against her. The department secretary questioned Jane about the kids she is yet to have. Race and gender were always at the fore of most of the discussions, the participants were cognizant of what Ong, (2011) called the double bind.

The Double-Bind: Race and Gender

The intersecting oppressions within which Black women reside were pervasive throughout this discussion, whereas I discuss it as a separate theme; its tenets are present in the discussion of all the topics. Hirschfield and Joseph (2012) discovered gendered identity taxation was common in the lives of women of color. Some of the participants spoke of the emotional, physical or mental burden that accompanied their academic experiences when they worked beyond what is expected of others because of their minority status. Tasha elaborated that she now "to work extra hard, work harder than a White female who may have three kids to prove … I am intelligent and capable of doing it even though I had a child." Porsha highlighted that she constantly corrected people who assumed she was getting a master's degree rather than a doctorate and summed her observation in this way:

> And so if someone doesn't realize that you're an accomplished person, and that you're here with a purpose, it's a very strange feeling like I have looked at some people and I know they think, she's just a Black girl going to class, like I do, I feel like….

Jane, and Janelle also relayed that they had to prove that they not only belonged in their respective programs but also were intellectually suited to undertake their studies. Shauna felt

isolated from the faculty and students around here because most of them did not share her lived experiences. Other interviewees observed the disconnect between them and their advisors especially went it related to matters outside of the academic sphere. Janelle remarked, "…you get certain faculty members that you can kind of, you feel like you can go and talk to them whenever but….honestly speaking there's no African Americans in our department, faculty members or staff now that I can think so…." They also felt constant scrutiny because of the negative stereotypes, which influenced the dominant discourse about them. Jane addressed the issue of racial stereotypes and concluded her rant with "So the education system has been failing these Black people because it's a tax bracket that pay for the education, these kids ain't learn how to do things from kindergarten." They felt not only the gendered discrimination that women are inferior to men in STEM fields but also the racial prejudice that Blacks are intellectually inferior.

The images of the Black woman continue to obstruct others' view of them irrelevant of where they are. Lubiano (1992) explained that these images have become part of the dominant social narrative erroneously used to define Black women. All the women in the study by virtue of being in a doctoral program debunked most of these images. There is no welfare queen, matriarch, welfare mother, jezebel, or mammie even though society constantly casts them in these roles. Rather than existing within the intellectual status they undoubtedly worked hard for, they are ascribed the status of the Black lady. Collins (2006) noted that no matter how "highly educated or demonstrably competent" (p. 255) they are; their merit is always questioned. Howard-Baptiste (2014) called the questionable moments "mammy moments" where others distrust and disregard the abilities of Black women. The Black lady image is a modern version of the mammy as she has to work twice as hard to prove her worth (Collins, 2000; Lubiano, 1992). Jane laid out the impossibility of her finding a mate or starting a family at this point in her life

feeding into the matriarchy thesis (Collins, 2000) as her studies consumed most of her time when she said, “but then as a Black woman it’s difficult, let’s just be real.” She was referring to a Black woman in STEM having both a family and a career. She also highlighted the difficulty of her finding a partner in the college town she resides when she asked, “Me finding a husband in [city] right now, what the chances of that are?” There were also other participants who were single and concentrating on their academic career. The image of the Black lady posits that educated Black women are so consumed with their careers that they have no time for men.

The discriminatory racial and gender bias bared here demonstrated Black females never exist outside of their intersectionality. They have to debunk myths and let others know that they are as capable as their counterparts, before they gain the respect of others. An educated, well-accomplished individual is never the foundation of a Black woman’s identity. She is constantly juxtaposed within multiple identities. In the study, this is illustrated in the narratives of individuals like Porsha and Janelle who witnessed people constantly assuming they pursued undergraduate studies rather than a doctoral degree. This can be seen in the following exchange:

> Porsha: people are like, are you getting your Master’s, I’m like no I’m getting my Ph.D. in science education. I’ve had a Master’s for 8 years.
>
> Tasha: I’m curious, what kind of people, is it family or just random people?
>
> Porsha: Just when I mean meet people and you say you’re in graduate school.
>
> Tasha: Ohh.
>
> Janelle: They're shocked; I feel like you have to say that first though. People take me for an undergrad
>
> Jane: Yeah they think undergrad.

In a similar vein rather than be cast as a doctoral student with a problem, Janelle acknowledged “I think that, well in my department, I think there’s still a stigma of the angry Black woman or whatever…” When she spoke about an error that affected her, rather than seeking an immediate

solution, she was cast in that role. Their academic positionality is often secondary to the socially constructed Black woman identity.

When Jane declared, “Let me tell you, my first day in the department, somebody assumed I had children,” the secretary who asked, perpetuated the hyerfertile stereotype associated with the welfare mother. It is hard to fathom that someone would assume she was a mother without any evidence. It is important to highlight that many of these images place the Black women in a subservient role; they are not in a position of power. So Janelle spoke up like everyone else did, she assumed the position of an angry Black woman. Labelling her an angry Black woman conveyed the notion that Janelle should be happy that she is a graduate assistant in a STEM field and should not speak up when there is an issue with her disbursement.

Lord et al. (2009) noted that women in STEM fields are particularly susceptible to tokenization, which subjects them to the dominant voice. In these areas of study, this is typically a White, male voice. The overlapping discriminatory spaces that Black women occupy isolate them from the homogeneous atmosphere present in those fields (Sallee, 2011). Some of the interviewees spoke of the isolation in their fields and the way they carved their own niche. Derricka noted that because everyone in her field had a different research interest, it was easy to become isolated, “it’s like building your own niche and you can’t talk to nobody really about it because you’ll be having mini lectures with everybody.” Jane boldly stated “I’m definitely different. I definitely think that they’re smarter” when asked how she compared to the rest of her academic cohort. She believed that she was different. Allison expressed, “I don’t compare myself to people but I look at others and see what they’ve done and I’m like I’m not near that so I’m not successful in my mind.” Although she stated that she did not compare herself with other

students, she still countered that her achievements were minimal when she observed others around her.

The participants were fully aware that they did not accommodate the homogeneity of their respective fields. The following excerpt from Carla's interview demonstrates the outsider status of Black women in the academy.

> Carla: The White tower that is academia is called the White (stresses) tower for a reason. And while you can have faculty members who get it, and you can have faculty members who they understand that there's more than this at play, you also have faculty members who don't and the thing is while they don't have to get it.
>
> Interviewer: Umm hmm
>
> Carla: In order for you to succeed, you have to get it. For example, I do have White people in my program,
>
> Interviewer: Umm hmm
>
> Carla: and the lens through which they view the world is cool, it's educated, they miss a lot of stuff. And that's the fact that they may not necessarily affect you inside the classroom but again the Ph.D. process and getting the Ph.D. is so much more than what goes on in the classroom, things that go on in the world really matter and as a person who's a double minority
>
> Interviewer: Umm hmm
>
> Carla: in an environment where if you walk across classes, like if you're teaching a class or guest lecturing in a class or doing something, you might be the only Black person that these undergrads have ever seen that is in this position.

