THE PERSISTENCE OF AFRICAN AMERICAN DOCTORAL STUDENTS AND GRADUATES FROM OR IN STEM PROGRAMS: A TRANSCENDENTAL PHENOMENOLOGY STUDY

by

Tanisha Johnson-Smith

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

Liberty University

2024

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APPROVED BY:

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Abstract

The purpose of this transcendental phenomenological study was to describe the persistence efforts for African American doctoral science, technology, engineering, and mathematics (STEM) students or graduates. The theory guiding this study is Tinto's theory of student departure with a focus on the model of student persistence as it lays the foundation for how students persist to degree completion. The following questions guided this study: What lived experiences have helped African American current doctoral students or graduates persist in a STEM program? What challenges have African American graduate or current doctoral students experienced while completing a STEM degree program? What strategies or retention efforts have been offered by higher education institutions that benefit African American doctoral students to persist through to degree completion? What personal efforts have African American doctoral students or graduates experienced that helped them persist? The study used a qualitative research approach with a transcendental phenomenological design. Ten participants were current African American STEM doctoral students or graduates. The participants were recruited through social media flyers and the snowball sampling method. The data collection process included individual interviews, focus groups, and journal prompts. The researcher analyzed the data through Epoché, transcription, and coding. As a result of the study, themes uncovered during the data analysis included showing up for yourself and self-discipline as persistence measures.

Keywords: persistence, African American, STEM, higher education

Copyright Page

Dedication

I dedicate this dissertation to my Lord and Savior, Jesus Christ, because it is Him that has governed my life and allowed me this opportunity!

I dedicate this to my Pastor, The Honorable Chief Apostle Belle Smith, who never stopped encouraging me to return to school.

To my father-in-law, James L. Smith, who believed in me.

To my sister and very best friend, Negila Brown, for supporting me every step of the way.

To Bishop Anthony Brinkley, for supporting me as a real father should.

To my husband, Marlin Smith, who has been my rock, my encourager, my support, my pick me up, my strength, and everything else throughout my academic journey.

To my precious jewels, J&A, they know who they are.

Acknowledgments

The completion of this dissertation would not have been possible without my Lord and Savior Jesus Christ. I am beyond thankful that He saw something in me worth saving and using for such a wonderful opportunity.

I would also like to acknowledge my committee chair, Dr. Patricia Ferrin. Words cannot express my gratitude towards her. She has helped and guided me every step of the way. Her patience and guidance is immeasurable and she has been an absolute blessing from God.

I appreciate my co-chair Dr. Vonda Beavers for assistance and helping me to understand even further the methodology for my research.

I want to recognize my peers from each course that were always encouraging me to push through.

A special acknowledgement to my principal, Dr. Brenda Winfrey Knox for being my editor. I am blessed to have her selflessly involve herself in my doctoral journey. I love and appreciate her.

I am thankful that my church family has supported me, prayed for me, cooked for me, helped me with my husband, helped me with my job, and whatever else they could do to help me along the way.

Last but not least, I want to acknowledge Mamanisha's Babies (SKKKANJ & Company) …they know who they are.

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Central Research Question (CRQ)

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CHAPTER ONE: INTRODUCTION

Overview

In 1972, Willie Hobbs Moore became the first African American woman to receive a doctoral degree in physics (Miller, 2019). This accomplishment, however, did not ignite a momentum that continued to increase African Americans entering and completing a doctoral degree in a STEM program. African Americans should have accounted for many doctoral degrees awarded as the years progressed; however, they did not. With a particular focus on current African American doctoral students and graduates, a minimal amount of research is available on what helps these demographics of students persist toward doctoral degree completion in a STEM program. This research aims to identify specific resources, strategies, programs, or interventions that helped African American doctoral students, current and graduated, persist while completing a STEM program. The study examines the historical elements of why African American men and women are underrepresented in STEM doctoral degree programs. The chapter expounds on who and what is impacted by this underrepresentation. The chapter explains what happened over time through various theoretical lenses that examined this phenomenon. These various aspects will provide a foundation for the research that explains how persistence contributes to the success of African American doctoral students in STEM degree programs.

Background

This research begins with a historical background of the status and progression of the underrepresentation of African Americans in STEM higher education doctoral programs. Their underrepresentation will be expounded through research that attempts to uncover this issue. First, the underrepresentation of African Americans in STEM higher education is examined through

the challenges within STEM programs from previous years until now. Next, the social context of the research issue is explored by examining how underrepresentation impacts the STEM workforce. Finally, the evolution of the underrepresentation is explained through the theoretical perspective of Tinto's model of student persistence.

Historical Context

A reflective look at the effects of segregation in education is a starting point toward understanding the complexities of persistence for African American doctoral students and graduates. Generally, segregation can be defined as "a separation of groups of people with different characteristics, which often leads to inequality" (Browne, 2022, par. 1). Segregation came about after the abolition of slavery (Library of Congress, n.d.) that explicitly made African Americans as well as other minorities aware of what side of inequality they belonged. Although laws were implemented to give African Americans rights as citizens, a separation still occurred (Library of Congress, n.d.). One inequality of segregation is linked to education, where race was the leading factor in keeping ethnicities separated (Logan et al., 2012). Not only were they separated due to race, but there was also a separation in academic quality and performance (Logan et al., 2012). This separation is identified as racial segregation in education. It is defined as "the operation of a school system in which students are wholly or substantially separated among the schools of an educational agency based on race, color, sex, or national origin or within a school based on race, color, or national origin" (Legal Information Institute, nd.).

African American students have been victims of racial segregation in education for decades, which has impacted their persistence (Allen et al., 2018; Logan et al., 2012). Segregation made it difficult for minority schools to have adequate funding for learning and instructional resources, facility needs, appropriate class sizes, and the ability to hire highly

qualified teachers (American University, 2020; Logan et al., 2012). Without these amenities, African American students found it hard to continue to graduate high school, much less from a college or university (American University, 2020; Logan et al., 2012). African Americans who made it through high school and then on to college discovered that they were inadequately prepared to handle the meticulousness of the curriculum on the collegiate level (C. Steele, 2003). The pressures of being unable to maintain the rigor of the instruction led many African Americans to leave their degree programs.

Although there were many challenges due to racial segregation in education for African Americans, efforts were attempted to combat such issues (Harper et al., 2009). The United States Congress passed laws such as Title VI of the Civil Rights Act of 1964 that "prohibits discrimination by race, color, and national origin" (U.S. Department of Education, 2020a). Before this law, the second version of the Morrill Land Grant Act was established as another means to help further the advancement of African Americans. The first phase of the Morrill Land Grant Act was to provide land to states in order to build higher education institutions that would specialize in teaching "agriculture, military tactics, mechanic arts, and classical studies" (University of Nebraska-Lincoln, 2022, par 2). These academic provisions were not created to include African Americans or other minorities (National Archives, 2022). This implementation was of little to no benefit to African Americans. However, in 1890, a second edition of the Morrill Land Grant Act was created (National Archives, 2022). The Morrill Land Grant Act had specifications to grant land for separate institutions for minorities or prove that race was not used against anyone who tried to enroll in higher education institutions (National Archives, 2022). Instead of allotting land, this second version gave money, which resulted in the births of several historically Black universities and colleges (National Archives, 2022) that opened the door for

many African Americans to experience the benefits of receiving a collegiate education. Many years after the Civil Rights Era and the Morrill Land Grant Act, African Americans still face difficulties obtaining degrees, specifically on the doctoral level in STEM. Research has found that African Americans are still behind in STEM due to various challenges within higher education STEM programs (Allen et al., 2018; Logan et al., 2012; Rainey et al., 2018).

Social Context

Efforts were implemented to increase the enrollment of underrepresented minorities in STEM programs. However, there is still a concern about the slow progress at which the enrollment numbers are growing (Logan et al., 2012; Ruud et al., 2016). The concern remains because of the increased demand for STEM professionals (Lancaster & Xu, 2017). Still, higher education institutions struggle to produce the needed number of STEM-educated individuals, especially minorities, at the same rate as the growing STEM career field (Lancaster & Xu, 2017). Doctoral students who persist to degree completion are essential contributors to the workforce (Okahana et al., 2018). In the United States, doctoral graduates with a STEM background have an impact that directly helps the country to compete with the global society (Okahana et al., 2018). However, there has been an issue with employers' ability to attract individuals with a STEM background to fulfill STEM career professions (E. Smith & White, 2019).

Underrepresented minorities have the lowest enrollment for programs that produce STEM degrees (K. Smith et al., 2021). Low enrollment impacts the STEM workforce's ability to diversify as it continues to globalize (K. Smith et al., 2021). Innovation within the STEM profession will also be an issue due to the minimal amounts of underrepresented minorities participating in STEM degree programs (Okahana et al., 2018). Many strategies are in place to address the low enrollment in STEM, but significant increases in participation have yet to be

made (Okahana et al., 2018). Without the increase, the STEM workforce will lack innovation and diversity (K. Smith et al., 2021).

Theoretical Context

Tinto's theory of student departure, with a focus on his model of student persistence, is the primary theoretical foundation for this research. Considering the amount of research on student dropout and what previous research lacked, Tinto and Cullen (1973) developed a theory that goes beyond the dropout description. Tinto and Cullen (1973) describe the dropout process as an individual leaving an institution in which they were enrolled because of the lack of usage of institutional resources. Tinto and Cullen (1973) also describe the dropout process as a student enrolled in a program, never completing and receiving the degree. These theorists assert that "human capital" is wasted on individuals who fail to meet the certifiable criteria in their degree program (Tinto & Cullen, 1973, p. 3). The human capital mentioned here is the knowledge base an individual attains or possesses to be proficient in their skill area (Goldin, 2016).

However, when examining the underrepresentation of African American doctoral students, other theories have been used for this same area of research. Intersectionality is a theoretical foundation for understanding how race and gender impact the underrepresentation of African American females in STEM degree programs (Charleston et al., 2014). At times, race and gender for African American females impede the support they receive when pursuing an educational pathway through STEM (Charleston et al., 2014). It causes them to lose ground on establishing an identity in STEM (Charleston et al., 2014). Intersectionality theory helps reveal what methods of persistence African American females have used to overcome the challenges that arise because they are women while pursuing a STEM education (Armstrong & Jovanovic, 2017; Charleston et al., 2014).

Critical race theory (CRT) is another theoretical lens through which to examine the underrepresentation of African Americans in STEM education. CRT was established by professor and lawyer Derrick Bell (Ballard & Cintrón, 2010; Cobb, 2021). CRT is a concept through which race and racism are evaluated regarding the various aspects of life (Ballard & Cintrón, 2010; Cobb, 2021; Yosso & Dixon, 2006). Racism has been considered a contributor to the underrepresentation of African American students in STEM (Ballard & Cintrón, 2010; Cobb, 2021; Yosso & Dixon, 2006). CRT can examine this idea because of how CRT understands racism as an active part of the general public (Ballard & Cintrón, 2010; Cobb, 2021; Rosa & Mensah, 2016; Yosso & Dixon, 2006).

Significantly, the theory of student departure is connected to Durkheim's (1897) theory of suicide. Durkheim explained how suicide is most prevalent when an individual has not made a connection within society (1897). These connections are specifically identified as being morally invested in society and bonding with a group where the individual has similar interests, goals, or ambitions as the collective (Durkheim, 1897). These individuals feel like outcasts because they cannot integrate and become isolated or alone. When individuals cannot integrate into society on these levels, the probability of suicide intensifies (Durkheim, 1897). Tinto (1975) suggested that students' integration into the collegiate experience is similar to how people integrate into society. Tinto (1975) does not suggest that students who do not integrate into higher education will commit suicide. However, it is more likely that they will depart for one reason or another. Persistence in higher education can be viewed in this manner. Higher education is sometimes viewed as a structural system with many facets through which students can connect, such as social organizations or academic clubs (Tinto, 1975). When these links are not established, a break in commitment to their education is inevitable (Tinto, 1975).

Problem Statement

The problem is that African American doctoral students remain underrepresented in STEM degree programs (Alfred et al., 2019; Crumb et al., 2020; Horsford et al., 2018; McGee & Bentley, 2017; Watkins & Mensah, 2019). Although African Americans are among the fastest-growing college populations (Alfred et al., 2019), their underrepresentation makes them the lowest race in STEM degree programs (Alfred et al., 2019). It has been suggested that information be made available through research to help African American doctoral students persist in completing STEM degrees (Shavers & Moore, 2017). This information is crucial in helping overcome challenges that hinder African American students from completing STEM degrees (Crumb et al., 2020; McGee & Bentley, 2017). It is also pertinent to understand persistence measures to help ensure that society has the necessary personnel to fulfill the STEM workforce (Lee et al., 2020; Yoder, 2015).

African American men and women have been viewed as the minority in race and gender, facing many challenges to persist through graduate-level programs, particularly on the doctoral level (Horsford et al., 2018). Many of those challenges are linked to racial disparities (Horsford et al., 2018). Persistence strategies help overcome these challenges and others. However, only a tiny amount of research has explored this area concerning successful efforts for African Americans in STEM doctoral programs (Watkins & Mensah, 2019). This study highlights persistence factors that help African American doctoral students persist to degree completion in STEM programs.

Purpose Statement

The purpose of this transcendental phenomenological study is to describe the persistence efforts of African American doctoral STEM students or graduates. At this stage in the research,

persistence efforts will be defined as ways students integrate into the higher education setting that successfully impact their degree completion (Tinto, 1975). The theory guiding this study will be Tinto's (1975) student departure with a focus on the model of student persistence.

Significance of the Study

While there is an increase in African American enrollment in higher education institutions (Alfred et al., 2019), there is still a lack of research-based information that explains how this demographic of students persists through STEM degree programs on the doctoral level (Alfred et al., 2019; Crumb et al., 2020; Horsford et al., 2018). Ways to persist towards degree completion do exist. However, only a few methods have been researched concerning African American doctoral STEM students (Watkins & Mensah, 2019). This study uncovers the research's empirical, theoretical, and practical impact.

Empirically, the study reveals how it correlates with other research that has explored the same deficit regarding African American STEM graduates and the lack thereof. However, this research adds persistence measures to help combat the STEM degree completion issues for African American doctoral students. Theoretically, the study explains how the problem of African American students relates to Tinto's student persistence model. Lastly, the study expounds on how the information obtained can give more insight to African American doctoral students, higher education institutions, and other stakeholders on achieving STEM degree completion.

Theoretical

The theoretical framework for this study focuses on Tinto's model of student persistence. This model has been used to guide how students persist through their degree programs (Estrada et al., 2016; Foltz et al., 2014). This model helps to explain the importance of a student becoming

academically and socially integrated to persist to degree completion (Tinto, 1975). Higher education institutions must be equipped with this information to ensure they make available as much support as necessary to aid in degree completion. Without being connected, be it academically or socially, students' chances of not completing their degree program increase (Tinto, 1975).

In terms of a connection, the research on the persistence of African American doctoral STEM students and graduates will extend Tinto's theory. Tinto's model of student persistence explains how making institutional commitments through integration impacts student persistence (Savage et al., 2019). This study will expand on the idea that other connections or commitments besides institutional commitments are essential. The study will show that when it comes to students persisting through to degree completion, being committed to themselves has just as much impact. It will also show that being self-driven is a significant factor in persisting.

Empirical

Much research exists concerning why African Americans are underrepresented in STEM degree programs (Armstrong & Jovanovic, 2017; Sanchez et al., 2019). Prior research has revealed many factors contributing to African American underrepresentation in STEM doctoral-level programs. The factors included are, but not limited to, doctoral socialization (Bragg, 1976; Gardner, 2010), imposter syndrome (Collins et al., 2020; Lige et al., 2017; Stone et al., 2018), attrition (Artiles & Matusovich, 2020; Young et al., 2019), science identity issues (Collins, 2018; Gottlieb, 2018; Ireland et al., 2018; Nealy & Orgill, 2019), and lack of support (Burt, Williams, et al., 2019; Watkins & Mensah, 2019).

While this research on African American student persistence explains some reasons for African American underrepresentation in STEM doctoral programs, it also uncovers some

existing supports used to combat this issue. However, this research on minority student persistence shows that more than the support in place is needed, and research in this area is needed to help this demographic of students persist through their STEM doctoral degree programs. The information in this research builds upon existing theories used to examine this phenomenon. Overall, the research serves as an additional source of literature in this area of higher education.

Practical

Adding information about the successful persistence experiences of African American doctoral students can benefit the higher education academic system (Farmer et al., 2016) and current African American doctoral STEM students. This information can aid college and university personnel by compelling them to reflect on best practices involving all students, including minority students. (Bauman et al., 2019). Knowing how to help students persist will help to ensure that each student receives the best support in completing their higher education program (Bauman et al., 2019). Current African American doctoral STEM students will have a resource to utilize when their persistence levels decline. This information will help give them ideas and strategies to employ in order to get through their difficulties.

Research Questions

This study aims to add information to research that unveils the answers to questions surrounding what exists to improve persistence among African American doctoral students who are completing STEM programs. There is a dire need for higher education institutions to improve or implement such efforts because the STEM workforce is in high demand to fill STEM positions with competent, skilled, and diverse individuals (Chelberg & Bosman, 2019). In order to diversify the workforce, STEM education enrollment must improve, specifically for African

American doctoral students. Gaining more knowledge from African Americans who have already graduated from doctoral-level STEM programs or are currently enrolled with a solid path toward degree completion is a place to start. The focus would be on their lived experiences, the challenges they faced, and the efforts they used in order to complete or maintain their degree program.

Central Research Question

What lived experiences have helped African American current doctoral students or graduates persist in a STEM program?

The first area examined to gain insight into successful persistence measures for African American doctoral students is the challenges African American current and graduated doctoral STEM students face or have faced. Understanding the barriers and challenges helped clarify why successful measures are imperative. This information benefited students by realizing that they are not alone and that someone can relate to what they may be going through. Higher education institutions can benefit from the information by gaining insight on how to help African American doctoral STEM students deal with or overcome challenges with persistence and continue towards academic success. Lastly, revealing firsthand accounts brings the issue of persistence to the forefront and helps all stakeholders see the reality of this problem.