Janelle further remarked, "honestly speaking there's no African Americans in our department, faculty members or staff now that I can think so…" The above narratives symbolized the paucity of Black female professors or students at Tiger University while highlighting the way women of color stand out.

Some individuals consider girls who evolve into women as incapable of succeeding in STEM disciplines (Nerad & Cerny, 1999). The participants in the study although they have defied that myth, discerned these gender norms within their respective disciplines. Janelle

relayed receiving a lower grade on an assignment that she completed with a male colleague and acknowledged “but I’ve heard that a lot with women in mathematics. I’ve heard that sometimes old way of thinking that women aren’t as capable in math as men so and there’s not a lot of women in math so...” This discourse provided evidence that the dominant White male thinking that women are less intelligent than men is still present today. Tasha was fully aware that as a female who exercised her procreative rights, her academic advisors assumed they had further evidence to support their deficit way of thinking. It should be noted that by returning to her program, succeeding in her comprehensive exam and well positioned to complete her doctoral studies this academic year, she proved the deficit thinking wrong. Her resilience however, does not diminish her awareness that she is surveilled and expected to fail. She explained “even now I had to take my child to my parents in …. And now I’m here without him so that I can finish up and leave.” The huge sacrifice of being away from her son so she can spend more time in the lab shows that the male way of thinking still pervaded her academic discipline. To succeed she had to choose between her maternal role and her academic role. Success is contingent on her not assuming her femininity and maternal instincts.

McGee and Martin (2011) established that Black female students due to their small numbers in STEM fields feel the pressure of the stereotypes associated with their race and gender. Steele (1997) reasoned that they are more likely to feel threatened by these stereotypes as they proceed into graduate school. Judging by the number of females in the study who experienced the impostor syndrome, and their gender and race narratives, it is safe to say that they may be prey to stereotype threat. This was particularly salient during the focus group interview when the interviewer asked the five participants whether they felt marginalized by their race and gender. They all laughed and conveyed that it was an integral part of their STEM

experience. Tasha argued that her mother who encouraged her to have a child while she was a student "doesn't understand the nuances of being Black and being a female in something like this." The "this" referred to here is the racial and gender stereotypes that Black females face in STEM fields. Shauna gave credence to race and gender narrative when she surmised, "I feel like an outsider because I am a minority student and because I'm female." Marginalization became a topic for discussion in the focus group interview because of its strong presence in the one on one interviews.

Lord et al. (2009) interestingly noted that the chilly STEM climate for women is even icier for Black women. Race and gender consistently collide to shape their experiences in these fields (Collins, 2014; Ong, 2011). There is currently a huge impetus to increase the American STEM workforce and that means including minority groups such as Black women who Ong (2011), claimed historically have been left out of these fields. Porsha, Janelle, and Jane participated in NSF sponsored initiatives geared to increased minority participation in the STEM workforce. Researchers note that despite the initiatives, the number of Black females is small (Espinosa, 2008; Ong, 2011). In the study sample only three of the participants gained access to these minority-geared sponsored programs. As previously stated, the need to specifically recruit minority populations indicated that they have been deliberately left out and did not always have access. The majority of the participants went to "good" schools and did not indicate attending the resource deprived schools characteristically attended by minorities. Carla indicated how hard her mother work to send her to the private "school which was good enough for White people" and therefore should be "good enough for her too." Jane, Janelle, Shauna, and Porsha were selected to attend magnet schools and were bused out of their school zone to attend those schools. Tiffany and Allison attended the top secondary schools in their respective countries. Shanae and Tasha

attended the schools in the middle class suburbs they resided. Derricka attended the zoned high school in the rural area she grew up. The American participants attended majority White schools. They had to assume a form of Whiteness to gained access to STEM fields. Whiteness in this context refers to the property value attached to the well-resourced schools they attended. Researchers have noted the disadvantaged schools that Black students attend which do not adequately prepare them for a graduate STEM degree (Anderson, 2002; Hale, 2001; Kozol, 1991; Lewis, 2003; Oakes, 1990; Perry, 2003). To be prepared the participants attended a majority White school where they were separated from their racial group. This need for separation to gain access sustains the hegemony of Whiteness.

Gaining access to the STEM initiatives is contingent on assuming a form of Whiteness. Jane and Janelle's experience however, demonstrate Bhabba's (1984) mimicry. At their HBCUs, they had access to these sponsored programs, which prepared them for doctoral programs in STEM disciplines. When they entered the PWIs, those in power reminded them of what Fanon (2008) called the fact of Blackness. Their credentials from their Black colleges were inadequate and disregarded as insubstantial. Janelle who graduated from an HBCU conveyed this when she stated, "none of my credits counted and so what my advisor at that point in time told me, he said that the school that you went to for your master's program does not offer as many math classes as we offer here." Jane also an HBCU graduate eventually dropped out of her program because she "had a professor who refused to work with [her] because [she] went to an HBCU." Although they assumed a form of Whiteness by attending the White schools, which prepared them academically to pursue a STEM discipline, and gain access to sponsored programs when they entered their doctoral programs, they were mocked and told they were not good enough and they are still under the dictates of the White males who dominate these areas of study.

Some of the respondents confirmed they felt alienated in the field. These feelings go in tandem with the impostor syndrome. Those who had frequent or intense feelings were the ones who felt the alienation and most aware of the how their marginal identities converged to influence experiences. Jane shared insight into her experience and that of a fellow Black female from an HBCU during her first attempt at a Ph.D. program. She described, “they kept trying to make us take undergrad classes like oh you don’t have the background. So it was a lot of hell for us.” During her interview Carla further presented evidence of this when she explained, “Because a lot of these different interactions, being a Black woman, being first generation, studying sex, being a victim of sexual assault, you know all of these different things is something that especially the white males, they don’t ever think about.” The accounts depicted that they are rarely visualized as doctoral students, but constantly juxtaposed within different identities due to the historical context of their race and gender. Figure 4 displays one of my moments of reflection as I analyzed the data, I was still in disbelief at the manifestation of all I read. Although many of them continue to doubt themselves, they persist and resist the social, cultural and academic deterrents, which accompany their intersectionality.