Sub-Question One

What challenges have African American current doctoral students or graduates experienced while completing a STEM degree program?

Sub-Question Two

What strategies or retention efforts have been offered by higher education institutions that benefit African American doctoral students to persist through to degree completion?

Sub-Question Three

What personal efforts have African American doctoral students or graduates experienced that helped them persist?

Definitions

1. *African Americans* – An African American is considered an individual with any connection with any African black origin (U.S. Census Bureau, 2022).
2. *Critical Race Theory (CRT)* – Critical Race Theory is a framework that explains how racism and inequality are not birthed from one's judgment or personal bias, but instead, it is deeply rooted in the ways of society, be it education, housing, and laws (Ballard & Cintrón, 2010; Cobb, 2021; Yosso & Dixon, 2006).
3. *Higher Education* – Colleges, community colleges, and universities that provide quality instruction that is beyond the high school level (National Center on Safe and Supportive Learning Environments, 2023)
4. *Persistence* – Persistence is achieved when a student has integrated academically and socially into the university learning environment so profoundly that the student has committed to achieving goals such as degree completion (Schreiber et al., 2014).
5. *Retention* - When a student enrolls at a specific institution and continues at the same school through at least their 2nd year (National Student Clearing House Research Center, 2016).
6. *STEM* – Studies in Science, Technology, Engineering, and Mathematics (Jelks & Crain, 2020)

Summary

The purpose of this transcendental phenomenological study was to describe the persistence efforts of African American doctoral STEM students or graduates. African Americans continue to grow within the college population (Alfred et al., 2019). However, African Americans remain the lowest race in STEM degree programs (Alfred et al., 2019). Therefore, the need for this study is imperative to add to existing research on how to help this demographic of students persist. When African American postgraduate and degree-seeking students experience barriers, the effects can directly impact whether or not they complete their degree program.

Some theories have tried to explain the barriers, such as stereotype threat (C. M. Steele & Aronson, 1995) and Tinto's (1987) student departure. These theories also aid in setting plans that outline what can be done to prohibit those barriers or lessen their effects. Research has identified barriers such as lack of support and microaggressions (Mile et al., 2018). On the other hand, there have been successes, including student engagement, retention efforts, support groups, and mentorship. While these efforts have proven beneficial to those for whom the study was conducted, some limitations must be considered. Some successes were not specific to African Americans but to general students. Therefore, whether those strategies would work for African American students is still being determined.

Other limitations were the widespread usage of the successes and the timeframe in which they were conducted. These studies were isolated and only used across a few regions. That lack of usage makes it difficult to determine if it works for one or if it will work for all. The time frame in some of the studies lasted only a semester and was not repetitive. Continuous usage would have given data to review the strategies for improvement or note what is working well.

With this minimal amount of information, the impact of needing to continue research in this area to ensure that African American students are breaking through barriers and heightening their academic performance through successful strategies is imperative.

CHAPTER TWO: LITERATURE REVIEW

Overview

A review of existing literature was studied to expound on African American current and graduated doctoral students and their experiences of persistence from STEM degree programs. The chapter begins with highlighting a foundational theory that will serve as a framework for the research. The theory specified for this research is Tinto's persistence model, developed through Tinto's theory of student departure. The chapter continues with related literature highlighting challenges African American students have experienced in higher education that have impacted their persistence in one way or another. The concluding portion of the chapter expounds on research-based interventions, initiatives, or strategies that have been put in place to help solve some of the issues. However, the amount of research available regarding persistence strategies for this demographic of students is still being determined. The lack of that information will show the need for this study to uncover more definitive actions of persistence that will help African American doctoral students persist through their STEM programs.

Theoretical Framework

A theoretical framework is vital in research because it supports the topic of study or phenomena. The theoretical framework that underpins this particular research is Vincent Tinto's (Tinto, 1975; Tinto & Cullen, 1973) theory of student departure, focusing on the model of student persistence. This model was developed to help explain the relationships between students and their institutions that impacted students' decisions to leave or persist (Tinto, 1975; Tinto & Cullen, 1973). The model examines how those varying interactions are related to specific types of student departure behavior and connections that compelled students to persist (Nicoletti, 2019; Tinto, 1975). Tinto voiced that higher education institutions directly impact the persistence of

their students, which comes through the effectiveness of their organizational structure (Tinto & Pusser, 2006). When college or university systems have specific processes in place to foster student learning and achievement, such as student support services, opportunities for student engagement, and consistent feedback, it helps to warrant student success (Tinto & Pusser, 2006).

Tinto's Theory of Student Departure

The theory of student departure was developed to explain the process of students dropping out of higher education programs more in-depth. Before this theory developed, much research had been completed concerning student dropouts (Marsh, 1966; Rootman, 1972; Tinto, 1975). However, the research lacked the needed information to create a definitive explanation of the actual dropout process (Marsh, 1966; Rootman, 1972; Tinto, 1975). The research described the dropout characteristics of an individual more than explained the reasons behind the decision to drop out (Marsh, 1966; Rootman, 1972; Tinto, 1975).

In addition, the previous research produced findings that implied motives for dropout through behavioral or background descriptions but not definite explanations of what happened for students to get to that point (Tinto, 1975). These descriptions included but were not limited to "social class, high school experiences, community residence, ethnicity, ability, sex, and race" (Tinto, 1975, p. 93). Explaining why an individual dropped out, or the actual dropout process, is essential rather than just background data to mitigate any misleading information. For instance, when the words "drop out" are heard, it can be interpreted as an individual who left school with no intentions of returning and no explanation. However, when a student chooses to leave, it may fall under one of three reasons: voluntary dropout, involuntary dropout, or transfer (Tinto, 1975; Tinto & Cullen, 1973). Reasons for dropout are also defined as leaving institutions that one was

enrolled in or not receiving a degree from a program an individual was committed to (Tinto & Cullen, 1973).

Although Tinto's (1975) original theory is student departure, from this theory derives perspectives on persistence. Tinto develops a model of student persistence that can be used to understand how students can continue their education while facing challenges during their collegiate experience (Tinto, 1975). Persistence occurs whenever students enter a higher education system, have been able to integrate socially and academically into the collegiate system and complete their degree program (Tinto, 1975, 1993). Integration can cause a student to see the educational value in their institution and feel compelled to excel (Tinto, 1975). The more integrated the student becomes, the more likely they will follow through with their degree completion commitment (Tinto, 1975).

While Tinto's theory on student departure and the persistence model has been part of the research pool within higher education, only some research shares the same stance. Other theorists do not share the same perspective as Tinto (1975) regarding student departure and persistence. Persistence in higher education, to some theorists, is not based on background characteristics such as race or social class (Tinto, 1975). In contrast, other theorists explain that students' background and history directly affect whether or not they persist (Tierney, 1992). For example, students with family members who attended college before them and have completed their degree programs are more likely to follow that path (Tierney, 1992). Students who did well academically in high school are more likely to complete a four-year degree than those on a vocational track (Tierney, 1992). Being academically successful in this manner is different from the theory of Tinto (1975), as his theory suggests that students must be committed to the institution, whether academically or socially, to be successful in college.

Other perspectives have compared the academic and social integration themes of Tinto (1975) to themes of vision and sense of community (Tucker, 2000). Students with a solid vision of what they see of themselves in the future based on their successful academic performance are likely to persist through degree programs (Tucker, 2000). These students can almost describe down to the smallest detail how they will function in their future careers and overall lives (Tucker, 2000). However, vision can only jeopardize persistence (Tucker, 2000). A sense of community parallels integrating into the social aspect of college life (Tinto, 1975; Tucker, 2000). Students joining campus communities such as social or academic organizations can connect with the institution (Tucker, 2000). This connection is vital to make early on as some college students enter straight from high school, where they have had similar connections (Tucker, 2000). Developing a sense of community in these manners is essential to persistence (Tinto, 1975; Tucker, 2000).

For this particular research, all aspects of student departure and the persistence model are used to help formulate the strategies for the data collection process. During this research, current African American doctoral students and those who have graduated from STEM are the participants who will be individually interviewed and brought together in focus groups to gather their perspectives on the challenges and successes of being in STEM programs. Their perspectives grant access to reasoning that will help to reshape how higher education institutions get involved in support of student persistence. Instead of using that information to compile a general description of an individual who leaves college, the information will be beneficial in assisting higher education institutions to understand how to rectify those issues. Tinto's student departure theory will be the guiding factor that helps to answer the research questions about the persistence that African American doctoral students exhibit while in STEM programs.

Throughout the study, this theory will be the lens through its persistence model. The data is analyzed better to understand specific challenges and persistence in higher education. It is essential to know this because it gives insight into what went wrong and what diminished students' drive for persistence. Intervention programs can be analyzed for improvement or formed based on uncovered information. Overall, it will help to find what happens when an individual drops out, why they leave, and what prevention methods are most beneficial for persistence.

Related Literature

The phenomenon of this study expounds on the persistence of current African American STEM doctoral students and graduates from STEM doctoral programs. African American students are underrepresented in STEM higher education programs on both levels, undergraduate and graduate (Corneille et al., 2020; Tao, 2018). Because African Americans have low enrollment in college degree programs, they are also underrepresented in the STEM workforce (Corneille et al., 2020; The Journal of Blacks in Higher Education, 2022; Tao, 2018). The Pew Research Center reported that African Americans account for only 9% of the STEM workforce, while Caucasian engineers and architects account for 71% (Fry et al., 2021; Yoder, 2015). In order to understand how to improve African American presence in STEM, research has to be uncovered that explains their persistent efforts while in STEM degree programs (Ceglie, 2021; Corneille et al., 2020). Unveiling the specifics linked to persistence will improve academic success and the weight of diversity in the STEM workforce (Ceglie, 2021; Corneille et al., 2020; Long & Mejia, 2016).

It is important to note that although students may commit to completing a STEM doctoral degree program, factors may affect their commitment, resulting in voluntary dropout, involuntary

dropout, or transfer (Tinto, 1975; Tinto & Cullen, 1973). For instance, a student may commit to obtaining a degree, but their academic performance reflects low grades. The outcome would be an example of either voluntary dropout, involuntary dropout, or transfer. Voluntary dropout is when students know they do not meet the academic requirements and discontinue their education (Tinto, 1975). Involuntary dropout may be caused by the student being removed from their program by the institution because they do not meet the academic guidelines (Tinto, 1975). A transfer may happen when the student moves to another institution that suits their academic needs better (Tinto, 1975). This information helps to determine how persistence is positively or negatively impacted (Tinto, 1975).

However, there is a debate as to whether this perspective is accurate. That reasoning should be further examined when saying that a student leaves an institution or drops out because of resources. Knowing the difference will help to identify whether the student transferred to another college or university versus dropping out and never returning (Tinto & Cullen, 1973). As stated before, depending on whether the dropout was voluntary, involuntary, or transfer would give a more definitive explanation of the nature of the student departure (Tinto & Cullen, 1973). Specifically, the student should not be classified as a dropout but as a transfer student (Tinto & Cullen, 1973).

Participation in STEM higher education programs by minorities has been an ongoing concern (Hite et al., 2019; Kricorian et al., 2020; Pierszalowski et al., 2021). There have been efforts to improve the enrollment of minorities in the STEM field (Hite et al., 2019; Kricorian et al., 2020; Pierszalowski et al., 2021). Despite the efforts that have been researched and implemented to help with this issue, underrepresentation remains (Hite et al., 2019; Kricorian et al., 2020; Lee et al., 2020; Pierszalowski et al., 2021). Higher education institutions are

responsible for preparing future employees for STEM (Lee et al., 2020; Yoder, 2015). However, that responsibility has yet to show significant progress regarding African Americans completing STEM degree programs (Lee et al., 2020; Yoder, 2015).

The problem with successfully retaining African American students did not begin when they entered a higher education setting. Instead, it traces back to their pre-college education days (Jury et al., 2019; London et al., 2021). During that time frame, the lack of how well African American students were groomed mentally to pursue steps toward a career in a STEM field was clear and evident (Jury et al., 2019; London et al., 2021). The lack of African Americans developing a STEM identity before college impacts how underrepresented they are in STEM degree programs. STEM identity involves how much an individual believes that he or she can apply STEM concepts and knowledge professionally (Collins, 2018).

When trying to understand why African Americans are underrepresented in STEM, research suggests it is essential to trace their developmental stages through school-age years (Collins, 2018; Gottlieb, 2018; Ireland et al., 2018; Jury et al., 2019; Karen, 1991). Investigating this area helps to determine what affects African Americans and other minorities' STEM identity perception (Collins, 2018; Gottlieb, 2018; Ireland et al., 2018; Jury et al., 2019; Karen, 1991). Middle school is a time in African American students' education that reveals the breach in which these students develop a positive mindset toward a STEM identity (Collins, 2018; Gottlieb, 2018; Holcomb-McCoy, 2007). This same trajectory continues through high school (Collins, 2018; Gottlieb, 2018; Holcomb-McCoy, 2007). Therefore, by the time student enters higher education, their perception should have the adequate foundation to sustain the rigor of a STEM degree program (Collins, 2018; Gottlieb, 2018; Ireland et al., 2018).

That being the case, an unstable STEM identity foundation can harm the student's

academic performance, so they should ensure they enter with a strong sense of STEM identity and STEM background knowledge (Collins, 2018; Gottlieb, 2018; Ireland et al., 2018). A strong identity is essential because an undergrad STEM degree program differs vastly from the STEM doctoral level (Gottlieb, 2018; Howard, 2017). Not only does the doctoral level have a more rigorous and unique curriculum, but it also has its share of advanced challenges. Students learn how to research at previous levels, but at the doctoral level, students become researchers (Howard, 2017). Therefore, the work becomes more challenging than on any other level of education. African American students sometimes fail or struggle to maintain because they cannot conform to the normalcies of a STEM-level degree program (Gardner, 2008; Gottlieb, 2018; Howard, 2017). Their lack of a solid STEM background and STEM identity makes it difficult to persevere.

Challenges experienced by African American doctoral students

Studies have outlined other specific difficulties that African American doctoral students face within STEM programs (Brunsma et al., 2017; Crumb et al., 2020; Horsford et al., 2018). These challenges attempted to prohibit African American students from completing their degree programs (Brunsma et al., 2017; Sanczyk et al., 2021; Trent et al., 2020; Watkins & Mensah, 2019; Wolfe & Riggs, 2017; Xerri et al., 2018). However, successful methods were used and implemented to prevent adverse outcomes (Brunsma et al., 2017; Sanczyk et al., 2021; Trent et al., 2020; Watkins & Mensah, 2019; Wolfe & Riggs, 2017; Xerri et al., 2018). Unfortunately, with all the research completed thus far, research still needs to be expanded on what makes these students persist.

Whether male or female, African American students face challenges navigating any doctoral-level degree program; sometimes, those challenges differ for each. However, there are

some challenges that both African American males and females share. Those challenges include doctoral socialization (Bragg, 1976; Franklin, 2020; Gardner, 2010; Moore et al., 2020; Weidman & Stein, 2003), stress (Cadenas et al., 2022; Wilkins-Yel et al., 2022; Yoder, 2015), and lack of support. Other issues that have been reported are recruitment and accessibility for minority students (Acosta et al., 2016; Everett et al., 2016). These challenges are not an exhaustive list, but a few have been highlighted to show their effects on an African American student trying to persevere to degree completion.

Doctoral Socialization

Socialization is a familiar context for comprehending how students traverse through the doctoral experience (Bragg, 1976; Gardner, 2010). Doctoral socialization is "a continuous process an individual goes through that results in acceptable behavior, values, and attitudes that the individual has managed to conform to a prescribed role or group" (Bragg, 1976, p. 6). Doctoral socialization is essential because it helps prepare graduate students with the innate abilities to navigate from the educational aspect to applying the knowledge while functioning in a career (Bragg, 1976; Gardner, 2010; Weidman & Stein, 2003). One of the staple attributes of doctoral socialization is the relationship between the student and their advisor, mentor, or faculty member (Bettencourt et al., 2021; Franklin, 2020; Moore et al., 2020). When students reach the doctoral level, doctoral socialization can be experienced through those relationships (Franklin, 2020; Moore et al., 2020). African American faculty mentors are a valuable asset to doctoral students of the same ethnicity (Bettencourt et al., 2021; Franklin, 2020; Moore et al., 2020). These faculty mentors help black doctoral students with networking connections, collaboration opportunities, and student support (Franklin, 2020; Moore et al., 2020). Black faculty mentors

often serve black students by providing them with important information that Black students would not know to be aware of (Franklin, 2020; Moore et al., 2020).

While doctoral socialization can positively impact students' academic success, African Americans on the doctoral level have only sometimes been able to benefit from it. One area of socialization that African Americans rarely reaped benefits from is being mentored by faculty with the same ethnic background (Franklin, 2020; Moore et al., 2020). The reason is the low percentage of African American faculty members available to serve as mentors (Kelly et al., 2017; Moore et al., 2020). Many higher education institutions have acknowledged being committed to diversity, but the amount of diversity within the faculty is unevenly distributed (Kelly et al., 2017; Moore et al., 2020). The National Center for Education Statistics has reported that as of 2018, black men and women comprise only 6% of higher education professors (U.S. Department of Education, 2020b). Another reason for the low rates of African American faculty mentors is that they must be adequately trained to serve students in such a capacity (Bettencourt et al., 2021; Davidson & Foster-Johnson, 2001). Some colleges and universities implement professional development opportunities to deflate this issue (Bettencourt et al., 2021; Davidson & Foster-Johnson, 2001). However, there still needs to be more professionalism in this area because of the lack of importance placed on the African American student and advisor relationship (Bettencourt et al., 2021; Davidson & Foster-Johnson, 2001).

Financial Aid

While students are continuing their education beyond a bachelor's degree, students have to rely on loans in order to finance their continued education (Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021). Graduate degrees often signify access to careers with salaries that sustain a comfortable lifestyle through at least retirement

(Bostick et al., 2022; Pyne & Grodsky, 2020; Webber & Burns, 2021). However, the cost of obtaining that career through graduate school or post-graduate studies devalues the monetary benefit that goes along with the career (Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021). The amount of money students have to pay for a graduate and post-graduate degree can be expensive. Many students must rely on educational loans to cover costs (Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021).