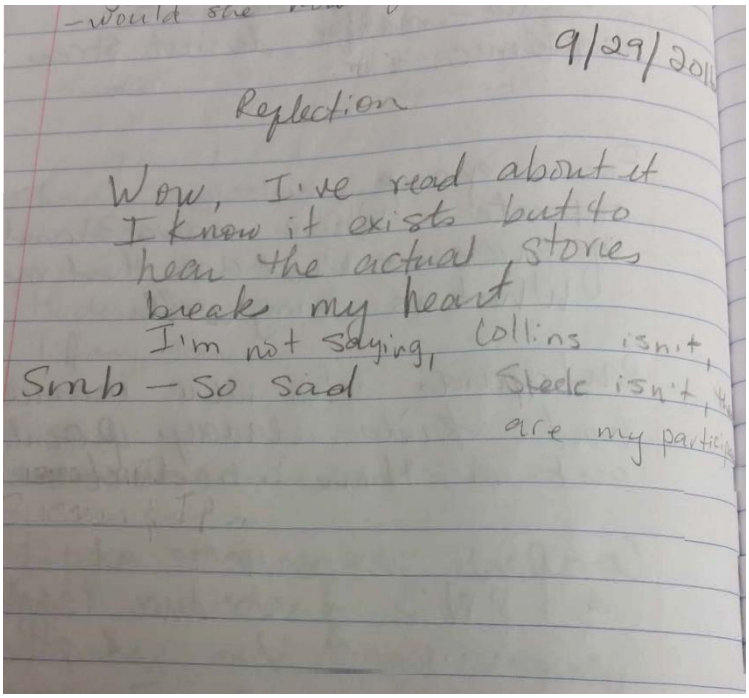


Figure 4. *Journal reflection*

Research Questions

Research Question 2

The second research question asked how do Black females who feel like impostors perceive success while pursuing studies in a STEM Ph.D. program? I use the findings from Chapter IV, the theoretical framework undergirding this study and the literature to respond to the two questions in the second phase of the study. Black females who felt like impostors perceived success in different ways.

Many of the participants believed that completing their programs on time and publishing indicated academic success in their respective departments. When asked to describe a successful student in their program, Jane indicated that such a student would be "publishing papers, performing experiments that benefit the scientific community." Janelle believed that a successful student "get[s] out in a reasonable amount of time, like four to five years, maybe even six if you have to but I think just even making it out., to me that's enough," Allison noted,

> The type of people who do well are the people who are disciplined in terms of their work ethic. Like people who understand you have to be at work every day, you have to do as much as you can every day and willing to sacrifice weekends, holidays, you know nights, things like that.

The amount of effort required to generate results, publish papers and complete degree programs on time makes the STEM climate competitive for a Black female residing within intersecting oppressions. This competitive environment is a breeding ground for developing impostor feelings. Negotiating the STEM environment as a woman of color who did not fit the norm made that individual feel like an impostor. There is pressure to complete their studies on time and publish because not doing so makes them stand out even more. Although Jane had publications, and was currently working on another, she still felt that she did not meet the standards of her department or fellow students. She constantly asked herself, "Are they still going to give me this degree?" Shanae felt secure that she was on track with everything and believed that she was succeeding.

Allison also felt that she was not a success because she was not publishing as much as she would like to or generating the results she would like. By virtue of being in a Ph.D. program, on their way to being part of the three percent of the population with doctoral degrees, the participants were accomplished. Despite their presence in a slim type field, some participants still believed that they did not "feel like [they] were successful enough," "not fully accomplished," or "not as successful as they would like to be." The Black females in the study who felt like impostors did not believe in their achievements.

Lin (2008) postulated that women might be part of a sociopolitical culture that feeds off perfection. It is this desire for perfection that conjures self-doubt in those experiencing frequent and intense feelings. Clance et al. (1995) noted the academic stereotype that women are academically inferior to men have caused them to internalize that any anything less than perfect

is a sign of incompetence. This is particularly salient for women of color who have to deal with the intellectual quandary while dealing with their racial and gender identities. Tasha highlighted this when she claimed "so my advisor is very difficult and he's very well-known so for a Black woman like me to be in that group and to tough it out…" Although she admitted that she endured the rigor demanded by her advisor she continued:

> So I've toughed it out and I think compared to other students in the program, I think if someone was to be really honest, they would say that I am doing better than most students but I tend not to see that in me.

There was still evidence of her doubt; she did not recognize her accomplishments. When she alluded to "a Black woman like me," she bared the interactions of her intelligence with her race and gender. Black women are not expected to "tough it out" when there is an intellectual challenge. Solorzano and Yasso (2001) reflected that the need to exhibit perfection in deference to these stereotypes made successful women of color in the academy feel like impostors.

Solorzano and Yasso (2001) observed that due their conspicuous presence, successful women of color question their rightful place in academia. Stereotype threat was pervasive throughout the doctoral journey of some interviewees. Although they achieved the status of being in a graduate program, they were aware of the stereotypes that work against them and questioned their competence. Some of the interviews with participants who had frequent or intense impostor feelings demonstrated this. This interrogation of their success is particularly salient when Shauna asks, "Who am I to be here?" She voiced this while highlighting the paucity of Black female professors or Black female doctoral students in her program or on campus. Although success in indicated by their continued presence in a doctoral program that not everyone is privy to, they continue to doubt their competence. Some of the participants were ever cognizant of how race and gender interact to shape their experiences. The gender and race

interaction is underscored when Tasha noted, “Black women don’t do well in my program.” She had to work against that stereotype and prove that despite being Black, female and a new mother she had a rightful place in her academic discipline and just as competent as the other students.

Some of the students in the study accredited their family and advisors for the success they had achieved so far. Kaba (2013) verified that family and community support were pivotal in Black students’ persistence in STEM degrees. When asked about the factors that contributed to their academic success, Shanae replied, “Well I had a good support system at home. My parents are always helpful...” Allison answered “my parents’ prayer honestly” while Derricka responded, “I’ve had a lot of support from my parents.” Many of the participants praised their parents for their support even though they thought they should start a career rather than continue to graduate studies. This is demonstrated when Porsha admitted that her family reacted to her decision to pursue doctoral studies with “that girl don’t she love school, she can’t get enough.” Similar to the participants in this study, the females interviewed by Ong (2011) admitted that despite their families questioning their decision to pursue a STEM doctorate, they felt encouraged to push against all odds and make them proud. Some individuals in the study recognized the lack of academic support from their advisors of departments. Carla remarked, “I wasn’t getting any support from my department at all” while Shauna in a separate interview also observed, “I don’t feel like I have support from my department.” Shauna further advanced that “my advisor is, I don’t know selective about his responses and meeting with students.” Palmer et al. (2011) acknowledged that a supportive environment in STEM disciplines contributed to student success. A student in an unwelcoming environment is more likely to feel like an impostor if their surroundings do not provide supportive scaffolding for their success.

Young's (2011) description as a natural genius mirrors some of the ideas that impostors may have of success. When asked how she compared to the other students in her cohort, Jane replied, "I definitely think that they're smarter." Although she acknowledged that they possessed an engineering background that she did not have and she was succeeding, she laughed and concluded that she was still in the program, "by grace." She believed that intelligence is innate and success is marked without failure. The fact that she had to work harder than those who were better prepared made her doubt her intelligence. Simonton (2012) believed that exceptional distinction in a particular domain demonstrated superlative intelligence. Exceptional distinction is characteristic of an individual described as a natural genius.