It is found that African American students are among those who borrow more money than their white classmates while furthering their education beyond an undergraduate degree (Addo et al., 2016; Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky 2020; Webber & Burns, 2021). Because of the amount of money that needs to be borrowed and then eventually paid back sometimes leads African American students to drop out of their program (Addo et al., 2016; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021). They leave because they feel they will not be financially secure enough to repay the large amounts of borrowed money (Addo et al., 2016; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021). Therefore, the better choice would be to drop out rather than finish with an overwhelming debt to be paid back (Addo et al., 2016; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021).

Imposter Syndrome

In addition to doctoral socialization positively or negatively impacting minority students in STEM, how well they perceive their abilities can also be an issue. The lack of self-confidence in STEM can be referred to as imposter syndrome. Imposter syndrome is a way of thinking individuals have of themselves that doubts their abilities despite their achievements (Collins et

al., 2020; Lige et al., 2017; Stone et al., 2018). They attribute their success to luck and no doing (Chakraverty et al., 2022; Collins et al., 2020; Lige et al., 2017). When students have his way of thinking, it leads to anxiety about believing their perceived inabilities will be revealed (Collins et al., 2020; Lige et al., 2017). They become consumed with self-doubt, feeling unworthy, inadequate, and incapable of being as good as the next person (Collins et al., 2020; Lige et al., 2017). They fear their self-perceptions of inadequacy will soon be discovered (Collins et al., 2020; Lige et al., 2017).

When imposter syndrome first surfaced (Pierce, 1970), people from all walks of life could have become prey to this thinking, but it was more prevalent in women (Clance & Imes, 1978). Women with high levels of achievement were found to have inner feelings of inadequacy despite their attainments (Clance & Imes, 1978). Although they showed they were more than capable abilities, academically or professionally, they still believed their so-called achievements were inaccurate and only deceived others (Clance & Imes, 1978). While there is not much research on imposter syndrome specifically related to African American students, this demographic of students still has suffered from this condition similarly (Peteet & Weekes et al., 2015; Stone et al., 2018). Those students have experienced adverse conditions that increased their feelings about self-inadequacy (Peteet & Weekes et al., 2015; Stone et al., 2018). Sometimes, African American students enter graduate-level programs feeling academically insufficient (Lige et al., 2017; Peteet & Weekes et al., 2015). They also have low self-confidence (Lige et al., 2017; Peteet & Weekes et al., 2015).

These feelings and other negative perspectives and emotions led those students to place themselves in a category known as other (Lige et al., 2017). Othering is a theory originated by Spivak (1985) that explains how individuals may feel so insignificant that they do not identify

with any of the norms or expectations of society. Therefore, they would be considered a part of the other group (Lige et al., 2017; Spivak, 1985). African American students sometimes fall prey to identifying as part of the other group (Lige et al., 2017; Spivak, 1985). Feeling and believing they are part of the other group intensifies the imposter syndrome they are already experiencing (Lige et al., 2017; Peteet & Weekes et al., 2015; Spivak, 1985; Stone et al., 2018).

Attrition

Not only is imposter syndrome a challenge for African American students, but attrition is another difficulty. Attrition is "the departure from or delays in completing program requirements" (Ascend Learning, LLC, 2012, p. 2). While it is the intent that once a student enters their doctoral STEM program, they will complete the program, African American underrepresented students and women are less likely to finish due to causes of attrition (Artiles & Matusovich, 2020; Young et al., 2019). Several factors of attrition impact students' persistence (Artiles & Matusovich, 2020; Young et al., 2019). One factor involves the quality of the relationship between the student and the faculty. A second factor involves the need for students to have a mentor connection (Artiles & Matusovich, 2020; Young et al., 2019). However, a third factor of attrition that profoundly impacts student persistence is the dissertation process (Artiles & Matusovich, 2020; Young et al., 2019).

Within the dissertation process, there are many tasks that the students must fulfill by themselves (Ghoston et al., 2020; Young et al., 2019). Although help from chairpersons is mainly through an email or a phone call away, generally, they will need someone to hold their hands or guide them through each step. The students are expected to display independence, motivation, determination, organization, and commitment to the program that drives them through the dissertation process (Ghoston et al., 2020; Young et al., 2019). Many doctoral

students may have to find committee members to include the chairperson (Ghoston et al., 2020; Young et al., 2019). The student is responsible for conducting the research, analyzing the collected data, meeting goals, and more (Ghoston et al., 2020; Young et al., 2019). Completing these requirements can be overwhelming and challenging (Hanson et al., 2022; Russell-Pinson & Lynne-Harris, 2019). If students do not receive the proper support, they can easily give up and not finish (Hanson et al., 2022; Russell-Pinson & Lynne-Harris).

Retention Issues

Retention is also a factor when examining challenges African American students face in STEM programs. In higher education, retention is reached when a student enters their degree program and continues through to completion (NSC Research Center, 2015). However, when it comes to African American students in STEM, retention can be difficult. One reason is that there needs to be more African American students to have a solid identity in science (Collins, 2018; Gottlieb, 2018; Ireland et al., 2018; Nealy & Orgill, 2019). African American students are unable to identify as future scientists, which can affect their motivation and determination to complete a STEM degree program (Collins, 2018; Gottlieb, 2018; Ireland et al., 2018; Nealy & Orgill, 2019).

Student backgrounds and personal, social, and institutional factors also impact retention (Tinto & Pusser, 2006). These positive or negative influences come in different forms (Curry & DeBoer, 2020; Tinto & Pusser, 2006). For example, personal influences motivate students to complete their degree programs (Curry & DeBoer, 2020; Tinto, 1975). The motivation can be fostered by personal reasons or goals such as a passion for the field, a chance to have a career in their field of study, or an assurance that they are working towards getting a job or career that will secure their future financially (Curry & DeBoer, 2020; Tinto, 1975). Social influences include

"how well connected the student is to their advisor, mentorship, discrimination, and sense of belonging" (Curry & DeBoer, 2020, p. 8). However, if there is a need for more connection to the program or even the university, there is an increased chance that the student will leave (Curry & DeBoer, 2020; Tinto, 1975). Institutional influence involves minority students seeing and having access to faculty/professors on the doctoral level in STEM who look like them (Curry & DeBoer, 2020; Joseph, 2012). Minority students feel that support from faculty or professors with the same ethnic background will benefit their academic journey (Curry & DeBoer, 2020; Joseph, 2012). The security of success in this manner is because those faculty members and professors are viewed as having completed a STEM doctoral program (Curry & DeBoer, 2020; Joseph, 2012). Therefore, they are more willing to help students persist and advise them based on their experiences and persistence methods (Curry & DeBoer, 2020; Joseph, 2012).

Lack of Support

Moreover, African American doctoral students have found that having support while completing their studies is beneficial (Burt, Williams, et al., 2019; Watkins & Mensah, 2019). It is challenging if support is absent (Burt, Williams, et al., 2019; Watkins & Mensah, 2019). African American students need help persisting through a doctoral-level STEM program because they need support. These support systems can vary in style. The support comes in the form of family, mentors, faith, and other resources the student feels are necessary to maintain (Burt, Williams, et al., 2019; Tiffany et al., 2022; Walsh et al., 2021; Watkins & Mensah, 2019). When the support is not in place, students can be affected negatively, resulting in not being able to adjust, frustration with any financial issues or academic planning, and the inability to locate necessary resources to uphold themselves while completing their degree program (Tiffany et al., 2022; Walsh et al., 2021).

Challenges experienced by African American male doctoral students

Thus far, it has been explained how both African American men and women face similar challenges regarding STEM doctoral-level education. However, some challenges are faced by each gender, which may be more difficult for one gender than for the other. When it comes to African American males, they have experienced unique challenges with microaggressions (Burt, McKen et al., 2019; W. Smith et al., 2011), student-faculty relationships (Burt, McKen et al., 2019; B. Spencer, 2021), being spokesperson (Abdelaziz et al., 2021; Gazley & Campbell, 2020; W. Smith et al., 2011), and harmful advice (Jones et al., 2013; McClain et al., 2016; Posselt, 2018). This list needs to be completed, but some of the mentioned items have been found in research. While African American females have faced these challenges, the males have a different experience.

Microaggressions

African American male doctoral students have encountered microaggressions threatening their persistence in STEM (Burt, McKen, et al., 2019; W. Smith et al., 2011). It has been expressed that if black men work hard academically, they will be afforded the results that come with such dedication (Burt, McKen et al., 2019; W. Smith et al., 2011). However, microaggressions have surfaced in various forms that have threatened those amenities for black men. Microaggressions are "a comment or action that subtly and often unconsciously or unintentionally expresses a prejudiced attitude toward a member of a marginalized group such as a racial minority" (Merriam-Webster, n.d.). Sue et al. (2007) described microaggressions as everyday moments that people of color are subjected to, such as condescending messages in one form or another. Sometimes, these instances can be intentional or nonintentional (Holder et al.,

2007; Sue et al., 2007). Those who carry out acts of microaggression will rarely acknowledge or even know that they are doing such things (Holder et al., 2007; Sue et al., 2007).

Microaggressions come in three forms: microassaults, microinsults, and microinvalidations (Sue et al., 2007). A microassault is identified as racial name-calling, while microinsults are insults to an individual's racial "heritage or identity" (Sue et al., 2007). Microvalidations convey a critical perspective to minorities of origin or experiences (Burt, McKen, et al., 2019; Sue et al., 2007). An example of a microaggression would be a white person holding their purse or wallet closer to them as a black person approaches (Pittma, 2012). It is assumed that the black individual is a criminal and intends to take what does not belong to them (Pittma, 2012). Microaggressions were first brought into the academic conversation by Chester M. Pierce in 1970, where he described them as racial encounters initiated by white people towards black people (Pierce, 1970). However, since his introductory perspective, microaggressions have grown in context (DeAngelis, 2009; Williams, 2020). Over time, it has been found that microaggressions are not limited to being carried out by what is considered racist individuals (DeAngelis, 2009; Williams, 2020). Often, microaggressions are committed unknowingly by anyone of any race (DeAngelis, 2009; Williams, 2020).

Student faculty relationships

Continuing with the discussion concerning challenges experienced by African American male students and graduates in STEM, interactions within the student-faculty relationship are areas where microaggressions can be found. The student and faculty relationship is one area that is expected to enhance the academic development of minority students (Fries-Britt & White-Lewis, 2020). However, this has not always been the case with all students, particularly minority males. African American male doctoral engineering students and their advisors have been

identified as an area where microaggressions exist (Burt, McKen, et al., 2019; B. Spencer, 2021). Examples include advisors doubting the originality of student work and negatively inquiring about the student's choice to seek a doctoral degree or that particular career path (Burt, McKen, et al., 2019; B. Spencer, 2021). These microaggressions have negatively impacted black male students' academics, personal perception, retention, and career/field identity (Burt, McKen, et al., 2019; B. Spencer, 2021).

Spokesperson

African American male doctoral students have also been challenged with persisting through STEM programs because they have been placed as spokespersons for their race (Abdelaziz et al., 2021; Gazley & Campbell, 2020; W. Smith et al., 2011). African American males are often expected to be the expert educators on the black life experience because they are black (Abdelaziz et al., 2021; Gazley & Campbell, 2020; W. Smith et al., 2011). They are asked many questions by peers and faculty who are not black, with the expectation that they have all the answers (Abdelaziz et al., 2021; Gazley & Campbell, 2020; W. Smith et al., 2011). Being the spokesperson for their culture can sometimes frustrate African American male students (Abdelaziz et al., 2021; Gazley & Campbell, 2020; W. Smith et al., 2011). It negatively impacts their persistence in the program because it makes them feel as if that is all they are there for, which is to explain the black life experience (Abdelaziz et al., 2021; Gazley & Campbell, 2020; W. Smith et al., 2011).

Negative Advice

Besides being the voice to explain the black life experience, African American males experience another difficulty that involves being advised to use their race as a gateway toward retrieving resources (Jones et al., 2013; McClain et al., 2016; Posselt, 2018). When scholarship

or internship opportunities become available, African American male students have been encouraged to use their race as an advantage to secure receiving what they have applied for (Jones et al., 2013; McClain et al., 2016; Posselt, 2018). Being advised this way has affected these students in at least two ways. First, it has made those students feel that their intellect and academic abilities need to be improved to qualify (Jones et al., 2013; McClain et al., 2016; Posselt, 2018) for specific opportunities. Secondly, this type of guidance has caused the students' psychological state to turn negative. This results in students dropping out or transferring to another university (Jones et al., 2013; McClain et al., 2016; Posselt, 2018).

Challenges faced by female African American STEM doctoral students

This research section will examine a specific analysis of persistence issues that African American female doctoral students or graduates have experienced. African American females have added to the STEM society in many ways. However, because of many challenges, they continue to be underrepresented in STEM field doctoral-level programs and the workforce. Just like African American men, African American women have had their share of challenges. These challenges include STEM career inclusion (Chelberg & Bosman, 2019; Kemp et al., 2021), educational training (Hlinka, 2017; Lancaster & Xu, 2017; Park-Taylor et al., 2022), faculty-student relationships and interactions (Park et al., 2019; Ruud et al., 2016; B. Spencer, 2021), microaggressions (Lee et al., 2020; Mile et al., 2018), stereotype threat (C. M. Steele & Aronson, 1995), and sense of belonging (Johnson, 2012; Shavers & Moore, 2017). While some of these challenges may be similar between African males and females, their experiences differ, particularly for women.

STEM Career Inclusion

Importantly, there is a great need to establish a pool of professionals with a background in STEM education that will diversify the workforce and help sustain it with all the demands that continue to rise (Chelberg & Bosman, 2019; Kemp et al., 2021). In order to meet this demand, STEM education has to increase minority student participation (Chelberg & Bosman, 2019; Kemp et al., 2021). Even with trying to increase minority student enrollment in STEM education, African American females are among those who are underrepresented in every area of STEM (Kemp et al., 2021; Kricorian et al., 2020; Richardson et al., 2019). In the past, white individuals had the most significant presence in the workforce with jobs from a STEM background (Kemp et al., 2021; Kricorian et al., 2020; Meador, 2018). 2017 about 70% of whites had careers as scientists or engineers (National Science Foundation, 2017). African Americans represented only 7.7% of those careers (National Science Foundation, 2017). This dramatic difference sparked research concerning the gaps in higher education that have created such a vast difference in science and engineering career holders by ethnicity (Kemp et al., 2021; Kricorian et al., 2020; Richardson et al., 2019; Riegle-Crumb et al., 2019).

Educational Training

Regarding educational training, many African American students who have chosen to pursue a STEM degree need to be adequately prepared for the rigor of STEM programs. The inability to navigate through the rigor plays a factor in high attrition rates with this population of students (Hlinka, 2017; Lancaster & Xu, 2017; Park-Taylor et al., 2022). However, being inadequately prepared to meet the academic demands of a STEM degree program (Hlinka, 2017; Lancaster & Xu, 2017; Park-Taylor et al., 2022) has been viewed more as a personal issue rather than an institutional issue (Farmer et al., 2016). In high school, rigorous courses help prepare

students for what lies ahead within the higher education curriculum (Bicer et al., 2020; Park-Taylor et al., 2022). When students need more preparation, it makes enduring these classes more challenging (Bicer et al., 2020; Park-Taylor et al., 2022). Some will need more math, reading, and critical thinking skills, which are crucial while taking college courses (Bicer et al., 2020; Park-Taylor et al., 2022). A satisfactory amount of this knowledge can benefit the student's academic performance (Park-Taylor et al., 2022). Depending on the pathway minority students choose, this inadequate preparation can lead to changing majors or dropping out (Bicer et al., 2020; Park-Taylor et al., 2022). As far as African American females are concerned, they are often encouraged to go in a direction that does not involve STEM because of their lack of preparedness (Green et al., 2019; Wilkins-Yel et al., 2022). They are encouraged to seek a college-level social work degree or education instead (Green et al., 2019; Wilkins-Yel et al., 2022). Once these same students enter college and choose STEM instead, they find it challenging to navigate because they need to be adequately prepared (Green et al., 2019; Wilkins-Yel et al., 2022).

Faculty-Student Relationships and Interactions

Regarding minority students, STEM faculty interaction is not always the most optimal experience (Park et al., 2019; B. Spencer, 2021). African American female doctoral students have had less than high-quality advising experiences (Park et al., 2019; Ruud et al., 2016). They give this rating because they feel their relationships with faculty members or advisors have been unharmonious, adverse, and sometimes verbally offensive (Park et al., 2019; Ruud et al., 2016; B. Spencer, 2021). Conditions such as these make it difficult for students to connect with faculty members. When presented with relationships characterized as such, students will feel their academic career is optional to the individual guiding them. To them, their next best option would

be to leave or transfer (B. Spencer, 2021). Tinto's (1975) theory expressed the importance that for a student to be successful and remain at an institution, the student must commit in one way or another. With that commitment, the student would be almost able to remain (B. Spencer, 2021; Tinto, 1975).

STEM programs are rigorous in which students find stability, support, and guidance through quality faculty relationships (Acosta et al., 2016; B. Spencer, 2021). African American female doctoral students in these programs have yet to secure these bonds successfully. Instead, they felt isolated and lacked support (Horsford et al., 2018; Park et al., 2019; B. Spencer, 2021). Lacking support and feeling isolated would contribute to these students departing their STEM programs. Tinto (1987) described institutional departure in cases like these as being due to the lack of support. Tinto (1987) explained that this barrier can cause students to lose motivation to persist through the program and transfer or leave altogether. Faculty support has a significant role in students continuing through the degree programs through various forms, such as counseling and mentoring (Tinto & Pusser, 2006). These forms of support give students a chance to stay connected to the university and less of an opportunity to isolate themselves (Tinto & Pusser, 2006).