Many of the participants expressed that they were not successful because they had not made a distinction in their respecttive fields. In punctuating their ideas of success with the word "but" they indirectly acknowledged that they have experienced failure because they have not made any distinctions. When probed about their success, Allison noted, "I never feel like I'm successful enough." Tasha replied, "I'm successful but I'm not as successful as I want to be in this particular area but yeah" while Porsha observed, "I'm successful but I'm not fully accomplished." They have not internalized that rarely are experiments successfully executed the first time or papers published during their initial submission. Success goes through stages and these hurdles set the stage for achieving one's goals. Many doctoral students do not finish their studies in the stipulated five-year period because experiments do not go as planned, or the research process is lengthened beyond the anticipated timeframe. This is no undermines the intelligence or abilities of a student who eventually holds a doctoral degree and goes on to succeed. When success is not instinctive, some participants felt like impostors instead of embracing the setbacks as steps toward a successful end.

Wood and Breyer (2017) proposed some key factors that contribute to student success in higher education on a personal level. Acceptance to an institution of higher learning denotes pride and achievement. The ten women were all doctoral students at a Research 1 institution yet the majority of them had frequent impostor feelings. The writers elaborated that one should be able to choose their area of study and envision themselves professionals in the field. The study participants chose their respective disciplines but the majority of them did not believe that they were professionals in the field. Many of them believed that they still had a long way to go before they could make their mark in their respective academic concentrations. Allison demonstrated this when she expressed, "but I look at others and see what they've done and I'm like I'm not near that so I'm not successful in my mind." Meeting family expectations and conjuring parental pride is another key aspect of personal success (Wood & Breyer, 2017). All of the interviewees spoke of the pride that the parents, spouses and other family members felt based on their achievements. Despite exceeding family expectations, some of them still felt like impostors. The writers postulated self-efficacy, resilience, persistence and confidence are instrumental in achieving results. While Shanae and Tiffany appeared to possess those four key traits, confidence and self-efficacy appeared lacking for the other women in the study. When asked about success, Tiffany remarked, "academically, I'll say I'm a success because everything I've set out to do, by His grace, I have been able to up until this point. So based on that, I would consider myself a success." Jane on the other hand doubtfully replied "I guess" when asked if she was successful. Although they put in the effort and hard work, when they got the expected outcomes, they doubted their intellectual ability.

Wood and Breyer (2017) noted that happiness and enjoyment motivated individuals to succeed. It is important that an individual feel safe, secure and a part of their learning

environment. Many of the narratives in the study depict the opposite. The participants with frequent or intense impostor feelings did not have a sense of belonging; neither did they feel safe and secure within their respective academic disciplines. The researchers predicted that the possibility of a stable future and future employment enabled students to succeed (Wood & Breyer, 2017). With the current impetus to increase the STEM workforce in this country, the future prospect of the study population is hopeful. All the participants were confident about their future careers in academia or industry and did not express doubt about gaining employment. The writers concluded that success enables one make a contribution to the community. Tasha, Jane and Tiffany included making an impact in their community in their definition of success. Tasha declared "You're making your community to be more positive to me that's what success is all about." Jane stated "I have to be able to give back to my community in some kind of way. Like when you're Black it's not about the money, I got to help out these kids or I got to be a mentor…." Tiffany also shared this view when she expressed "someone that can make a difference in the community is a successful person." Despite their positive future and the prospect of giving back to their community, most of them felt like impostors. The impostors in the study did not use all of the factors outlined by Wood and Breyer (2017) to define success. If these factors are carefully considered by an individual to define their success, it is easy to see why many of the students did not feel they were successful. The impostor syndrome negatively influenced the internalization of their success.

Research Question 3

The third research question asked what are some of the successful strategies and practices employed by Black female students who self-identify as impostors during their Ph.D. studies? The participants who reported frequent and intense impostor feelings conveyed that participating

in mentoring programs, forming healthy peer relationships, maintaining healthy advising relationships, and their faith in God were instrumental tools during the doctoral studies. Some of the respondents took part in a formal mentoring program on campus where they liaised with a faculty and peer mentor who assisted them during the first years of their academic program. As a participant in this program myself, I wish to emphasize the value of this resource in equipping me with knowledge that I needed to traverse my first years in graduate school. The lessons and relationships I gained from there are invaluable. Those in the program explained similar sentiments. Carla highlighted the support of the program, "I'm really thankful for [the mentoring program] because my first semester was awful." Janelle also noted,

> The thing that made a difference is my faculty mentor. I talk to her about everything, if I had any problems she's not here anymore, I'm about to cry. But when I was having trouble, she took it to the higher level and got it taken care of just like that.

The goal of the program is to assist traditionally underrepresented groups in graduate programs in negotiating their higher education journey. The directors of the program specifically recruit first-generation students, women in STEM, and racial and ethnic minorities.

Carla was extremely grateful for her faculty mentor who eventually became her dissertation chair. She noted that the program gave her access to a Black female professor who was not part of her department. Jane, who is now a peer mentor, underscored the value of her experience and was excited about working with her new mentee. During the focus group interview she announced, "Me and my mentee gonna be lit this year, she's great." The mentoring relationships not only provided emotional support but also provided the participants with access to resources such as fellowships, academic support and financial support for conferences. Derricka was appreciative of the relationships she fostered outside of her discipline especially with Black females that she met through the mentoring program. She noted, "well my friends are

not chemistry people; I met them through [mentoring program]. I've got like some chemistry people but again if I hang out with too many chemistry people we start having chemistry lectures." She joked and said she needed friends outside her field to maintain her sanity.

In graduate school, informal interpersonal relationships between students and faculty which provide support for their career functions, psychosocial functions, and role modeling functions has always been important in helping students navigate their academic journey (Scandura, 1992). Career functions include exposure, teaching and providing feedback on the student's work. The psychosocial aspect of the mentoring relationship includes approval and validation, friendship and counseling. Mentees look up to their role models as a guide to shape the attitudes, behaviors and values (Scandura, 1992). Traditionally mentoring relationships have left out minority populations (Blake-Beard, Bayne, Crosby, & Muller, 2011). This led to an increase in formal mentoring programs that target marginalized student populations (Blake-Beard et al., 2011). The Black females who participated in the formal mentoring program at Tiger University outlined the ways in which their mentoring relationships supported their career, psychosocial and role model functions.

Researchers observed that a lack of mentoring contributed to impostor feelings (Parkman & Beard 2008; Cope-Watson & Betts, 2007; Young, 2011). The absence of role models of a similar race and gender may be problematic for Black women in STEM fields. Blake-Beard et al. (2011) discovered that graduate students with a mentor of the same race and gender developed healthier relationships with their mentors than those who did not. Due to the paucity of Black female faculty in STEM fields at Tiger University, not all mentees received a Black female faculty mentor. Those who did get one had more favorable relationships with them than those who did not. Having participated in the program, the mentees were eager to transition to a new

role as a peer mentor. Jane insisted that she had to give back to her community when her advisor cautioned that her participation in the program hindered her studies. The others were content to provide support for other Black females new to their doctoral studies. The mentoring relationships definitely helped self-identified impostors negotiate their academic journey.