Microaggressions

Another challenge African American female doctoral students face is repeated racial microaggressions (Lee et al., 2020; Mile et al., 2018). These racial microaggressions are a result of Black students being stereotyped. Racial stereotypes come from what is thought about a group of people within a particular race (Lee et al., 2020; Mile et al., 2018). This results in the targeted race being treated differently based on those assumptions (Mile et al., 2018). It also attacks their academic performance abilities. Some African American female students will fall prey to racial

microaggressions (Burt, McKen, et al., 2019; Lee et al., 2020; Mile et al., 2018; B. Spencer, 2021; C. M. Steele & Aronson, 1995). It sometimes affects their well-being and intellectual abilities (C. M. Steele & Aronson, 1995). Some students may leave the institution for better conditions at a Historically Black College or University (HBCU). At HBCUs, this demographic of students gets more support from peers and faculty (Lancaster & Xu, 2017). Others may leave the higher education system altogether (Tinto, 1987).

Stereotype Threat

Besides microaggressions, stereotype threat is another barrier that has plagued African American female doctoral students. It was introduced by psychologist researchers C. M. Steele and Aronson (1995), who hypothesized that when African American students are subjected to tasks that deal with intellect, there is an overwhelming chance they may perform poorly. Stereotype threat is the state in which there is a negative stereotype about a person's group, and he or she is worried about being judged or treated adversely because of this stereotype (Block et al., 2019; Cromley et al., 2013; S. Spencer et al., 2016). Stereotype threat affects how minorities view themselves, which leads to poorer academic and intellectual performance (American Psychological Association, 2020). They will base their performance on how others perceive their ability negatively (Block et al., 2019; C. M. Steele & Aronson, 1995). African American female students have fallen prey to this thinking, particularly those in STEM programs at predominantly white institutions (Block et al., 2019; C. M. Steele & Aronson, 1995).

Consequently, African American female students are a minority within a minority at predominantly white institutions. That can make them feel as if they have to work harder to prove they have the academic abilities to maintain a STEM program at a doctoral level (Block et al., 2019; C. M. Steele & Aronson, 1995). However, they may sometimes allow the negative

stereotypical perceptions of their culture to detour them from performing at their best (Block et al., 2019; C. M. Steele & Aronson, 1995). That can affect their critical thinking skills, collaboration efforts, and academic performance overall. A negative perspective of themselves and their abilities can eventually lead to dropping out or transferring from the institution (Block et al., 2019; C. M. Steele & Aronson, 1995).

Altogether, stereotype threat puts pressure on minority groups. That pressure can become overwhelming (Block et al., 2019; C. M. Steele & Aronson, 1995). It can lead to extreme difficulties while completing post-graduate degree programs (Block et al., 2019; Cromley et al., 2013; S. Spencer et al., 2016). Specifically, this pressure can weaken the students' academic performance through their level of effort and information retention (Block et al., 2019; Cromley et al., 2013; S. Spencer et al., 2016). When there are negative assumptions about any ethnic group that are widely known, it presents the opportunity for an individual or several of that ethnic group to constantly become a threat to themselves by indirectly conforming to the negativity that is thought of them.

Given these points, it is essential to note that further research into stereotype threat has seen significant advances in African American students (Baker et al., 2020; Warne, 2022; Whaley, 2018). According to Whaley (2018), stereotype threat has less of an impact on prohibiting the academic success of African American students. He explains that other areas must be considered more closely when examining the barriers to success (Whaley, 2018). These factors include school racial climate and faculty diversity (Baker et al., 2020; Warne, 2022; Whaley, 2018). These could significantly impact the achievement gap, persistence, and success rates between African American students and their White counterparts and complex challenges to overcome during post-graduate studies (Baker et al., 2020; Warne, 2022; Whaley, 2018).

Sense of Belonging

Returning to specific challenges African American women students face, they have also had to endure adversities that made them feel alone and disconnected (Johnson, 2012; Shavers & Moore, 2017). Many African American female doctoral students have reported these feelings onset once they enter the doctoral level (Shavers & Moore, 2017). They may experience heightened racism, sexism, and discrimination (Banks & Dohy, 2019; Chelberg & Bosman, 2019; McGee & Bentley, 2017). These experiences can result in those students feeling a campus climate that, for them, is frigid, lacks support, and does not desire their presence (Johnson, 2012; Trent et al., 2020). Their sense of belonging becomes negatively impacted by these adverse conditions. It interferes with their academic performance and causes them to lose their drive and passion for persisting in the degree program (Apriceno et al., 2020; Fisher et al., 2019). As in Tinto's student departure theory, a loss of connection with the school, be it socially or academically, can cause a student to depart (Tinto, 1975). Therefore, college professors, administrators, and faculty must help to find ways to ensure that African American female doctoral students are integrated into the institutional family and their STEM programs (Guiffrida, 2004; Johnson, 2012).

Supports for African American doctoral STEM students

Although much research has unveiled barriers in doctoral studies for African American students, research exists that uncovers pathways to success amid adverse conditions (Dekelaita-Mullet et al., 2021; Lancaster & Xu, 2017; Trent et al., 2020; Watkins & Mensah, 2019; Xerri et al., 2018). The following are research-based strategies or initiatives that have had some success. It is essential to know that the strategies mentioned are general resources. Many are not specific to African American male or female doctoral-level students. They are for both African men and

women. While the measures can be applied to these students, little research explicitly explains the successful effects on that demographic of students.

Student Engagement

Student engagement is a method that has been researched as a way of successfully helping students overcome barriers during their studies (Xerri et al., 2018). Specific student engagement methods have positively impacted student retention (Xerri et al., 2018). Engaging with other students and professors helps develop a sense of purpose for studying for a higher education degree (Xerri et al., 2018). However, much of that research on student engagement did not identify African American post-graduate students among the participant pool (Xerri et al., 2018). That makes implications difficult for that group of students when gauging whether or not engaging in the relationships mentioned is a means to help persevere through a post-graduate degree program.

Peer and Other Support Systems

Secondly, peer support has been recognized as substantially impacting African American students' success (Dekelaita-Mullet et al., 2021; Lancaster & Xu, 2017; Watkins & Mensah, 2019). Students found it essential to establish connections with classmates early on (Dekelaita-Mullet et al., 2021; Lancaster & Xu, 2017; Watkins & Mensah, 2019). Collaboration with these peers is an educational benefit and helps solidify their sense of belonging (Dekelaita-Mullet et al., 2021; Lancaster & Xu, 2017; Watkins & Mensah, 2019). Support from advisors, mentors, and family has also contributed to African American doctoral students persisting through their STEM programs (Dekelaita-Mullet et al., 2021; Lancaster & Xu, 2017; Watkins & Mensah, 2019). It is also noted that some have flourished because of their significant other (Dekelaita-Mullet et al., 2021; Lancaster & Xu, 2017; Watkins & Mensah, 2019). These students have been

able to pursue their degree programs while their significant other has put their goals on hold to support them (Dekelaita-Mullet et al., 2021; Lancaster & Xu, 2017; Watkins & Mensah, 2019).

Mentoring

Next, mentoring has been researched as a beneficial initiative that helps minority students persist through degree programs (Brunsma et al., 2017; Grant & Simmons, 2008; Sanczyk et al., 2021). Doctoral students are said to be among the ones who benefit the most because the journey at the level can be unpredictable (Brunsma et al., 2017; Grant & Simmons, 2008; Sanczyk et al., 2021). Navigating academics at the doctoral level is an unknown experience to many students who reach that level. Having a good mentor to help charter those waters can be an excellent gauge of student success (Brunsma et al., 2017; Grant & Simmons, 2008; Sanczyk et al., 2021). However, African American female doctoral students are among the few who benefit from mentoring because they cannot connect with their mentors (Grant & Simmons, 2008). This inability is because of cultural differences (Grant & Simmons, 2008). Often, these students attend institutions where the faculty looks different. Therefore, the students feel the faculty, including mentors, would only understand them if they were different.

African American female doctoral students also have more trust issues than African American males regarding faculty/mentors of the opposite race (Brown & Grothaus, 2019; Sanczyk et al., 2021). The mistrust these students have stemmed from acts of racism (Brown & Grothaus, 2019; Sanczyk et al., 2021) and the superior attitudes the students have experienced from the majority race (Sanczyk et al., 2021). The continued acts of oppression and the slave period also contributed to the lack of trust (Brown & Grothaus, 2019; Sanczyk et al., 2021). These reasons give some African American students no desire to build relationships with mentors outside their race (Brown & Grothaus, 2019; Sanczyk et al., 2021). With no help to

charter the doctoral waters, it is almost impossible to navigate alone. African American students will find themselves at a crossroads of deciding to continue the best they can or leave altogether. While mentoring may positively impact some, institutions need to ensure that this effect reaches the masses of their students.

Suggested Research-Based Resources

While much research can be found to support issues that impede the persistence of African American doctoral students in STEM, there are some helpful research-based resources as well. As mentioned before, mentoring and peer support networks are starting places. When a mentor, such as a faculty member, has committed to the academic success of a minority student, and the student knows that the commitment is genuine, the likelihood of retention will soar (Sanczyk et al., 2021). The mentor does not necessarily have to be of the same ethnic background but must show a genuine vested interest in the student's success (Sanczyk et al., 2021). Mentoring activities can help establish a bond and trust collaboration beyond the surface level (Sanczyk et al., 2021; Wolfe & Riggs, 2017). The benefit of having mentoring opportunities will support minority students in finishing the degree program and pursuing a career.

Peer support networks help to engage minority students and thwart them from feeling isolated or unsupported (Wolfe & Riggs, 2017). Mentoring, whether by faculty or peers, has benefits for minority students that will help retention rates soar. First, mentorship will help relieve social pressures associated with college (Lisberg & Woods, 2018). Next, it softens the transition into the academic community (Lisberg & Woods, 2018). Finally, it provides an environment to address challenges associated with being a minority student and promote coping skills and resiliency (Lisberg & Woods, 2018).

Protégé Effect

Finally, when discussing strategies and resources, the protégé effect is another helpful strategy for improving minority retention rates. The Protégé Effect can take on the meaning of one individual teaching another while both are learning at the same time (Gates, 2019; Ma et al., 2020; Mondisa & Adams, 2022). In some aspects, this technique aims to introduce underrepresented minority high school students to the field of science (Gates, 2019; Ma et al., 2020; Mondisa & Adams, 2022). The process has proved to be successful in some areas. For example, some university students who served as mentors were compelled to complete their own STEM program to serve as an example to those they recruited or became long-term mentors (Gates, 2019; Ma et al., 2020; Mondisa & Adams, 2022). They took on the responsibility to show those with the same background that they, too, can achieve in the geoscience program as long as they put their mind to it (Gates, 2019; Ma et al., 2020; Mondisa & Adams, 2022). Here is where the protégé inspired the already existing students to complete their degree path and not fall into the woes of retention.

Student Integration

Overall, the theory of student departure explains how there can be various reasons why students may not finish their program (Ruud et al., 2016; Tinto, 1975). However, finding those ways of success in research for minority students, such as African Americans, can be difficult. Issues with maintaining an approved academic standing, temporary leave of absence, or transferring to another institution (Tinto, 1975; Tinto & Cullen, 1973) are just a few of the reasons why students leave. Another reason addresses cultural differences. The ways of the African American culture often do not align with those of their Caucasian classmates (Tinto,

1993). These differences can sometimes lead to African American students being unable to fully integrate into higher education institutions, academically or socially (Tinto, 1993).

However, Tinto (1975) explained how integration into higher education can reverse these conditions. How well a student can participate in or integrate into the school system's academic and social arenas directly impacts how well they can persist through their college education or leave altogether (Tinto, 1975; Zomer, 2007). Personal goal commitments, perspectives, and beliefs, coupled with the institution's structure and how well the students integrate, determine factors that lead to persistence or departure (Tinto, 1975; Zomer, 2007). Measuring students' commitment helps determine their degree program progression (Tinto, 1975; Zomer, 2007). For instance, students' academic integration can be measured by their commitment to their academics and their level of motivation (Tinto, 1975; Zomer, 2007). The more committed the student is to completing their degree program, the higher the chances they will do so (Tinto, 1975; Zomer, 2007).

On the other hand, if the student has low motivation toward degree completion, the chances of finishing are improbable (Tinto, 1975; Tinto & Cullen, 1973). Low motivation can occur when students feel that more important things can be done to improve their lives than college (Tinto, 1975). Students may think that the time and money spent on a college education may pale compared to securing other means of life security (Tinto, 1975).

Another way to integrate into the higher education setting is through social integration. Social integration is met when students can informally or formally connect with organizations, activities, peers, or faculty (Tinto, 1975). These connections, be one or many, directly impact a student's commitment toward degree completion (Tinto, 1975). As students apply to college, they enter with pre-determined goals (Lakhal et al., 2020; Tinto, 1975). These goals are either

strengthened, revised, or weakened by how much the student has integrated socially (Lakhal et al., 2020; Tinto, 1975). If integrating into the social aspect of college has been completed successfully, students can glean from the support that comes with those connections (Tinto, 1975). Therefore, that support strengthens a student's desire to complete their degree because it gives hope that someone can help them (Tinto, 1975).

Furthermore, the model of student persistence explains how student integration can impact how well a student will persist or discontinue (Tinto, 1975; Tinto & Cullen, 1973). Students will enter higher education institutions with pre-determined goals based on environmental factors (Tinto, 1975; Tinto & Cullen, 1973). These factors include but are not limited to "race, sex, ability, grade-point averages, and family backgrounds" (Tinto, 1975, p. 94). Although students may come in with these factors, as they adjust to their new academic setting, their goals are adjusted, and they revise their commitments (Tinto, 1975; Tinto & Cullen, 1973). These adjustments correlate with academic and social integration (Tinto, 1975; Tinto & Cullen, 1973). The more students can integrate, the more likely they will finish their degree (Tinto, 1975). On the other hand, the less integrated a student is, the more likely they will transfer or leave school altogether (Tinto, 1975).

Summary

The beginning of this study on the persistence of African American current doctoral students and graduates in STEM programs included a thorough literature research that already existed that surrounds this phenomenon. Studies have been completed to identify specific challenges and ways of persistence that have impacted the performance of minority students in post-graduate degree programs. However, there is still a need to research this area further when it relates explicitly to African Americans. The reviewed studies provided successful ways to

combat the challenges, but many of those were used sparingly. That posed a need for more data to review to determine if those successes worked long-term or just for that specified time frame. The studies were also completed on more minor scales, which made it difficult to determine if those strategies would work for African American post-graduate students across more regions. With these missing pieces, it is imperative to continue this research to come to a solid conclusion about what will benefit African American doctoral students persisting through STEM degree programs.

Tinto's theory of student departure, with a focus on the model of student persistence, was used to help explain what helps students complete their degree programs and what hinders them. Tinto described the necessity of students having an academic or social connection to their institution to persist. When this connection is in place, it can help the student's degree completion. Research has also identified specific challenges, such as a lack of support and microaggressions (Mile et al., 2018). On the other hand, there have been successes, including student engagement, retention efforts, support groups, and mentorship. While these efforts have proven beneficial for those for whom the study was conducted, some limitations must be considered. Some successes were not specific to African Americans but to general students. Therefore, whether those strategies would work for African American students is still being determined. Other limitations were the widespread usage of the successes and the timeframe in which they were conducted. These studies were isolated and only used across a few regions. That lack of usage makes it difficult to determine if it works for one or if it will work for all. The time frame in some of the studies lasted only a semester and was not repetitive. Continuous usage would have given data to review the strategies for improvement or note what is working well. The lack of this information impacts the need to continue research to ensure that African

American doctoral degree-seeking students heighten their academic performance through successful persistence. Empirically, the continuation of this research will add to the scarce literature available in this area. Higher education institutional leaders will gain insight into strengthening and developing persistence for resources for these students. African American doctoral students will glean new perspectives to help motivate and encourage them to press through the STEM program.

CHAPTER THREE: METHODS

Overview

The nature of this research is to describe the persistence of African American doctoral students in STEM programs as well as graduates. This chapter expounds on the methodology of this research study which is a qualitative phenomenological approach. The chapter then gives meaning concerning interpretive frameworks that serve as foundational beliefs. The chapter goes on to provide permissions needed to collect the data. A description of the recruitment plan for participants is given. Next the chapter details the data collection and analysis processes. Finally, the chapter ends by presenting the trustworthiness.

Research Design

A qualitative research approach with a phenomenological design is used to explain how African Americans persist through a doctoral-level STEM degree program. A qualitative method allows the researcher to study African American doctoral students directly to explore and understand what helps them to complete their STEM doctoral degree. This approach allows African American postgraduate students to expound on various persistence methods that have enabled them to maintain and achieve academic success in STEM fields (Creswell & Poth, 2018). The information collected from this study helps to build upon the scarce literature in this area (Scherer et al., 2017). Prior research has been conducted about what causes minority student attrition (Artiles & Matusovich, 2020; Maher et al., 2020; Proctor & Truscott, 2012), but little exist about what helps them to persist (Scherer et al., 2017).

Taking a phenomenological design within this qualitative approach describes what persistence methods African American doctoral students report to be beneficial in completing a STEM degree (Creswell & Guetterman, 2018). Phenomenology allows individuals to express

first-hand accounts of lived experiences of a phenomenon (Neubauer et al., 2019). In order to glean those in-depth accounts, this phenomenological research process completes the major components embedded in this type of design. Those significant components include having a solid topic with aligned research questions, completing an extensive literature review concerning the phenomenon, securing participants or co-researchers, having a thorough data collection and analysis plan, and following ethical standards with high regard (Moustakas, 1994).

This phenomenology design also incorporates a transcendental approach. This method relies on the perspectives of the participants rather than the researcher (Creswell & Poth, 2018). Researchers make room for these perspectives by removing themselves from any biases or personal thoughts toward the phenomenon (Moustakas, 1994). In this manner, researchers will be tasked with only describing the phenomenon by what information they are given (Moustakas, 1994). That allows the participants in the study to describe their challenges and successes in complete detail, free from researcher interference (Moustakas, 1994).

Following a transcendental research approach lets experiences of a particular phenomenon be shared by those who lived it to analyze those experiences for further clarity and understanding while adding to the body of research (Moustakas, 1994). In this case, persistent efforts by African American doctoral students was analyzed. Those findings are expected to aid higher education institution administrators in better understanding the persistence of minority students on the doctoral level in STEM programs. It is also expected that the findings will also give minority students strategies of persistence that may benefit them. The transcendental research process helps to uncover that information on persistence to possibly transform minority students' academic pathways towards success through reflection of their progress based on the lived experiences of others (Moustakas, 1994). The goal of this research method is to "determine

what an experience means for the persons who have had the experience" through detailed descriptions that produce "general or universal meanings" (Moustakas, 1994, p. 13).

In contrast, a quantitative method would not work for this research. A quantitative approach does not include the opportunity to gather data from participants that describe their actual lived experiences (Creswell & Guetterman, 2018). Quantitative methods involve research that collects data through "statistics and numerical descriptions" (Creswell & Guetterman, 2018). While this information is beneficial for quantitative research, gathering first-hand information from the actual participants rather than relying on numerical data would give more insight into what helps African American doctoral students complete their STEM programs.

Research Questions

Higher education administrators may be aware of African American doctoral students' challenges while pursuing a degree in STEM education. African American students are aware of the challenges they face, as well as other minority students. However, either side may need to learn what helps the other persist. Awareness of persistent actions can be beneficial for higher education administrators and students. This information can help ensure the highest level of academic excellence.

Central Research Question

What lived experiences have helped African American current doctoral students or graduates persist in a STEM program?

Sub-Question One

What challenges have African American current doctoral students or graduates experienced while completing a STEM degree program?

Sub-Question Two

What strategies or retention efforts have been offered by higher education institutions that benefit African American doctoral students to persist through to degree completion?

Sub-Question Three

What personal efforts have African American doctoral students or graduates experienced that helped them persist?

Setting and Participants

In this section, a description of the setting where the research was conducted is given. This description includes the anticipated location of the higher education institutions and the leadership structure of it. However, the actual setting is online and reasoning for this choice is given. The online setting location is distinctive because the access it gives to diverse participants (Franz et al., 2019). The participant pool and how they were secured is provided as well.

Setting

In the beginning, the locations for this study were anticipated to be a higher education institution that is recognized as historically black college/university (HBCU). Initially, an HBCU was chosen because HBCUs "have unique structures that could foster a more supportive environment for STEM students" (Toldson, 2018, p. 97). The leadership structure of HBCUs include a Board of Trustees, a Chancellor, a Faculty Senate, a Staff Senate, and a Student Government Association (SGA). While the Chancellor is the top leader of these institutions, the Board of Trustees serves as advisors to the Chancellor and advisors to the Board of Governors concerning matters pertaining to the HBCU. From another perspective, the campus climate at HBCUs has also been researched as a contributing factor to why minority students are not persisting within STEM programs (Toldson, 2018). It was projected the data that would have

been gathered from minority students at these institutions would help improve the area of research in identifying what works to help African American doctoral students persist through their programs.

However, an HBCU was not the site used for this study. Instead, the site used to recruit participants was an online social media platform. The change in site was due to participants not being easily accessible for recruitment. Online social media platforms have an advantage in providing the opportunity to recruit and secure specific ethnicities for research purposes (Franz et al., 2019). Although the online social media platform in not a brick and mortar site, the participants have the same shared experiences in one way or another. Therefore, the information obtained was not skewed (Creswell & Poth, 2018).

Participants

The number of participants for this research study is 10. However, more than 10 were sought out to participate. The participants had to meet certain criteria such as being an African American doctoral-level STEM student completing a doctoral-level degree in STEM. Participants could also be African American students who graduated from a doctoral-level STEM program. Some participants have started their higher education career immediately after high school graduation and continued through the doctoral program. On the other hand, some participants are considered non-traditional because of when they began college studies, later in life.

Recruitment Plan

The sample pool were African American doctoral students in STEM programs. This pool of participants was chosen because researchers say that this demographic of students is underrepresented in STEM areas (McGee & Bentley, 2017). The reason is linked to the

experiences of African Americans while in these programs (McGee & Bentley, 2017). The sample size was anticipated to be at least 15. For this particular study 10 participants was secured. This sample size is chosen to achieve saturation (Hennink et al., 2017). Saturation is achieved when "there is adequate data from a study to develop a robust and valid understanding of the study phenomenon" (Hennink & Kaiser, 2019, par 1). Beginning with the 10 participants allowed seeing if the data analysis continued to reveal new themes/code descriptions or if the data was beginning to look the same (Saunders et al., 2018). If the data analysis did not reveal any new information, then saturation had occurred, and there was no need to exceed the existing number of participants (Saunders et al., 2018).

The participants were mainly secured by the snowball sampling method. Snowball sampling is a type of purposeful sampling (Creswell & Guetterman, 2018). The method is chosen because the sample pool is not readily accessible (Ghaljaie et al., 2017). To use this method, the researcher invited potential participants to participate in the study (Creswell & Guetterman, 2018). The participants were recruited through a recruitment flyer posted on a social media platform (see Appendix F). As they responded, I sent them an email (see Appendix C) with detailed information about the study as well as a consent form to participate (see Appendix B). From there, the researcher inquired if the participants know others that fit the criteria and are willing to participate (Parker et al., 2019).

Researcher's Positionality

Conducting research of my own, I have discovered a plethora of information regarding why African American students leave the higher education system before completing a degree. What needs to be added to the literature are specific goals, strategies, interventions, or retention efforts that higher education institutions can implement to help increase the graduation rates of

African American students. I am an African American doctoral student that has persevered through many obstacles to continue toward success in my academic career. However, I realize that what helped me to persevere may not be what works for another. It will benefit higher education officials to be aware of multiple ways to help this particular student demographic reach their highest potential.

My role in this study was to serve as the main "primary research instrument" (Erlandson et al., 1993, p.16). Serving as such comes with no relationship to the participants or the setting. I will be responsible for collecting the data interactively through the interview and artifact methods (Erlandson et al., 1993). I am also responsible for analyzing the data to apply a descriptive meaning (Erlandson et al., 1993; Moustakas, 1994). I will continue to revise those descriptive meanings as new data is collected through various methods (Erlandson et al., 1993).

Interpretive Framework

Interpretive frameworks are the foundational beliefs that guide action (Creswell & Poth, 2018). Within those frameworks are philosophical assumptions that are embedded within the framework. This study uses the transformative framework as the lens through which the research will be conducted (Creswell & Poth, 2018). A transformative framework proposes using the knowledge gleaned to aid people in improving society (Creswell & Poth, 2018, p.25). The framework allows information to not only be added to the literature but also use that information to help make academic achievement better for African American doctoral STEM students.

Philosophical Assumptions

The assumptions for this study are ontological, epistemological, and axiological. Ontological assumptions embrace multiple perspectives of reality (Creswell & Poth, 2018). Epistemological assumptions have researchers as close to the study as possible, creating higher

levels of understanding of the participant's views (Creswell & Poth, 2018). Axiological assumptions occur by the researcher "making their values known within the study" (Creswell & Poth, 2018, p. 21). All three assumptions are found throughout this research.

Ontological Assumption

According to Creswell and Poth (2018), the perspective of reality can be seen in many different ways. Therefore, an ontological assumption "relates to the nature of reality and its characteristics" (Creswell & Poth, 2018, p. 20). The reality of persistence is revealed through the multiple perspectives of the participants in this study. From each one, their reality of what persistence is, through their experiences, is reported. As the data is collected on these perspectives, the study discovers if there is a central reality or more than one when it deals with minority students' ways of persistence.

Epistemological Assumption

It is essential that throughout the research process, the researcher "stay as close as possible to the participants being studied" (Creswell & Poth, 2018, p.21) in order to get the best quality of first-hand information. Having this connection enables the researcher to use specific quoted evidence from actual individuals living the experience or have experienced it (Creswell & Poth, 2018). African American doctoral students and graduates can tell their stories of challenges and successes better than anyone else because they live or live it. The closer the researcher is, the better the understanding will be on the researcher's part. Interviews, focus groups, and artifact presentations will be how I stay closely connected to the research.

Axiological Assumption

My position in this research is that I have shared experiences with the participants. I am an African American female doctoral student and have experienced challenges and successes. I

have taken the time to evaluate my progress academically, and I have done well thus far. However, at the same time, it makes me wonder what has hindered others, such as myself, from getting as far as I have. I also wonder if there are any successful programs or strategies that will help those that seem to have no direction at the doctoral level of academics. I have always relied on my faith in God to see me through every endeavor, including my education. It is just that simple for me to trust in God. However, I realize that is only the case for some. This research helped answer those questions and give perspectives of first-hand accounts that will inform institutions on what works for African American female doctoral students.

Researcher's Role

As the researcher for this study, I have no personal or work relationship with any participants. I am in no position of authority over any of the participants. Although a snowball sampling method was used to secure the participants, the initial participants was recommended to me through an online social media platform. My goal was to secure the first participant from the recommendation of a former colleague who recently obtained a doctoral degree in education. However, the participants were secured through the online social media platform. All participants willingly agreed to participate, even though that was determined during our first-time meeting. I am an alumnus of one of the HBCUs that one of the participants attended but I am a doctoral student at a separate university from all participants.

Because I am an African American female doctoral student, I assumed that some of the challenges and successes the participants faced are the same that I have. More specifically, as the participants reported what helped them to be persist, there reports posed the risk that I may have differing views on what the participants feel are persistence strategies. Therefore, it was important for me to maintain an unbiased perspective to maintain the data's integrity. My most

important role in this research study was serving as the main data collection instrument (Pezalla et al., 2012).

Procedures

The first step in this research procedural section was to obtain approval from the Institutional Review Board (IRB) (see Appendix A). After the IRB approval, the recruitment process began. A recruitment flyer (see Appendix F) was posted on a public social media platform that did not require permission to join in order to post. After two participants were secured, the remaining participants were secured through a purposeful sampling method such as snowball sampling. Snowball sampling was incorporated because the researcher needed to know the exact number of participants to ask to participate. After the study began, snowball sampling allowed the researcher to ask participants for recommendations of others willing to participate (Creswell & Guetterman, 2018).

A preliminary email was sent to all anticipated candidates to provide a general idea of the research and the petitioning of their willingness to participate by electronically signing a consent form (see Appendix B). The data collection process began after the consent forms were obtained. The data collection techniques were individual interviews, focus groups, and journal prompts. During the initial interviews, participants were first interviewed virtually one-on-one. Questions were prepared before the interview and changed as the interview goes along (Moustakas, 1994). The interviews were recorded so that each conversation can be transcribed. After the initial interviews, focus groups were implemented to gain deeper insight into the similarities and differences in participant perspectives. These sessions were recorded as well for transcription purposes. Lastly, journal prompts were given to participants to answer specific questions. After

gathering all the information from the various collection methods, the researcher moved into sorting, coding, and analyzing the data for final analysis.

Data Collection Plan

The data collection involved individual interviews, focus groups, and journal prompts. The first was individual interviews to establish a rapport with the participants and gain first-hand perspectives. Next, focus groups were conducted in order to have participants share their experiences to allow the researcher to gain a shared understanding (Creswell & Guetterman, 2018). These groups consisted of four to six participants at a time. The completion of four journal prompts followed the focus groups. Lastly, the journal prompts were shared electronically, and participants were given 10-15 minutes to complete each. Completing the journal prompts showed similarities and differences between participant perspectives.

Individual Interviews

The first data collection method was individual interviews. Out of the variety of data collection methods available, Moustakas (1994) expounds on how one-on-one interviews provide a plethora of in-depth information when conducting phenomenological research. The one-on-one interviews are informal conversations. These conversations are between the researcher and the participant (Moustakas, 1994). This method was chosen to get first-hand accounts of successful persistence methods for African American doctoral students based on their perspectives.

The researcher initiates the conversation using open-ended questions (Moustakas, 1994). Many times, the researcher will have the questions prepared in advance; however, as the conversation goes on, those questions may be altered or not used depending on the comments and discussion of the participant (Moustakas, 1994). It is crucial that during the interview

process, the researcher ensures that the environment is welcoming and comfortable for the participant (Moustakas, 1994). When conducting the interviews, the participants are expected to be honest and thorough. In order to master this, the more comfortable the participant feels, the more comfortable they will feel sharing their honest experiences (Moustakas, 1994).

The researcher conducted the interviews through online platforms such as WebEx, Microsoft Teams, or Google Meet. These methods allowed the interviews to be recorded for transcription to take place later. Although the interviews were transcribed, the researcher also took down notes throughout the interviewing process. The actual timing of the interviews was based on predetermined days and times set by the researcher and the participant together. The researcher collected all of the information given during the interview times.

Table 1

Individual Interview Questions

1. Let us begin with you sharing your educational background up to this point. CRQ
2. What made you decide to enter a STEM field program? CRQ
3. How did you prepare for higher education STEM courses? CRQ
4. If so, explain that process and how you think it correlates with your program. CRQ
5. What are your future career aspirations once you finish your program?
6. What challenges have you faced since being in a STEM program at the doctoral level? SQ1
7. Which of those challenges did you find most difficult and why? SQ1
8. How would you describe the structure or process of any services the institution offers for these challenges? SQ2
9. Considering the challenges you have mentioned, what motivates you to continue? SQ2
10. What successful routines, strategies, or programs have your institution offered to help you

persist? SQ2

11. Which successful routines, strategies, or programs do you find most valuable and why? SQ2
12. What are some personal routines or strategies that you feel are most beneficial to your persistence? SQ3
13. What else would you like to add to our conversation to help enlighten others' understanding of what it takes for an African American doctoral student to succeed in a STEM program? SQ3

These questions are related directly to the research questions. The questions begin by exploring the motivations for these participants to enter the STEM field. The questions then lead to the specific challenges that the students may have faced. The answers to these questions help establish a foundation for why African American doctoral students struggle to complete a STEM degree program. As the questions continue, perspectives will be given from the participants that tell how they work through those obstacles to persist to the end.

Individual Interview Data Analysis Plan

From the beginning of the data analysis for the individual interviews, the researcher went through the process of Epoché. The Epoché process allows the researcher to free their mind of any thoughts that will detour their interpretation of the data collected (Moustakas, 1994). This mindset helps the researcher have a clear conscience (Moustakas, 1994). It also allows the data to have biased free value (Moustakas, 1994). The Epoché process removes any personal connections that can change the actual state of the data (Moustakas, 1994).

The next step in this analysis was to transcribe each interview verbatim.
The individual interviews each received a pseudonym, and real names were not used. The individual interviews were transcribed to complete an emergent category designation (Erlandson

et al., 1993). According to Erlandson et al. (1993), this process involves taking all of the individual interview transcriptions and "sorting them into categories of ideas" (p.118).
In order to do so, each interview transcription set was be read over several times as described in phenomenological reduction (Moustakas, 1994). Phenomenological reduction is a process in which the data is read over multiple times, looking for layers of descriptions that link to the phenomena (Moustakas, 1994). Once the first set is read, it will be placed down to the first category (Erlandson et al., 1993). Each interview set continued to be read. Similar thoughts and perspectives were discovered over multiple reads, so similar sets were grouped (Erlandson et al., 1993). Multiple reads continued until all individual interview transcription sets were read.

It is essential to understand that while reading each interview set and sorting them into emerging categories, some fit and some did not fit into any preliminary categories (Erlandson et al., 1993). In this case, those individual interview sets were placed into a miscellaneous category (Erlandson et al., 1993). Being placed in a miscellaneous category does not mean that information is useless. However, it was reviewed throughout the data analysis for the other methods to see if a category could be created for it (Erlandson et al., 1993). If not, that data information was be used.

Next, the sets in groups with similar ideas and perspectives were each assigned a title or some other descriptive measure (Erlandson et al., 1993). Once this was completed, the process was repeated again. Each individual interview was read over to ensure that the information fits that particular category description (Erlandson et al., 1993). After which, each set of individual interview transcriptions was scanned into the computer. Each set of individual interview data was given the same pseudonym used in the transcription process for identity protection and organizational purposes. The data was also analyzed through the NVivo software. NVivo was

beneficial because "it is used for the analysis of unstructured text, audio, video, and image data, including (but not limited to) interviews, focus groups, surveys, social media, and journal articles" (Kent State University, 2021, par. 1).

Focus Groups

Focus groups were utilized "to collect a shared understanding from several individuals as well as to get views from specific people" (Creswell & Guetterman, 2018, p.218). The researcher asked preformed questions to a group of participants and gave time for them to respond. Because the participant pool was 10, the focus groups were broken into two groups of five that met separately. The focus group sessions were conducted through Microsoft Teams. Meeting online allowed the session to be recorded to transcribe later and look for themes.

Table 2

Focus Group Questions

1. What attributes/characteristics are essential to persist through a doctoral level STEM degree program as an African American, and explain the importance of those attributes/characteristics?
2. Think back over your time thus far in the STEM doctoral program. What have you personally experienced that could have negatively impacted your academic progress if you did not possess what it takes to persist?
3. How would you encourage another African American STEM doctoral student that struggles with persistence?
4. What would you say has been the influence of persistence for you?
5. Out of all you have been through or accomplished in the STEM program, what would be your most memorable moment that you know was impacted by your persistence?

The focus group questions helped validate the responses received from the individual interviews. A process of triangulation completed this validation. Triangulation allowed the interview information to be corroborated with the information from the focus groups (Creswell & Poth, 2018). It will also do the same for journal prompts (Creswell & Poth, 2018). The triangulation process assisted in confirming what challenges and successes are common among African American doctoral students.

Focus Group Data Analysis Plan

The first step in analyzing the focus group data was to find significant and relevant statements (Creswell & Poth, 2018; Moustakas, 1994). This process would be known as the "horizonalization of the data" (Creswell & Poth, 2018, p. 201). During this part of the analysis, the researcher gave each statement their unique but equal value (Moustakas, 1994).

After finding the significant statements, they were grouped into clusters (Moustakas, 1994). This grouping allowed the statements to reveal emerging themes or categories (Moustakas, 1994). As this was done, repetitious or overlapping statements were removed (Moustakas, 1994). The clusters moved into what is known as a textual description of the experience (Moustakas, 1994). This textual description is simply what the participants "experienced with the phenomenon" (Creswell & Poth, 2018, p. 201).

Next, structural descriptions of the experience were developed (Moustakas, 1994). In other words, the researcher described the experiences regarding where and when. Once the data was analyzed, enough information analyzed to write a "composite description of the phenomenon" (Creswell & Poth, 2018, p. 201). The textual and structural descriptions helped to define the phenomenon in terms of how the participants lived and experienced it (Moustakas,

1994). It clearly explained what and how participants experienced the phenomenon (Creswell & Poth, 2018).