Beyond the mentoring relationships, impostors underscored the importance of their peer relationships in supporting them throughout their studies. Allison was happy to have another Black female in her program that she could not only vent to but also share her success stories. Tasha particularly called out a Black female friend who she said was her "right hand." She appreciated that she had another female like her who could understand her emotions and empathize with her. Derricka explained the importance of having friends outside of her department. She joked that those friends were important for her sanity because when she hang out with her academic colleagues, the conversations turned into mini lessons. Peer relationships provided academic support for some of the impostors. They valued having another female in their field they could work with who would not judge them for seeking help. Jane who was the only Black female in her program, worked with another Black male student. Janelle noted during her interview: "I think the thing that has sealed us together so far, supportive wise was our peers." All of the participants spoke of the relationships with other females of color and emphasized the significance of those relationships in their success.

Syed, Azmitia, and Cooper (2011) observed that peer relationships contribute to the success of underrepresented minority students. As they proceed into adulthood, students rely more on their friends for social and emotional support (Furman & Buhrmester, 1992). Students reported a sense of belonging when they found friends who shared their interests (Syed et al., 2011). The researchers also highlighted that peer relationships may hinder the success of students

but this does not relate to the sample as they all spoke of positive peer relationships. Unlike their White peers who transition to college with some of their high school classmates, minority students find it more difficult to carve an academic identity that integrates their race, gender and social class (Syed et al., 2011). Finding peers residing within a similar intersectionality proved instrumental in helping the impostors successfully negotiate their academic identity. These peer relationships do not undermine the importance of family support. The collegial relationships provided emotional and social support for an academic identity that many of them could not discuss with family members.

The self-identified impostors realized that maintaining a healthy relationship with their academic advisor was a successful strategy for navigating their doctoral studies. Some of them realized that heeding the words of the faculty advisor was a key factor in completing their academic journey. Some of them were working on research topics in which they had remote interest but to gain the Ph.D. and graduate from the institution, they worked on the research suggested by their advisor. Allison and Jane spoke the praises of the good working relationship they had with their professors. When asked about departmental support, Allison conveyed, "Yeah especially with my research advisor it's very good; she's wonderful, really good." In response to the question of factors that contributed to her success, Jane remarked "my advisor pushing me to do stuff, having me do other stuff you know. Writing these papers, telling me I've got to publish stuff." The supervisors assisted them in publishing journal articles and completing their final research projects. They had a relationship where they received practical and psychosocial help from them and it contributed to their success. Tenenbaum, Crosby, and Gliner (2001) found that practical help from advisors contributed to student productivity. Publications are one of the indicators of success identified in the study. The ability to publish with the

assistance of their advisor signified academic achievement (Tenenbaum et al., 2001). The writers deduced psychosocial support increased student gratification of their graduate experience. Tasha received diminished psychosocial support from her advisor but remained productive due to continued academic support.

For those like Carla and Shauna who did not have the most rewarding relationship with their advisors, they found reaching out to mentors outside of their department helped them traverse their academic journey. Shauna maintained contact with her undergraduate mentor who provided academic and psychosocial support. She noted, “I also have a mentor who is really influential in my life. She’s been my mentor since I was in undergrad so it’s been about ten years.” Carla found her faculty mentor from the mentoring program invaluable. When she was unable to form a cohesive relationship within her discipline, her mentor filled in the gap. She explained that she chose that mentor to chair her dissertation because “she cared for [her] beyond the research aspect.” Bekhuis (2014) learned that finding a mentor interested in a graduate student’s intellectual development helped them achieve their academic goals. The participants who recognized that their assigned advisor did not contribute to their intellectual development, found someone who assisted with their academic and psychosocial development.

Participants spoke of their faith which sustained them throughout their studies. Allison for example, remains convinced that her achievements were not of her volition but emanated from her parents’ prayers and God. She declared, “my parents just prayed enough and God had mercy on me,” when asked about the factors that contributed to her success. Many others referenced God as a source of support to navigate their doctoral studies. Tiffany averred “I never doubted my abilities because my abilities come from God Almighty so I’m always very reliant on His strength when the workload was heavy.” When asked about the factors which have

contributed to her success, Janelle avowed “definitely my faith in God.” Lori and McClure (2009) confirmed that Black women often use spirituality as “as a transformative, regenerative, and uplifting space” (p.42). The authors discovered that faith guided their lives and provided a coping mechanism for negotiating the academic space at a PWI. Historically Black people especially during slavery embraced strong spiritual beliefs to resist the pervasive forms of discrimination they encountered in their daily lives (Milner, 2006). Spirituality remains a major facet in the lives of Black people and for many Black women, serves as a vehicle for negotiating the intersecting oppressions they continually face (Lori & McClure, 2009).

Walker and Dixon (2002) asserted that religious beliefs highly correlated with positive academic performance in their study on African American students. Other researchers deduced that spirituality was not only salient with academic performance but encouraged a healthy lifestyle and identity development (Lori & McClure, 2009). Identity development is significant in the lives of women of color as they continuously carve a niche for themselves in the spaces they occupy. The impostors in the study found ways to resist the dominant ideology in STEM fields and be successful.

BFT provided a framework, which explained how Black women resisted the dominant discourse about them. Through dialogue with their mentors, advisors and peers the participants have found ways to use their lived experiences for wisdom, which has helped them succeed although they feel like impostors. Engaging in the ethic of caring through expression, emotion and empathy, they have found ways to validate their knowledge claims and show they are just as intellectually competent as the rest of their academic cohort. These four tenets have shaped how they use their spirituality in collaboration with their mentoring, peer and advising relationships to succeed even though they doubt their intelligence.

This study did not explore every aspect of the Black female impostor's experience during her graduate studies. Beyond the scope of this study, there are other areas for investigation. This study set the stage for an introductory investigation of the impostor syndrome, but exposes often overlooked areas. The next section examines the restrictive discussions that may have enhanced the study.

Limitations

This section focuses on the limitations of the study. An increased response rate for the first phase of the study would have rendered the statistical analysis more powerful. A response rate of 20% was sufficient to conduct the study but the generalizability of the results would increase with a larger sample size. While the purpose of the study was to investigate the experiences of Black females in STEM fields, results from Phase 1 indicated that Non-Black females are a population of interest when investigating the impostor syndrome. They had the highest overall mean on the Clance Impostor Phenomenon Scale. Black feminist thought however, is an inappropriate framework for investigating their experiences. This limitation does not undermine the validity of the findings. Most of the mainstream scholarship on the impostor syndrome focuses on White populations and overlooks the experiences of minority populations. Furthermore, as a Black female impostor, engaging in BFT was important framework for me to conduct the study.