The data from the focus groups was transcribed in the same manner as the individual interview notes. After the transcription, the focus group transcriptions were scanned and uploaded to the computer. The data then went through causation coding. Causation coding is "extracting attributions or causal beliefs from participant data about not just how but why particular outcomes came about" (Lungu, 2022, p. 234). Coding this information helped unveil what beliefs some African American doctoral students hold that impact their decisions to complete their STEM programs (Lungu, 2022).

Journal Prompts

Journal participants were given four journal prompt questions to answer.

1. What is the most difficult challenge that African American doctoral STEM students have to contend with during their time in a STEM program and why?
2. What will be the most effective method for retaining African Americans in STEM programs and why?
3. Would self-care help with persistence for African American STEM doctoral students? Why or why not?
4. How impactful can the family be toward an African American STEM doctoral student?

Participants were given these prompts through a Google Doc that the researcher shared with them. Each participant received their own copy, and only the researcher saw their responses.

Journal Prompts Data Analysis Plan

The journal prompt responses were analyzed through the same process as the individual interviews and focus group data. The researcher read each response multiple times (Moustakas,

1994). The researcher also annotated the responses looking for similar themes (Moustakas, 1994). Similar to the data analysis for the focus groups, the journal prompts analysis went through horizonalization (Creswell & Poth, 2018). Each theme was coded to see how well the prompts correlated with the other collected data forms.

Data Analysis

Although various methods were used to analyze the information, all the processes were combined to develop a description of persistence that leads to degree completion for African American STEM doctoral students. As each data collection was completed, the information gleaned helped uncover themes. Those themes came together as one unified method towards explaining persistence (Moustakas, 1994). Beginning this data synthesis process, the researcher analyzed each one-on-one interview transcription as a single unit of information with unique value (Lincoln & Guba, 1985; Moustakas, 1994).

After each interview unit was established, the search for similar perspectives began. The units were reread, grouped, or categorized based on their similarities (Lincoln & Guba, 1985). This part of the process allowed the researcher to see the emerging themes, similarities, and differences (Lincoln & Guba, 1985; Moustakas, 1994). In other words, the researcher began to connect the dots. As those dots were being connected, it was vital to purge any irrelevant information that gave no significance to the study (Lincoln & Guba, 1985; Moustakas, 1994). After the irrelevant information was removed, the data was clustered into thematic meanings that represent the central meaning of the lived experiences (Moustakas, 1994). Once this was completed, a cross-check was done to evaluate these themed groups against the transcripts from the interviews of the participants, the focus groups, and the journal prompts (Moustakas, 1994).

From there, each data collection was constructed for textural and structural descriptions (Moustakas, 1994).

Trustworthiness

Trustworthiness is expected in qualitative research. In order to achieve this through the research, the researcher should be able to show that "data analysis has been conducted in a precise, consistent, and exhaustive manner through recording, systematizing, and disclosing the methods of analysis with enough detail to enable the reader to determine whether the process is credible" (Nowell et al., 2017, p. 1). This study reached trustworthiness through credibility, transferability, confirmability, and dependability (Lincoln & Guba, 1985).

Credibility

Credibility was established when the data collected for the research has been proven to be accurate and credible (Lincoln & Guba, 1985). For credibility purposes, I began with the triangulation method. Triangulation in qualitative research "corroborates evidence from different individuals, types of data, or methods of data collection in descriptions and themes" (Creswell & Guetterman, 2018, p. 261). This process helped to support or disconfirm the information, but more so, it enhances the meaning of the data being gleaned (Erlandson et al., 1993). Triangulation allowed the data from individual interviews, focus groups, and journal prompts to find similarities that will created themes. The descriptions and themes gathered were credible enough for review to determine if they answer the research questions.

Transferability

The participants' perspectives in this research can also be found in other contexts, depending on who is reading this study and how that reader perceives the information given. It is up to the reader whether the information is transferable to their interest or situation. This research

provided evidence that interpreters can use as a foundation to make that determination. According to Lincoln and Guba (1985), "It is, in summary, not the naturalist's task to provide an index of transferability; it is his or her responsibility to provide the database that makes transferability judgments possible on the part of potential appliers" (p. 316).

Dependability

Dependability was determined through the repetition of this study through the highly descriptive procedural section. Researchers will be able to find specific procedures on permissions that need to be obtained, recruitment of participants, and data collection. The data collection process is outlined for researchers to follow the study guidelines to conduct individual interviews, focus group sessions, and journal prompts. As each data collection process is conducted, "adequate records will be kept during the study" that will also aid other researchers in using these procedures (Erlandson et al., 1993, p. 148). The dependability of this research is also validated by an inquiry audit conducted by Liberty University. The dissertation committee and Qualitative Research Director comprehensively evaluated this research's methods, practices, and procedures.

Confirmability

As the researcher, I remained unbiased throughout this process. Remaining unbiased is vital for the study (Erlandson et al., 1993). It is important to be unbiased because the findings should be based on the participants' data (Erlandson et al., 1993). The findings should not be that of the researcher's (Erlandson et al., 1993). Participants reviewed the individual interview transcripts and the focus group transcripts to ensure that all accounts were accurately recorded.

Ethical Considerations

Throughout this research process, ethical considerations were kept in mind. The first was to ensure that IRB approval had been secured. IRB helps to protect the participants while participating in the research study. Once the IRB approval was granted, the purpose of the study was fully disclosed to the participants (Creswell & Poth, 2018). Participants were given a documented flyer with information concerning the purpose and procedure for the entire study (see Appendix F). Providing this information helped participants to be fully aware of what would take place and gave them the liberty of whether or not to participate. It also informed the participants of their right to withdraw from the research process without consequences of any form.

Since participants were interviewed, there was a potential risk for their identity to be exposed. In order to protect their identity, pseudonyms were used for each participant throughout the study. Pseudonyms helped to ensure that no one was identifiable. The data was gathered electronically and stored electronically as well. The researcher was the only one to have access outside of what is made accessible to the participants. No further data was be added after the research study was completed. Therefore, the data will be stored for up to three years and destroyed (Liberty University IRB). Anonymity will continue to be used with the storage of the data because backup files will be created. Anonymity helps to continue the security of the identity of the participants while having pertinent information. To help organize these files and the researcher's ability to retrieve specific information, "a data collection matrix will be created as a visual means of locating and identifying information for the research" (Creswell & Poth, 2018, p. 175).

Permissions

The first step in conducting this research study was to obtain approval from the institutional review board (IRB). In order to do this, the process included "seeking permission, developing a description of the project, designing an informed consent form, and having the project reviewed" (Creswell & Guetterman, 2018, p. 210). Securing IRB approval began with an application that was submitted that contained consent (see Appendix B) and recruitment (see Appendix C) documents to be distributed. Data collection began after receiving the IRB approval. These steps were essential to complete before proceeding forward with data collection.

Summary

For this study, a phenomenological design approach is chosen. The data collection includes individual interviews, focus groups, and journal prompts. The data was analyzed through transcription using the NVivo software. Other aspects of the data collection were analyzed by hand. Finally, triangulation ensured the study's trustworthiness by evaluating each data collection set through various methods.

CHAPTER FOUR: FINDINGS

Overview

This transcendental phenomenological study aims to explain the persistence of African American doctoral students in and graduates from STEM programs. African American students are underrepresented in STEM programs on the collegiate level (Corneille et al., 2020; Tao, 2018). This underrepresentation also crosses over into the STEM workforce (Corneille et al., 2020; The Journal of Blacks in Higher Education, 2022; Tao, 2018). Therefore, this study aims to uncover persistence methods that others could be aware of to help them succeed in doctoral STEM degree programs. In addition to the discussed persistence methods, this research explicates challenges the participants faced while persisting through their STEM doctoral degree programs. The study also describes successful routines, strategies, or programs that were either personal or offered by the participants' institutions to help the students with any challenges. The chapter begins with 10 participant descriptions of those currently in a STEM doctoral degree program or who have already graduated from one. The chapter discusses research results gathered from the participants through individual interviews, focus group interviews, and journal prompts. These data collection methods highlight and discuss emerging themes and subthemes. The chapter concludes with participant responses to the central research questions. The conclusion also includes how the themes and subthemes correlate to the participant responses.

Participants

The participants for this study were recruited after IRB approval (see Appendix A). The snowball sampling method was used to ensure that the 10 participants were secured. Participants were recruited through email (see Appendix C) and a flyer posted on social media (Appendix F). Potential participants were emailed with general information. This information included an

overview of the research study (see Appendix B) and a consent form to be electronically signed confirming their participation (see Appendix C).

Overall, 20 potential participants responded. After sending consent forms to the potential participants, 10 African American participants were secured. Although the number of participants for this study ranged from 10-15, having 10 participants secured was settled upon because thematic saturation was achieved (Creswell & Guetterman, 2018). Two males and seven females are current STEM doctoral students. One male and one female are STEM doctoral graduates. Each participant's information is expounded upon in the following sections, and each participant is given a pseudonym for anonymity.

Alice

Alice completed her Bachelor's degree in Science and Master's degree in STEM education while serving in the United States Army. Alice is completing a doctor of philosophy program in STEM education at an HBCU in the southeastern United States. Her ultimate goal is to work as an advisor for doctoral-level STEM students. Currently, she is an advisor in a college's science department. She was motivated to continue her education because of her love for educating, advising, and helping others as they progress through their higher education programs. Alice was precise when it came to discussing the challenges that she faces in her current program. Her main challenge dealt with navigating through how the course works. She explained that it is difficult to understand the expectations or requirements by saying, "It can be very difficult for me to know how and what to do when it comes to the assignments because I attend online and face-to-face I am sure would be much easier to understand." She does reach out to her professors for clarification and understanding. However, she says, "The wait time seems to take forever to get a response, and it can be days at a time before I hear back."

Beth

Beth completed a Bachelor's and Master's from an HBCU in the southeastern region of the United States. She is currently working on a Ph.D. in Science education. Her most considerable hardship thus far is being financially stable. She also finds it challenging to live up to the expectations she has set for herself, which adds an enormous amount of pressure on Beth as she tries to remain focused on her studies. Through it all, Beth's son is her biggest motivation in staying persistent.

Carrie

Carrie received her Bachelor's in biology at the local university in her hometown. She completed her Master's in biochemistry at a university in the Northern region of the United States. Carrie is now completing a Ph.D. program in science education. She currently works as a dental hygienist and hopes to become a dentist one day. Being that Carrie is a first-generation graduate and the first in her family to continue her education at the doctoral level, she found that there were many aspects of higher education she could not receive support from her family because of their lack of higher education. Carrie says,

> Although I am proud of how far I have come, not having family support has been extremely difficult. They support me through encouragement, but none have been to college, so they cannot give me personal experience-type advice. Particularly regarding financial aid, I have had to navigate it by myself.

Dan

Dan graduated with a bachelor's in Interdisciplinary Education with a concentration in Secondary Education. He graduated from an HBCU with a Masters in Mathematics. Dan is currently pursuing a doctoral degree in Mathematics Education. He finds it challenging to

understand the content virtually on such a rigorous level as a doctoral candidate. Dan says, "As a virtual student, it is sometimes hard to get the help needed from the online professor versus the face-to-face professor." Dan needs help because he lacked the necessary skills before his higher education journey. Dan attended low-performing schools growing up, and all the students were predominantly African American. He feels the instruction needed before college to prepare him better was not as accessible to him as it was to his white classmates. Dan says, "It is hard for me because I do not have the foundation I should have, but I make it my business to get through the instruction as best I can. Failure is not an option."

Esther

Esther obtained her B.S. from an HBCU while receiving her Master's from a PWI in the northern region of the United States. She received her doctoral degree from a PWI as well. Her biggest challenge while in the doctoral program was to prepare for that level of writing and get the support needed to help in that area. Esther articulates,

> I ultimately feel that I lacked support from my professors and the institution because of my skin color. I witnessed other students who did not have the same skin color as me get thorough help, questions answered, and the whole nine. Attitudes changed when it came to me.

Esther reported that the institution has writing help centers. However, she felt her need for writing support went beyond what was available through the center.

Greg

Greg has an extensive academic background. He has two associate degrees and completed a double major, resulting in two Bachelor's degrees, two Master's, and a Ph.D. in Biochemistry. Greg started his academic career later in life. He feels that his late start caused him

difficulty understanding the information and maneuvering through the online process. He was around 30 when he decided to return to school. Greg said, "The learning process was different from what I remembered or was used to. I had trouble navigating certain platforms such as Blackboard and then Canvas. At times, it was very discouraging". However, his desire to obtain a Ph.D. motivated him to continue.

Inez

Inez is currently in a Ph.D. program in Forensic Technology. She needs help understanding, learning, and processing information on the doctoral level online. Inez says, "I was not prepared with the critical thinking skills necessary to maintain such a high level of instruction. It is even harder for me because everything is done online". Although she has a Bachelor's and a Master's, the doctoral program is her first time completing a degree online. Inez is more used to face-to-face instruction. However, she needed to take the courses online so that she could still work to pay her bills.

Janet

Janet is seeking a Ph.D. in Forensic Technology. Janet is very close to her family, but being away from them in a doctoral program that is away from home, she says, makes things difficult for her. She expresses, "Throughout my academic career, I have always been able to rely on my family to keep me encouraged and motivated. However, being away from them does not have my normal level of support". Janet acknowledges that most of her family is only a phone call away, but it is not the same for her. She is used to being with them in person. She is used to them being more readily accessible. Janet still calls them when she needs them but feels it is different. She aspires to become a director of forensic technology services within a law enforcement branch.

Kelly

Kelly holds a bachelor of science in Nursing and a Master of Science in Nursing Leadership. She is now in a doctoral program to receive a Ph.D. in Nursing Science. Kelly says that being a single mom and working full-time while in school makes time management an issue. Kelly reports, "I have the hardest time juggling everything with work, my kids, their school, my school, their activities, my responsibilities. It is hard sometimes". This challenge is intensified for Kelly because she is back in school eight years after receiving her Master's. Kelly's children are what keeps her with a positive attitude toward completing her degree program and not giving up.

Larry

Larry is a dentist who has been doing so for over 30 years. He was a student from the U.S. Virgin Islands who completed his higher education studies in the United States. Larry did so while serving in the United States Army. Although Larry is a United States citizen, he felt as if he was treated differently while in his degree programs. He says, "Because I was black and had an accent, I was not afforded the support that many of my United States-born classmates did." However, this did not stop him from pursuing this degree. His motivation was a deep desire to make something of himself.

Table 3

Participant Demographics

Participant	Highest Degree Earned	Current Doctoral Degree Program	Graduate or Student
Alice	Masters	STEM Education	Student
Beth	Masters	Science Education	Student
Carrie	Masters	Science Education	Student
Dan	Masters	Mathematics Education	Student
Esther	Doctorate	System Engineering	Graduate
Greg	Doctorate	Biochemistry	Graduate
Inez	Masters	Forensic Technology	Student
Janet	Masters	Forensic Technology	Student
Kelly	Masters	Nursing Science	Student
Larry	Doctorate	Dental Sciences	Graduate

Results

The following sections will discuss data analysis of the information obtained in this study. Data methods used for this study included individual interviews, focus group interviews, and journal prompts. The individual interviews and focus groups were used to get extensive first-hand information from the participants concerning the phenomenon of persistence for African Americans in STEM doctoral programs. These informal conversations between the participants

and the researcher allow them to expound on their experiences (Moustakas, 1994). Four themes emerged from the data collection process, with sub-themes for three of those themes.

Table 4

Themes & Subthemes

Theme	Subthemes		
Financial challenges	Staying financially stable		
Lack of support	Lack of family support	Lack of faculty support	
Sense of belonging			
Showing up for yourself	Self-discipline	Self-reflection	Self-care

Financial Challenges

Financial challenges were one of the first themes to emerge. Participants considered Finances a challenge in one way or another throughout the data collection process. The participants discussed these issues throughout the individual interviews, focus groups, and journal prompts. While most participants expressed various ways that financial obligations and needs attempted to hinder their progress, two reported that they could access resources from their institutions to help with their financial state. Alice and Carrie found ways that the institution or family was a source of help with their financial strain. Alice reported that she utilized a program that helped pay for summer school sessions to help keep her on track toward completing her degree. She said

> Although I was moving forward and trying to better myself by getting a degree, I

> faced tuition balances that I knew I could not pay on my own. I searched high and low and found that my school offered financial assistance for summer classes. I jump on this opportunity every time it presents itself, and it helps me tremendously. Otherwise, I would have to quit. I cannot save to pay for summer school and maintain a regular life.

Carrie talked about how her family, particularly her grandfather, helps her to maintain her regular bills so that she can focus on school. She explained how she also utilized school loans for her educational needs. African American graduate students, particularly those going towards a doctoral degree, are found to obtain higher educational loans to cover all of their needs (Bostick et al., 2022; Webber & Burns, 2021). Sometimes, the thought of needing so much money to maintain discourages these students and puts them at risk of dropping out (Mustaffa & Dawson, 2021; Webber & Burns, 2021). Carrie's reflection shows the risk of dropping out: "Even though my grandfather helps me with my regular adult bills if I did not have financial aid to take care of my tuition, the school would not be an option at all for me."

While Carrie and Alice were fortunate to find or have resources to assist them, it was more challenging for some of the other participants. A couple of the participants are single parents with no financial assistance. This can put a strain on maintaining the household financially and going to school at the same time. Some participants do have full-time jobs. Unfortunately, the wages are barely enough to keep them afloat. This constantly weighs on their mind and makes them consider dropping out.

Staying Financially Stable

The ability to maintain finances while completing a doctoral degree program was a sub-theme expressed by many of the participants. Beth has an outstanding balance each semester.

She attempted her studies years ago and dropped out, resulting in money owed to the institution. She is back in the same institution and has been put on a payment plan to clear out her previous debt and pay for her current tuition. Beth expresses how you must have a solid determination to remain in school while barely being able to make ends meet in a situation like hers. Beth says,

> When I decided to go back and finish, I had to face a balance I knew I could not pay all at once. I did not like to ask for help and was the type of person who would lie in my bed if I made my own. I will fix it myself.

Beth's way of fixing this is not only working full-time while in school. She also has a part-time online job that helps pay her school balance. Her full-time job is used to maintain her everyday household bills. Whatever is left, she applies to her tuition costs. Another participant, Dan, has a similar perspective to Beth regarding being financially stable while completing a degree program. Dan explained,

> One of the biggest challenges I have faced is staying financially stable. It can become difficult to balance finances, especially when you must simultaneously pay residential, school, and adult bills. It can sometimes be overwhelming and make you question if going to school is worth not having the hours necessary to maintain financially. I must tell myself it will not always be like this constantly.

Lack of Support

Another theme evident during the data analysis was the participants' need for support in their degree programs. Support can be given in various forms, such as to family or faculty members (Tiffany et al., 2022; Walsh et al., 2021). The participants identified various ways they experienced support or the lack thereof. They expressed how they were used to support, and then

the next thing they knew, that support no longer existed. Some spoke about changing how they were used to being supported. Finally, some participants expressed that support never existed.

Lack of Family Support

Family support is essential for students when they are trying to complete a degree program (Tiffany et al., 2022; Walsh et al., 2021). If that support is not there, that lack can adversely impact the student's performance, from adjustment issues to frustration and dropping out (Tiffany et al., 2022; Walsh et al., 2021). Jane expressed how challenging it has been for her in the doctoral program without being near her family. Jane is at an institution in the southeastern United States while her family lives up north. Jane says,

> I did not realize how much I relied on my family. They were always there to motivate me and remind me of the value of my future. When I started procrastinating and falling short in class, my family was not close enough to help keep me motivated. I felt so lost without them, even though many were only a phone call away. For me, it was not the same.

Jane went on to explain how her white classmates seemed to support only themselves with motivation and encouragement in the absence of family. According to Jane, these comraderies were not extended to African Americans on campus. Esther is another participant who expressed her feelings about not having family support. Unlike Jane, who had support but was not near her or what she was used to, Esther reported not having support from her family. Esther says,

> None of my family has been to college. I come from an African American family that felt like survival was more important than education. Therefore, I am the first to attend college and make it this far. They have no idea about financial aid,

> studying, meeting deadlines, dealing with the stress of exams, and all the other college stuff simply because they have not been. They cannot offer me any help. Even when I tried to reach out for encouragement, they did not want to hear my problems. Instead, they would tell me I thought I was better than them because I was getting a doctoral degree. When they give me any support, I say never mind.

Lack of Faculty Support

Not only was the lack of family support a recurring theme, but also the lack of support from professors or faculty members. Many of the participants spoke about feeling as if they were not afforded the same treatment as their white classmates. They talked about how they had longer wait times to be seen by professors when seeking extra help. They were also referred to a syllabus. Esther felt that being at a PWI as an African American plays a part in why she does not receive the support she feels she needs from her professors or advisors. Esther says one of her weak areas is writing, which she says you must have mastered by the time you reach the doctoral level. She says,

> I am not the best writer, but I am not that bad. When I reach out to my professors for help, I am pushed to the side or not even acknowledged. I have witnessed myself being told there were no available appointments to take me for assistance, but when one of my white classmates came right behind me needing the same assistance, time was made for that student right then! If I were not strong, I would allow things like that to make me quit.

Sense of Belonging

The more a student feels connected to their institution in one way or another, the greater their chances are towards completing their degree program (Tinto, 1975). This connection can be

known as a sense of belonging. African American students lack a sense of belonging due to racism or discrimination (Banks & Dohy, 2019; Chelberg & Bosman, 2019; McGee & Bentley, 2017). Participants Inez and Kelly both expressed having periods of feeling as if they did not belong in the doctoral program because of the color of their skin. Kelly said that currently, she is the only African American in her cohort. Kelly says her sense of belonging is bothered mostly during class discussions. Kelly explains,

> During class discussions, I am often left out. Alternatively, when I am included, I am coaxed along as if I do not know the subject and my classmates or professor must clarify. I would not say I like it when that happens. It makes me feel I am not as qualified as everyone else, so why should I be here? I have had to shake that feeling more times than I like even to admit.

Inez reports she has been ignored. She says that study/work groups are often formed. She is never included. Inez says, "The only explanation there is for leaving me out is because I am black." On the other hand, Larry has experienced the negative side of belonging differently. Being that Larry is an international student with a noticeable accent, he says that he has been overlooked and excluded not just by white students but by black students as well. During a focus group discussion, Larry says,

> While I am considered black, my accent makes my classmates either second guess me or say that I think I am better than blacks in America. In those moments, I feel like I cannot win for losing. Even my people reject me.

Showing Up for Yourself

All of the participants are African American doctoral students who are completing a degree in a STEM field, where many times they have had to rely on themselves to keep going.

That is why another theme kept reappearing among them, which deals with oneself. They all express how you must show up for yourself when no one else does. The participants spoke about relying on what they have on the inside. They all believe that having this ability has enabled them to endure challenges in their degree programs and helps them persist.

Self-Care

Self-care was a theme that emerged as something that all participants needed to do. Self-care was like a signal inside the participants that let them know it was time to do something for themselves. Even if they could not stop then, they had to commit to doing something just for them. The forms of self-care were different for each participant. It was implemented at different times. No matter what, they deemed it a necessary tool through their degree program. Esther says,

> Self-care helps me have a good balance and ensures I care for myself. It does not matter if it is a weekend getaway, a day of window shopping, or finding a quiet place to read a book. As long as it is uninterrupted self-time, it helps.

Self-Discipline

The participants expressed that self-discipline, another sub-theme, was essential to maintaining their degree completion level. They shared that being able to control your character, emotions, and how you work is essential. They all agreed that self-discipline is necessary when challenges arise to help you keep going and when successes happen to keep you grounded. They went on to express how it is not easy being African American in such a rigorous program where many of your classmates do not look like you. It is easy to take a defensive attitude. It is easy for everything to offend you. However, Esther says, "We have to maintain our self-discipline when difficulties arise so that we do not throw away the rare opportunity of obtaining a doctoral

degree." The participants unanimously agreed with Inez during the focus groups when she said: "Self-discipline at this level of education requires an individual to know what to do when to do it, how to feel, and how to react. It is necessary to keep ourselves in check at all times".

Self-Reflection

Reflecting on yourself is another subtheme that emerged through the participant discussions. As a collective, the participants explained how taking time to reflect on yourself was important. These reflections include looking at your progress, successes, failures, disappointments, high moments, and anything else that dealt with *you*. The participants expressed how reflecting is vital in continuing through the STEM program. Larry, as well as the other participants, said that self-reflection has to be constantly in action because it helps you improve and build upon yourself. Larry shared,

> Self-reflection helps me to see what I need to correct, what I need to do better, how I could have done things differently, and even where I may have gone wrong. Being African American in a STEM doctoral program has many challenges. It is vital to analyze our actions before we point the blame at someone or something else.

Inez agrees with this and adds, "You must have a mature mind when self-reflecting because we are not always right."

Research Question Responses

In this section, the responses to the research questions are given. The research questions include one central research question and three sub-questions. The information for each research question was obtained through the data collection methods: individual interviews, focus groups, and journal prompt answers. From these methods, themes were discovered that aided in

answering the research questions. Participant in vivo responses also support a correlation between the research question and answers.

Central Research Question

What experiences have helped African American current doctoral students or graduates persist in a STEM program? The participants perceive that most of their lived experiences in their degree programs have been negative. Those experiences, in one way or another, prompted them to take the higher road. They responded in the most positive manner, which ensured they would stay on the journey towards degree completion. With the many challenges the participants have faced, being motivated and determined has helped them the most. Inez said,

> Self-discipline is the key for me. I have experienced being giggled at or stared at because I am the only African American in the class. I make it my business to discipline myself to not lose my character over petty things like that because my reward at the end, which is my degree, is worth so much more.

Esther adds,

> Once, a professor asked me if I was sure that this degree was the one that I wanted to go after. He even suggested that I choose or consider education or social work instead. Right after that, I felt so discouraged. However, there was a fight inside of me that would not let me quit.

Sub-Question One

What challenges have African American graduate doctoral students experienced while completing a STEM degree program? All of the participants identified challenges that they have experienced while completing their degree. The participants reported varying types of

challenges. These challenges included financial problems, support issues, and constantly wondering if they belonged. Specifically, Greg stated,

> In the beginning, I found it most challenging to learn virtually. I started graduate studies later in life, and so many things changed. Reaching out to professors for help was even more difficult because the professors felt like I should know already at the doctoral level. Unfortunately, I did not. It would just take a few moments to help me navigate a few things but to no avail.

Sub-Question Two

What strategies or retention efforts have been offered by higher education institutions that benefit African American doctoral students to persist through to degree completion? It was understood from the participant discussions that challenges were evident. Nevertheless, many of them expressed efforts their institution had in place in order to help with their hardships. One of those resources that was talked about often was financial assistance. Paying for tuition or maintaining regular household bills in school can be challenging. Inez explained,

> It can be stressful trying to take care of children by yourself and pay for school expenses for yourself. I was grateful to find a program at my institution that will at least pay for summer courses if you qualify. I qualify for summer tuition assistance because of my GPA for the last two summers. That help helps keep me going and gives me hope that I can finish.

Sub-Question Three

What personal efforts have African American doctoral students or graduates experienced that helped them persist? The participants collectively feel that their efforts to help them persist come from within themselves. No matter what their institution, family, or friends may have done

or offered, the participants felt their inner strength was the most valuable persistence method. The participants described this inner strength as being in the form of self-discipline, self-reflection, and self-care. Many of their strategies are self-directed and self-guided. Larry says,

> Women talk much about self-care, but men also need self-care. I take the time to do something I want every day. It does not matter if it is only five to ten minutes. I carve out that time for me. With all the challenges I face as a black man in a STEM doctoral program, I need it! It helps me make sure I am taken care of and have the strength to go back out and not only finish my degree but conquer every obstacle that I have to face.

Summary

This study was conducted to explain the persistence of African American doctoral students and graduates who are in or graduated from STEM degree programs. This chapter began with the participant descriptions. The participants were a mix of male and female, current students and graduates, and all African American. As the chapter continued, outcomes from the data collection process, which included individual interviews, focus group interviews, and journal prompts, were discussed in detail. Themes and subthemes emerged from that data and were later correlated with the research questions. The recurring themes were financial challenges, lack of support, a sense of belonging, and showing up for yourself. The subthemes were staying financially stable, lacking family support, faculty support, self-discipline, self-care, and self-reflection. The correlations were substantiated by the in vivo responses of the participants per question.

CHAPTER FIVE: CONCLUSION

Overview

This phenomenological study aims to understand the persistent efforts of African American doctoral students or graduates within a STEM program at different higher education institutions across the southeastern portions of the United States. The chapter is designated to give my interpretation of this study's results from the researcher's perspective. Several components will be discussed. It begins with my detailed interpretation of the themes uncovered and then moves on to specific implications. These include implications for policy or practice and empirical and theoretical implications concerning persistence for African American STEM students. It goes on to explain limitations during the study, or in other words, encounters that were unavoidable during this process. Delimitation explanations are given, which will be what I, as the researcher, put in place to refine the range of the study. This chapter concludes with recommendations for future research.

Discussion

As stated earlier, the purpose of this qualitative transcendental phenomenological study was to uncover the persistent efforts of African American doctoral students and graduates who are currently in or have graduated from a STEM doctoral degree program. By choosing this research design, I collected data from first-hand accounts of the participants instead of relying on my personal opinions or perspectives (Creswell & Poth, 2018; Moustakas, 1994). The participants were allowed to expound on what they experienced, whether personally or through their institution, that helped them persist through their STEM degree program. Following the transcendental method also gives higher education institutions first-hand information concerning persistence from African American students. That will, in turn, help colleges and universities

understand persistence challenges and successful resources that will help promote this demographic of students in the STEM field.

Participants for this study had to meet specific requirements, such as being 18 years or older, being a doctoral student or graduate from or in a STEM doctoral program, and being African American. It was important for the participants to have these qualities to ensure the information gathered would come from individuals who were living through the phenomenon or had already been through it. I built a strong rapport with the participants during the first data collection method of individual interviews. They all felt comfortable from that point on, sharing in-depth experiences concerning their challenges and successes regarding persistence. The participants felt free to continue discussing the phenomenon through the focus groups and journal prompts.

As this chapter continues, the results of this research study will be discussed. That discussion will begin with interpreting the findings, revealing themes developed throughout the data analysis process. The discussion will give my interpretation of those findings by showing how a connection exists between the phenomenon and the information obtained through the data collection analysis. Information will be given on implications for policy or practice, as well as empirical and theoretical implications. This discussion section will conclude with limitations, delimitations, and recommendations for future research.

Summary of Thematic Findings

Throughout the individual interviews, focus groups, and journal prompts, themes continued to emerge. The themes centered around persistent efforts that the participants used or continue to use in their STEM degree programs. The participants were comfortable, confident, and proud to share information about what they did or what institutional resources they used to

persist, hoping the information would help someone else. Not only did themes dealing with persistence efforts emerge from the participants, but commonalities with challenges were also found. The participants felt a need to expound on the various hardships and challenges because, according to them, that is where their persistent efforts came to fruition.

Interpretation of Findings

In the following section, I will explain my interpretation of the themes that developed throughout the data collection and analysis. Four themes continued to occur. Participants continually expressed their financial concerns that could hinder degree completion. They also spoke extensively through the individual interviews and focus groups about a lack of support and struggles with belonging. However, they could all share how their internal forces helped them persist and not give up.

Financial Concerns

The cost of getting a higher education degree can be high. While completing a degree on any level can be expensive, going beyond a Bachelor's degree can be even more costly (Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021). Students often have to secure a loan to cover the costs (Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021). Research has found African American students have to borrow more money than white students when obtaining a graduate degree (Addo et al., 2016; Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020; Webber & Burns, 2021). The significant amount of money that has to be borrowed hinders some African Americans from completing their degree program because of the amount they will eventually have to pay back (Bostick et al., 2022; Mustaffa & Dawson, 2021; Pyne & Grodsky, 2020tierney; Webber & Burns, 2021).

While the participants expressed their financial concerns, six were not worried about how much their degree program would cost. They were more concerned with not having the finances to maintain their natural lives, such as rent, utilities, car payments, and insurance. They knew loans, grants, and scholarships were available to cover their education costs. They even knew that some of their institutions offered financial assistance for summer classes. The participants showed no anxiety about how they would pay for school but how they would maintain the financial side of life outside of school. Dan expressed, "It can be difficult trying to work and pay bills. I have no desire to live on campus because I feel I am too old, yet it would save me the headache of making sure my bills are paid".

While analyzing this aspect of the study, the time given to participating in face-to-face classes, study times and study groups, assignment completion, and other academic obligations takes away hours of availability for African American students working a job (Kricorian et al., 2020; Trent et al., 2020). These missing hours take away from the finances they would receive to help them pay their regular bills (Kricorian et al., 2020; Trent et al., 2020). The inability to financially maintain a life outside of school can become overwhelming (Kricorian et al., 2020; Trent et al., 2020). These students will be put in a situation where they must choose between continuing their education through degree completion or dropping out to work enough hours to maintain life (Kricorian et al., 2020; Trent et al., 2020). Esther talked about how paying for school was the least of her concerns. She said,

> being that I attended a PWI and I was black, I had so many financial opportunities just because I was black. Scholarships and grant money were practically thrown at me. My education was financially solid. But baby, paying to maintain outside of school was another beast. I was pregnant at the time and living alone. No help at

> all. When my money started looking funny when it came to my bills, that would cause me to rethink the school thing. However, I am glad the negative did not win.

To overcome this challenge, African American students rely on a strong determination from within that says quitting is not an option under any circumstances. They find the strength from within to help them survive until they complete the degree they started.

The persistence method the participants describe as coming from within differs from the theory used in this research. The theoretical framework for this research is Tinto's theory of student departure, which focuses on Tinto's persistence model (Tinto, 1975). Tinto (1975) says that students must be connected academically or socially to the institution to reach degree completion. However, the participants in this study expressed that being self-driven has more impact than being connected to the institution regarding success in their degree program. They did not have to be connected in any way. They just needed the passion on the inside to persist. Kelly expressed,

> I know people who are black, just like me, who just could not make it when it came to college. Being black is already complex by itself, but when you add trying to better yourself by going to college adds levels of stress that only being a black person could understand. I am so glad that I chose to believe in myself and be self-motivated to finish. I do this for me first and then everyone or everything else.

The Need for Support

Support for African American doctoral students in STEM programs can be found differently. While in a degree program, support can come from family members or close

relatives, friends, faculty, advisors, or classmates. Janet reported, "Family is a strong support and encouragement for me whenever I need it." Carrie said, "My grandfather was my constant support for everything. I am so grateful for him. He did not finish high school but wants to see me succeed and is doing anything he can to help me". Greg expressed, "My relationship with God is my most significant support. Next to God, my wife is a great support to me as well". However, there were quite a few who felt they had no support. These participants talked about relying on themselves and not having anyone to help them. They had to navigate life naturally and academically alone. Beth said,

> I have been on my own for a long time, and I have had to make life happen for me and my son. I did not change that concept just because of school. I had no one before college and made it. Now that I am in college, I will still make it with just my son and me.

Some even discussed going to professors for support and instead received rejection. Esther often spoke of being rejected or overlooked by saying,

> I hated to get an assignment that was not clear as far as the directions or what the professor expected. I would go to my professor after class and ask specific questions about an assignment only to be told I am a doctoral student. I should know how to do it. Then, not five minutes later, a white classmate asks for clarity on the assignment, and the professor gives that student all the attention he needs. Seeing that regularly can be bothersome. It also makes me wonder what professor or faculty members are here for us black.

Throughout the discussions with the participants concerning support, I found that while support is helpful and needful, it is not a priority or a must-have for African American doctoral

students. For these particular students, support is appreciated, and the absence thereof is felt. However, African American doctoral students have learned to rely on what they have inside them, which helps keep them going no matter what. A lack of support can be unfortunate, but not to the point where this demographic of students will solely quit because they have yet to receive it or have it. The lack of support does the opposite of discouraging these students; instead, it ignites their passion and drive to persist through to degree completion.