The second phase of the study provided knowledge claims from a student perspective and did not investigate faculty perceptions. Including evidence from professors would have supported the conclusions drawn from the participants. The study population only included doctoral students in STEM fields and did not include students from other disciplines. Identifying these limitations does not destabilize the credibility of the study as they were beyond the scope

of this investigation. Rather they open areas for further research and provide a springboard to further investigate the phenomena.

Future Research

While there are substantial possibilities for further investigation, I wish to focus on four main areas. The first area would investigate faculty attitudes to Black female doctoral students in science, technology, engineering and mathematics fields. Substantiating the conclusions from the study with faculty perceptions would provide more insight how faculty relationships with Black females in STEM fields influence the impostor syndrome. Secondly, I would like to conduct a qualitative study comparing the experiences of a sample of students in STEM doctoral programs, which includes the other groups (Black males, Non-Black male, Non-Black females) in the first phase of the study. This would allow me to identify ways in which their experiences are similar or different. The third area of investigation would compare the impostor syndrome in students across disciplines. This study would evaluate whether there are significant differences in the incidence of the impostor syndrome in students based on their academic discipline. A future study exploring how the psychological traits of attachment and entitlement predict the impostor syndrome, an area not explored in this study would add to the body of knowledge on the impostor syndrome.

Implications

This study has a number of implications for examining the impostor syndrome in Black females in STEM fields. The first area of concern is the need to address the racial and gender divide in STEM fields. Black women remain marginalized in those disciplines despite research done on their experiences. Whereas there are other factors that contribute to the impostor syndrome, the study indicated that the oppressive intersectionality of their race and gender

contribute to the impostor feeling experienced by the participants in the study. Continually doubting oneself adds to the stress of completing a doctoral degree. Although the participants engaged in different practices to foster success, they do not internalize the full extent of their achievements. Institutions of higher learning need to put into practice the theoretical guidelines that purport equal opportunity on college campuses. Faculty and staff need to be attuned to the needs of Black women and made aware of the overt and covert practices they engage in that sustain the dominant narrative about them. Institutional training on harassment and discrimination should provide strategies for minimizing discriminatory practices. In their effort to recruit minority populations, higher education institutions should recruit minority faculty to serve as mentors and role models for these students. The absence of faculty of color reifies the dominant deficit way of thinking.

As stated by Tenenbaum et al. (2001), the study demonstrates the need for supportive advising relationships for doctoral students in STEM fields. Academic departments need to train faculty to be attuned to the needs of the students assigned to them. One of the goals of academia is to build a community of scholars. I believe that any member of faculty entering academia should have a moral obligation to pass on this ethic to their students. This can be done by building a strong relationship with their advisee and providing support through career, psychosocial, and role modeling functions. A student is better able to navigate their academic journey if their advisors provide guidance. Evidence from this investigation indicated that students who have the support of their advisors were better able to negotiate their academic space than those who did not.

Finally, this study demonstrates how to engage in a transformative mixed-methods research. Mertens (2012) explained how axiological, ontological and epistemological

assumptions frame transformative mixed methods research. The axiological assumption guided my decision to challenge the dominant narrative about Black women in STEM fields due to my experiences with the intersectional gender and racial oppression. The transformative ontological assumption underlying BFT allowed me to question the origin of different versions of Black women's experiences while examining the power structures that may be associated with the oppressive and discriminatory intersectionality of their experiences. The epistemological assumption of BFT was demonstrated through the knowledge claims made in the study that the researcher as a Black female was able to develop with the study participants because of our shared experiences as members of a marginalized community. This study is a call for social justice, it demonstrates that race and gender and not mutually exclusive categories for Black women but intersect to shape their experiences. Engaging the tenets of Black feminist epistemology demonstrated the power relations that shape what others believed about the study participants and why these beliefs make them feel like impostors. The Black women in the study validated knowledge claims that not only defied the dominant narrative but showed how they learned to resist oppressive structures and became successful even though they felt like impostors.

Implications for Practice

The findings from this study highlight a need for policy changes at the university level. Some of the participants in the study underscored the absence or paucity of Black female faculty in their respective departments. Russell and Russell (2015) called for recruitment and retention practices that diversity STEM departments. They further state that administrators of institutions of higher education can answer that call by increasing the number of faculty members from traditionally underrepresented groups. Given the deliberate effort made to recruit and retain

minority students into STEM Ph.D. programs, there are policy implications if there is no return on the significant investment made in their training (Fouad & Santana, 2017). It is not only important that students persist in their respective programs but that they do that in an environment where they are comfortable. If the students are able to succeed and speak highly of their experiences during doctoral journey, it benefits the learning institution.

Implications for educational policy extend beyond the study's findings and necessitate an analysis of how policy makers increase the equal opportunities for Black women in STEM fields. In terms of discriminatory practices, the policies at TU address these issues in terms of harassment. The policy statement defines harassment as "abusive or hostile conduct which is directed toward or inflicted upon another person because of his or her race, color… sex... etc." None of the Black females revealed hostile or abusive situations where they felt discriminated; the examples were subtle but pervasive. There is a need to implement policies that address the forms of microaggression influenced by racial, ethnic and gender discrimination. As noted above given the paucity of Black female faculty, the professors in these departments should be trained on the needs of Black females, made aware of discriminatory practices and trained on ways they can learn the value of equity.

Mentoring makes a significant difference in the outcomes of doctoral students who are marginalized by their race and gender. Mentors who have completed degrees from various STEM career fields provide additional insight on expectations for STEM degree program. A Black female mentor who traversed the STEM doctoral terrain can help students negotiate not only the academic rigor but the interstices of the racial and gender intersection that is an integral part of their doctoral experience. Like Collins (2006) stated Black women form bonds and develop knowledge through their lived experiences. Whereas it is not always possible to find a

Black, female mentor in every STEM discipline, it is important that any faculty member who takes on an advisory role to a Black female understand and respect that their experience is different. It is the role of an educator to foster the success of their student or mentee. If there is difference, there is a moral and ethical responsibility to understand and support that difference rather than let it be a barrier to a fruitful mentoring relationship. Mentors can build healthy relationships by debunking the negative stereotypes attributed to Blacks in STEM fields, developing healthy relationships with their students and networking with other faculty or students who share similar experiences (Borum & Walker, 2012; Greene, 2008; Russell & Russell, 2015).

For the females in the study who acknowledged feeling like impostors there are a number of strategies that can be employed to minimize feeling fraudulent. The first step is admitting that they are intelligent, resourceful, creative, able individuals who have succeeded many milestones. Young (2011) cautioned those who doubt their achievements when they compare themselves to admirable individuals in their field that these successes came in stages and they too will make great strides in their fields. Rather than becoming one's own enemy by self-criticism and doubt, small victories which are the steps to greater success should be celebrated and accepted (Young, 2011). Greene (2008) also provided strategies that can be used by Black students to persist in STEM fields. He advised that they reject the negative stereotypes ascribed to Blacks in STEM fields, develop relationships with their classmates and professors within their respective departments and network with both Black and non-Black classmates and faculty.