To Belong or Not to Belong

Most participants reported moments of feeling as if they did not belong in their degree program because of the color of their skin. Some experienced being left out of study group sessions, while professors ignored others. Those same professors would give their other classmates the attention and support needed. The participants felt they were not afforded the same treatment; their skin color was the only reason. Alice discussed a conversation she had with her professor. Alice said,

> My professor had the nerve to suggest I switch my degree program to something else. He said, being that I was the only African American in the class, I might be more comfortable and thrive in another area. The nerve of him. I told him I belonged here just like everyone else. I am still in my program.

Another participant was surprised to learn she was not the only one with that experience. Carrie said, "The professor suggested I switch because I was the only African American in the class. The professor said I needed to adjust and felt another area might be better suited. That did not move me at all". The participant said it was not that she was not adjusting well; instead, she needed to be received better or included. She was often treated as invisible, no matter how much she tried to engage in class discussions or add input.

All of these experiences made the participants question whether or not they belong in the STEM degree program at the doctoral level. They would wonder if they made the right decision this far in STEM. What they were experiencing caused them to question themselves and consider deciding to stay or go. This particular experience was an encounter that happened on more than one occasion. According to Tinto's model of persistence, it is essential for a student to feel like they belong (Tinto, 1975). The more students are connected to their institution, the less likely they are to drop out (Tinto, 1975). In this study, when the African American doctoral students felt as if they did not belong, those feelings did not gain enough strength to affect them adversely. During these times, the students again relied on their inner strength to motivate them to continue and not give up.

Showing Up for Yourself from Within Yourself

Participants reported at least one challenging experience in their doctoral-level STEM degree program. Participants also gave examples of institutional resources available to help them through those challenges. Participants gave examples of personal strategies they used to persist despite their hardships. However, throughout every discussion, be it individual interviews, focus groups, or journal prompts, participants described how what they had on the inside of themselves always surfaced to help keep them persisting through. Self-discipline, self-reflection, and self-care were some ways the participants described how they could continue their academic journey. All of these inner tools were used from the beginning. For example, the participants began to enact self-discipline before they were met with a challenge. Self-discipline is always a part of who they are. Inez said,

> I have to rely a lot on self-discipline on this journey. I use it a lot in the form of ignoring the obvious when it comes to being a black woman in a STEM program.

> You can feel, see, and experience the negativity. Instead of responding in the wrong way, I practice self-discipline to make sure I keep my head on the street and keep my eye on the prize.

Dan said,

> It can be challenging for a black man as a doctoral student in STEM. I do something for myself every day to remind me that I matter. Doing something for me also reminds me that I can make it through the degree program if I care for myself. I hear many women calling this self-care. I also call it me-care.

They collectively reported ways they enacted self-care to make sure they were keeping themselves healthy, be it mentally, physically, and emotionally. Alice said, "I made taking a relaxing bath every evening mandatory. This helped me to reset and keep going". Larry reported, "Reading is my way of taking care of my mind. I make sure to take time to read something that I like that has nothing to do with school. I feel so refreshed after doing so". Self-care was non-negotiable for them and had to be done daily. It did not have to be something big and extravagant, just as long as they purposely did it to care for themselves.

Implications for Practice

Although African American doctoral students have increased their presence in higher education institutions (Alfred et al., 2019), improvements must be made to help these students persist. Financial concerns can hinder students while trying to complete their degree. A lack of support and a sense of belonging are other challenges that African American STEM doctoral students face. While these are not the only issues, efforts need to be made to help address existing challenges. These efforts will also help combat any foreseeable challenges students may face as they continue their degree program.

Higher education institutions could incorporate financial literacy seminars before the start of every semester. These seminars would cover financial information about school and regular life obligations. They would also include resources that inform students about scholarships, work-study, campus employment, grants, and tuition assistance outside of financial aid. Other information to be included would be resources for employment opportunities, daycare options, and other details that could help with the financial side of life outside of school. While implementing financial literacy opportunities would benefit African American doctoral students in STEM programs, this strategy would be helpful for all student demographics on any collegiate level.

Besides financial literacy seminars, higher education institutions could incorporate one-on-one wellness checks with African American doctoral STEM students. Positions could be added to the faculty for those handling these wellness checks throughout the semester if adding this responsibility to advisors is too much. The wellness checks help the faculty be aware of any challenges or barriers hindering these students from persisting through their degree programs. The wellness checks also gauge the student's level of sense of belonging. It will inform the institution whether the student has any challenges causing them to no longer feel connected to the school. Results from wellness checks will help make decisions for the student concerning intervention efforts that need to be offered to help them persist. These wellness checks can benefit African American doctoral students but may also be effective for all students, regardless of ethnicity.

When it comes to a lack of support, higher education institutions can ensure that they provide professional development for the faculty and staff that targets this area for African American doctoral students. Families can be educated on supporting their family members while

in school. Families may need help understanding the importance of support. Higher education institutions could take on the responsibility of offering parent development sessions to keep parents informed and aware of their responsibilities. The sessions do not have to be restricted to just parents and can extend to close family members or whomever the student deems their primary support.

Empirical and Theoretical Implications

The following sections will discuss this research study's empirical and theoretical implications. Empirical implications will explain how the participants' lived experiences can add information to existing research about persistence for African American students in doctoral programs. It will also explain the specific ways of persistence that the participants found impactful. Theoretical implications will reveal how the results of this study were not in sync with the theoretical framework of Tinto's student persistence model. This portion will expound on the contrast between Tinto's version of what it takes for a student to persist and what the participants feel makes them persist.

Empirical Implications

The lived experiences of how African American doctoral student participants in this study persist through various STEM degree programs can expand the literature concerning persistence for these same students. Prior research has found that a small amount of information exists that helps explain how this demographic of students can persist through STEM degree programs (Alfred et al., 2019; Crumb et al., 2020; Horsford et al., 2018). While persistence methods for STEM degree programs exist, more needs to be specified for African Americans (Watkins & Mensah, 2019). The participants' shared experiences in this study will add to the literature by giving specific personal methods that have helped African Americans persist

through STEM degree programs. These personal methods included self-care, self-discipline, and self-reflection. The participants shared how they used these methods to combat challenges like lack of support, financial concerns, and a sense of belonging.

Theoretical Implications

The theoretical framework that served as the foundation for this research study is Tinto's theory of student departure, focusing on Tinto's model of student persistence (Tinto, 1975; Tinto & Cullen, 1973). Tinto (1975) outlines in this theory that for a student to persist through a degree program and graduate, the student has to connect with the institution they are attending, be it an academic or social connection. Tinto (1975) explains that if students do not have one or both connections with their institution, they are more likely to transfer or drop out and leave their degree program, never to return. Participants in this study expounded on lived experiences that attempted to challenge their persistence in a doctoral STEM degree program. These challenges included a lack of support from family and professors, a sense of belonging, and financial concerns. The way participants responded to these challenges determined whether or not they continued to persist or leave their degree programs. In this study, all participants responded in ways that they chose to persist through their academic journey.

As mentioned, Tinto says that student connections are a priority for persistence (1975). However, the participants in this research study explained that other means of persistence came from within themselves rather than from a connection to their institution. Tinto defined *persistence* as students integrating into their higher education institution through social and academic means and completing a degree program (Tinto, 1975, 1993). On the contrary, the participants described their persistence through their degree program by utilizing self-care, self-

discipline, and self-reflection. None of these have a direct connection to their institution but rather to themselves.

Other theorists disagreed with Tinto regarding what makes a student persist through graduation. Tierney (1992) suggested that students would exhibit persistence if they had immediate family members who had attended college before them and graduated. This perspective was based on the fact that those students would have support from experienced family members to keep them persisting through (Tierney, 1992). The thought is still different from the participant's perspective because all of them are African American, and many of them lacked support because they were the only members of their families to have ever attended college. The closest theoretical perspective is one in which vision and sense of community are indicators of a student's persistence (Tucker, 2000). This theory explains that when students envision themselves being successful, they are more likely to keep going (Tucker, 2000). The participants relied on self-reflection to keep them motivated about their future. They took time to reflect on their challenges and successes along their academic journey. These reflections helped to keep them motivated and persisting towards degree completion.

Limitations and Delimitations

In the next section, I will discuss limitations and delimitations. I will describe limitations encountered during this research study that were beyond my control and explain remedies for them. Those limitations were prolonged recruitment and forgetfulness on the part of the participants. I will also describe delimitations that were purposely put in place. The delimitations were included to ensure the research study stayed within specific parameters to ensure quality data collection. The delimitations for this study included the criteria for participants to be eligible to participate in the study and the research design.

Limitations

Limitations for this study included prolonged recruitment and participants needing to remember to meet at scheduled times for the individual interviews and the focus group sessions. The prolonged recruitment was a limitation because potential participants took a long time to respond to the social media flyers and posts. When the second participant responded, I began the snowball method to combat this issue. This method helped to secure the other needed participants. Regarding participants meeting for the interviews and focus groups, I set new times but sent out email and text reminders to ensure they would remember to attend at the scheduled times.

Delimitations

The delimitations for this study were put in place to help keep the data for this research study as specific as possible. The participants had to be at least 18 years old or older. They had to be African American because the information was based on the lived experiences of this demographic of students. The participants also had to be doctoral students in a STEM degree program or graduates from the same type of program. Also, a qualitative method was chosen versus a quantitative method. The reason is that a qualitative method allows for gathering first-hand account information while a quantitative method deals with statistics and numbers (Creswell & Guetterman, 2018).

Recommendations for Future Research

After concluding this research study, recommendations for further research are suggested. The first concerns the participant pool. For this study, current doctoral students and doctoral graduates from STEM degree programs were recruited. Those who were graduates were older

and had a difficult time being specific about their experiences. Therefore, putting an age limit on graduates would be beneficial.

Another suggestion would be to recruit using methods other than social media flyers and emails. Recruitment may go faster if IRB approval from universities or colleges to send out recruitment information is obtained. This would be beneficial as it would move the study forward promptly. Waiting for potential participants to respond through only flyers and emails was highly time-consuming. The snowball method helped to speed the process up but was implemented later than desired.

Conclusion

This transcendental phenomenological study aimed to explain the persistence of African American doctoral students and graduates from or in STEM programs. The study began by providing background knowledge of the phenomenon in historical, social, and theoretical contexts. The study went on to establish the theoretical framework, which was Tinto's theory of student departure, with a focus on Tinto's model of persistence. Literature concerning the research topic was explained, and the need for this study to add to that body of literature was shown. The research went further by explaining the qualitative approach chosen for this study, which would be beneficial in gaining first-hand accounts of the lived experiences of the phenomenon. This research study secured ten willing participants who met specific criteria for this undertaking. Each participant shared their experiences of challenges while in their degree program and persistence methods that helped them keep going. The data collection methods included individual interviews, focus groups, and journal prompts. The data analysis process included transcriptions, coding, and analysis by hand. From this data analysis, themes and sub-themes emerged to describe the challenges and persistence methods of African American

doctoral STEM degree-seeking students. Next, the researcher's interpretations of the data collected and implications were given. Limitations and delimitations were also given to help aid in the understanding of the process. Finally, recommendations were given for future research considerations. Again, this research's purpose was to uncover methods of persistence that help African American doctoral students persist. Overall, this research found that the most effective method described by participants was using what they have on the inside of them to motivate them to persist no matter what challenges come their way.

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Appendix A: IRB Approval

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

December 12, 2023

Tanisha Smith
Patricia Ferrin

Re: IRB Approval - IRB-FY23-24-637 The Persistence of African American Doctoral Students and Graduates From or In STEM Programs: A Transcendental Phenomenology Study

Dear Tanisha Smith, Patricia Ferrin,

We are pleased to inform you that your study has been approved by the Liberty University Institutional Review Board (IRB). This approval is extended to you for one year from the following date: December 12, 2023. If you need to make changes to the methodology as it pertains to human subjects, you must submit a modification to the IRB. Modifications can be completed through your Cayuse IRB account.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk studies and minor changes to approved studies for the following reason(s):

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.)

For a PDF of your approval letter, click on your study number in the My Studies card on your Cayuse dashboard. Next, click the Submissions bar beside the Study Details bar on the Study Details page. Finally, click Initial under Submission Type and choose the Letters tab toward the bottom of the Submission Details page. Your stamped consent form(s) and final versions of your study documents can be found on the same page under the Attachments tab. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

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

Sincerely,

G. Michele Baker, PhD, CIP
Administrative Chair
Research Ethics Office

Appendix B: Consent Form

Title of the Project: The Persistence of African American Doctoral Students and Graduates From or In STEM Programs: A Transcendental Phenomenology Study
Principal Investigator: Tanisha Smith, Doctoral Candidate, School of Education, Liberty University

Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be at least 18 years of age or older and a current college student enrolled in a STEM doctoral program or a doctoral graduate from a STEM program. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

What is the study about and why is it being done?

The purpose of the study is to understand persistence measures through the lived experiences of African American students that are currently enrolled in a STEM doctoral program or graduated from.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following:

1. Participate in a one-on-one recorded interview conducted through WebEx, Microsoft Teams, or Google Meet that will take no more than 1 hour. The interview will be later transcribed.
2. Participate in a Focus Group Discussion with other participants that should take two hours or less.
3. Complete an online journal responding to 4 journal prompts.
4. Review the transcripts of your individual interview for accuracy.

How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include higher education institutions being able to better understand how to increase African American doctoral student retention in STEM programs by knowing how to increase or help with their persistence.

What risks might you experience from being in this study?

The expected risks from participating in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

How will personal information be protected?

The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be anonymous and will be kept confidential by replacing your name with a pseudonym.
- Interviews will be conducted in a location where others will not easily overhear the conversation.
- Confidentiality cannot be guaranteed in focus group settings. While discouraged, other members of the focus group may share what was discussed with persons outside of the group.
- Data will be stored on a password-locked computer. After three years, all electronic records will be deleted] [and all hardcopy records will be shredded.
- [Include the following if you will record participants. Describe how recordings, if used, will be maintained, when they will be erased, and who will have access to the recordings.] [Recordings will be stored on a password locked computer for three years until participants have reviewed and confirmed the accuracy of the transcripts. After which the transcripts will then be deleted. The researcher and members of her doctoral committee will have access to these recordings

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, apart from focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your contributions to the focus group will not be included in the study if you choose to withdraw.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Tanisha Smith. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [redacted]. You may also contact the researcher's faculty sponsor, Dr. Patricia Ferrin, at [redacted].

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the IRB. Our physical address is Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA, 24515; our phone number is 434-592-5530, and our email address is irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

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

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

_____
Printed Subject Name

_____
Signature & Date

Appendix C: Recruitment Email Form

Dear Potential Participant,

As a doctoral candidate in the School of Education at Liberty University, I am conducting research as part of the requirements for a Doctor of Philosophy: Higher Education Administration degree. The purpose of my research is to provide a better understanding of what helps African American doctoral students persist through a STEM program, and I am writing to invite you to join my study.

Participants must be an African American 18 years of age or older, college students who are enrolled in a STEM doctoral program or graduated from a STEM doctoral program. Participants will be asked to take part in a one-on-one WebEx, Microsoft Teams, or Google Meet video recorded interview, focus group, and completion of journal prompts. It should take approximately 1 to 2 hours to complete the procedures listed individually. Participation will be completely anonymous, and no personal, identifying information will be collected.

To participate, please contact me at [redacted] to schedule an interview. If you meet my participant criteria, I will contact you to schedule an interview and work with you to schedule a time for an interview

A consent document will be emailed to you if you meet the study criteria before the interview. The consent document contains additional information about my research.

Sincerely,

Tanisha Smith
Doctoral Candidate, School of Education, Liberty University
[redacted]

Appendix D: Individual Interview Questions

Individual Interview Questions

1. Let's begin with you sharing your educational background up to this point. CRQ
2. What made you decide to enter a STEM field program? CRQ
3. How did you prepare for higher education STEM courses? CRQ
4. If so, explain that process and how you think it correlates with your program now. CRQ
5. What are you future career aspirations once you finish your program?
6. What challenges have you faced since being in a STEM program at the doctoral level? SQ1
7. Which one do you find most challenging and why? SQ1
8. Explain the structure or process of any services offered by the institution for any of these challenges? SQ2
9. Considering the challenges you have mentioned, what motivates you to continue in spite of? SQ2
10. What successful routines, strategies, or programs have been offered by your institution to help you persist through? SQ2
11. Which one do you find most valuable and why? SQ2
12. What are some personal routines or strategies that you feel are most beneficial to your persistence? SQ3
13. Is there anything you would like to add to our conversation that you feel would help to enlighten others understanding of what it takes as an African American doctoral student to be successful in a STEM program? SQ3

Appendix E: Focus Group Questions

Focus Group Questions

1. What attributes/characteristics are important to have in order to persist through a doctoral level STEM degree program as an African American and explain the importance of those attributes/characteristics?
2. Think back over your time thus far in the STEM doctoral program. What have you personally experienced that could have negatively impacted your academic progress if you did not possess what it takes to persist?
3. How would you encourage another African American STEM doctoral student that struggles with persistence?
4. What would you say has been the influence of persistence for you?

Appendix F: Recruitment Flyer

Research Participants Needed

The Persistence of African American Doctoral Students and Graduates From Or In STEM Programs: A Transcendental Phenomenology Study

- Are you an African American that is at least 18 years of age or older?
- Are you currently in a doctoral level STEM program?
- Have you graduated with a doctoral degree from a STEM program?

If you answered **yes** to either of the questions listed above, you may be eligible to participate in a research study.

The purpose of this research study is to understand methods that African American doctoral students use or doctoral graduates have used to complete a STEM degree program.

Participants will be asked to participate in one-on-one interviews and focus groups, as well as completing an online journal with prompts.

If you would like to participate, contact the researcher at the phone number or email address provided below.

A consent document will be given to you before the interview.

Tanisha Smith, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Please contact Tanisha Smith at [redacted] for more information

Liberty University IRB – 1971 University Blvd., Green Hall 2845, Lynchburg, VA 24515