This investigation used Black feminist epistemology as the overarching framework in a transformative mixed methods design to explore how the impostor syndrome affected the experiences of Black females in STEM fields while they pursue their studies. The first phase of

the study examined differences between Black females and other groups on the Clance Impostor Phenomenon Scale. The instrument categorizes the impostor syndrome into four levels: low, moderate, frequent and high. A two-way factorial ANOVA revealed that race and gender were non-significant indicators of the impostor syndrome while level was a significant indicator. A Chi-square analysis indicated that there was an insignificant relationship between level and race or gender.

The second phase of the study explored the experiences of ten Black female students pursuing doctoral studies in STEM fields. Data analysis identified the following themes were an integral part of the experience of Black females: family background, academic journey, success, the impostor syndrome and the double bind: race and gender. The majority of the Black women in the study were the first in their family to pursue a college degree. The support they received from their families was instrumental to their success. The participants most of whom had impostor feelings defined success in both academic and non-academic terms. Some believed that publishing, generating good results and finishing their programs on time indicated success. Others defined success in non-academic terms such as having a spiritual relationship with God or being surround by family and love.

Many of the participants doubted their abilities and were unwilling to accept their achievements. The intersection between race and gender continually shaped their experiences and how they negotiated their doctoral studies. The Black females in the study used different strategies to successfully negotiate their programs. They participated in mentoring programs, formed peer groups, had healthy advising relationships and maintained spiritual relationships with God. The study generated data that provided insight on how the impostor syndrome influenced the experiences of Black females completing a Ph.D. in a STEM field.

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APPENDIX A:

CLANCE IMPOSTOR PHENOMENON SCALE

Clance IP Scale

For each question, please circle the number that best indicates how true the statement is of you. It is best to give the first response that enters your mind rather than dwelling on each statement and thinking about it over and over.

1. I have often succeeded on a test or task even though I was afraid that I would not do well before I undertook the task.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

2. I can give the impression that I'm more competent than I really am.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

3. I avoid evaluations if possible and have a dread of others evaluating me.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

4. When people praise me for something I've accomplished, I'm afraid I won't be able to live up to their expectations of me in the future.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

5. I sometimes think I obtained my present position or gained my present success because I happened to be in the right place at the right time or knew the right people.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

6. I'm afraid people important to me may find out that I'm not as capable as they think I am.

1	2	3	4	5

(not at all true) (rarely) (sometimes) (often) (very true)

7. I tend to remember the incidents in which I have not done my best more than those times I have done my best.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

8. I rarely do a project or task as well as I'd like to do it.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

9. Sometimes I feel or believe that my success in my life or in my job has been the result of some kind of error.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

10. It's hard for me to accept compliments or praise about my intelligence or accomplishments.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

11. At times, I feel my success has been due to some kind of luck.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

12. I'm disappointed at times in my present accomplishments and think I should have accomplished much more.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

13. Sometimes I'm afraid others will discover how much knowledge or ability I really lack.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

14. I'm often afraid that I may fail at a new assignment or undertaking even though I generally do well at what I attempt.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

15. When I've succeeded at something and received recognition for my accomplishments, I have doubts that I can keep repeating that success.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

16. If I receive a great deal of praise and recognition for something I've accomplished, I tend to discount the importance of what I've done.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

17. I often compare my ability to those around me and think they may be more intelligent than I am.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

18. I often worry about not succeeding with a project or examination, even though others around me have considerable confidence that I will do well.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

19. If I'm going to receive a promotion or gain recognition of some kind, I hesitate to tell others until it is an accomplished fact.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

20. I feel bad and discouraged if I'm not "the best" or at least "very special" in situations that involve achievement.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

Note. From The Impostor Phenomenon: When Success Makes You Feel Like A Fake (pp. 20-22), by P.R. Clance, 1985, Toronto: Bantam Books.

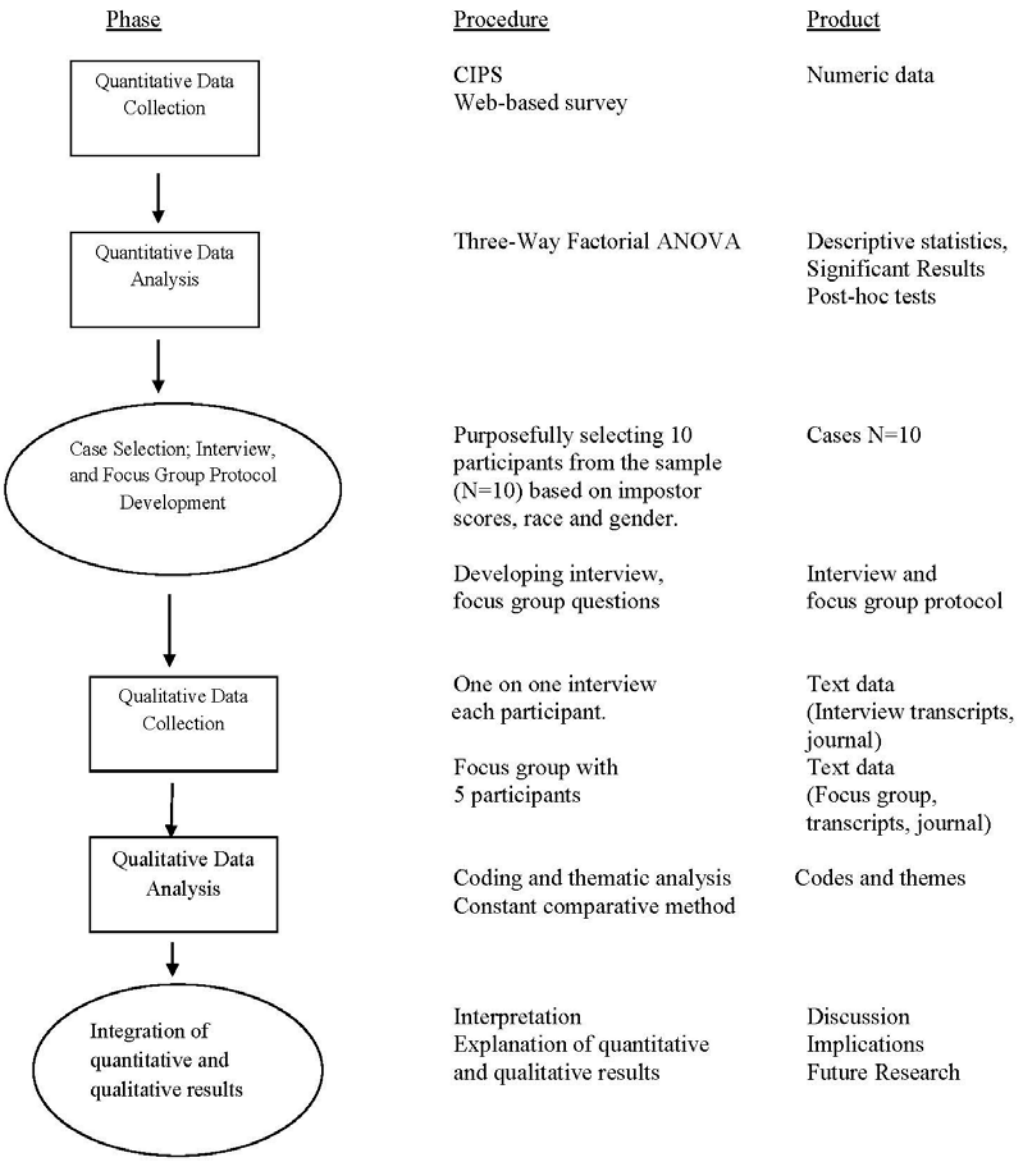
Scoring the Impostor Test

The Impostor Test was developed to help individuals determine whether or not they have IP characteristics and, if so, to what extent they are suffering. After taking the Impostor Test, add together the numbers of the responses to each statement. If the total score is 40 or less, the respondent has few Impostor characteristics; if the score is between 41 and 60, the respondent has moderate IP experiences; a score between 61 and 80 means the respondent frequently has

Impostor feelings; and a score higher than 80 means the respondent often has intense IP experiences. The higher the score, the more frequently and seriously the Impostor Phenomenon interferes in a person's life.

APPENDIX B:

RESEARCH DESIGN



(Adapted from Ivankova & Stitch, 2007)

APPENDIX C:

SURVEY EMAIL TEMPLATE

Dear University of Alabama Student,

You are being asked to take part in a research study. The study is being conducted by principal investigator Marsha Simon, a doctoral student in the program of Educational Research at the University of Alabama. The purpose of this study is to explore the experiences of Ph.D. students in STEM fields.

Taking part in this study involves completing a web survey that will take about 10 to 15 minutes. This survey first asks for basic information pertaining to your age, gender, race/ethnicity, country of origin, and area of study. The other questionnaire asks questions about your feelings about your studies.

This survey is completely anonymous and confidential. At no point will you be asked to give your name, student number, or any other identification. As well, the link to this survey contains no identifying information connected with your email address. The investigator is the only person that will have access to the password-protected research data. Only summarized data from all participants will be presented in publications or at meetings.

You will not be paid or receive any tangible benefits from this study. However, the results of the study will be useful for college and university personnel who design and offer services for students who experience mental or emotional distress while getting their college education.

The chief risk of this study is that some of the questions may make you uncomfortable. You may skip any question you do not wish to answer or you may stop the survey at any time. As well, you will be provided with information about resources available for students who would like to get help with distress.

If you have questions about this study, you may contact the investigator, Marsha Simon, at (318) 436-1025 or you may contact the investigator's advisor, Dr. Aaron Kuntz at (205) 348-5675. If you have any questions about your rights as a research participant you may contact Ms. Tanta Myles, The University of Alabama Research Compliance Officer, at (205)-348-5152.

YOUR PARTICIPATION IS COMPLETELY VOLUNTARY. You are free not to participate or stop participating at any time.

If you understand the statements above, are at least 19 years old, and freely consent to be in this study, click on the Take the Survey link below or you may follow the next option and copy/paste the URL into your browser.
Follow this link to the Survey:

APPENDIX D:

INTERVIEW PROTOCOL

Hi, I'm Marsha Simon, a Ph.D. student in Educational Research in the College of Education. I am interested in researching the impostor syndrome especially as it relates to black females in Science, Technology, Engineering and Mathematics (STEM) fields. Impostor syndrome is manifested in feelings of uncertainty about one's academic achievement despite evidence of intellectual ability. These feelings are especially common among women who have been successful and continue to succeed. I would like to ask you a few questions about this phenomenon.

1. Tell me a little about yourself?
   -Where are you from?
   -What is your program of study?
   -What is your academic/professional background?
   -What year are you in your program of study?
   -Why did you choose to attend UA?

2. How would you describe your academic journey been so far?
   -Are there any specific parts of your journey that you particularly remember?
   -Would you advise your friends to follow your academic path?
   -Why did you decide to pursue a doctoral program in STEM?
   -What type of person does well in your program?
   -How would you define success in your program?
   -Can you tell me about the support you receive from your department?
3. What classes are you taking?
4. How do you feel about your performance in these classes? Describe your completion process when you receive an assignment?. Have you ever felt like you are not able to keep up with your classes? Why/Why not?
6. Do you ever doubt your ability to undertake your graduate studies? When? Why/Why not?
7. How do you view yourself in comparison to other students in your class/program?
8. How would you define success?
9. What factors do you think can contribute to your success in your academic career?

APPENDIX E:

PERMISSION FROM DR. CLANCE

andra gailis <pudda67@hotmail.com> 1/21/14

to me, Pauline

Dear Marsha,

I am replying to your IP request on behalf of Dr. Clance. She received your methods overview and found it very interesting! You have permission to use and make copies of the scale (CIPS) and I have attached it along with the scoring. Also please read the permission form and reply with your consent. I have further included an IP Reference list (not all inclusive) for your use to make available for participants if they want to know more about the IP and you could refer them to Dr. Clance's website: <http://www.paulineroseclance.com>

We wish you well with your research and thank you for your interest in the Impostor Phenomenon!

Sincerely,

Andra

Andra Gailis, M.S., NCC
Professional Counselor
725 Wood Valley Trace
Roswell, GA 30076
(770) 594-7616
pudda67@hotmail.com

"To know even one life has breathed easier because you have lived; that is to have succeeded."
- Ralph Waldo Emerson

APPENDIX F:

INTERVIEW EMAIL TEMPLATE

Hi, my name is Marsha Simon and I am a Ph.D. student in Educational Research. I am interested in investigating the experiences of Black women in STEM fields. I would be extremely appreciative if you could discuss your academic experiences with me in your STEM discipline. With your permission, I would like to conduct an interview with you so we can talk a little more about how you feel while you pursue your doctoral studies. All information discussed will be kept confidential.

Thank you for your time and consideration.

Marsha

APPENDIX G:

FOCUS GROUP INTERVIEW EMAIL TEMPLATE

Hi, my name is Marsha Simon and I am a Ph.D. student in Educational Research. I am interested in investigating the experiences of Black women in STEM fields. I wish to thank you for allowing me the opportunity to discuss your academic experiences with me.

With your permission, I would like to conduct a focus group with you and four other participants so we can talk a little more about how you feel while you pursue your doctoral studies. All information discussed will be kept confidential.

Thank you for your time and consideration.

Marsha