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Mentoring Underrepresented Black Male Students in Science, Technology, Engineering, and Math

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Abstract

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MA, Walden University, 2016

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Psychology

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Abstract

Underrepresented Black men entering the science, technology, engineering, and math (STEM) career fields are expected to receive fewer than 6% of all bachelor's degrees awarded in these fields. In addition, a lack of attention has been given to social capital as a function related to increased self-efficacy obtained through minority mentoring and enrichment programs. This phenomenological study aimed to show the lived experiences of Black male undergraduate students who used STEM mentoring and enrichment programs to increase their self-efficacy and development of social capital. The theoretical framework for this study was Bandura's theory of self-efficacy and Putman's theory of social capital. Purposeful sampling and interviews were used to collect data from the lived experiences of seven Black male undergraduate students from various historically White institutions (HWIs) of higher learning located on the Eastern shoreline of the United States. Purposeful sampling allowed for identifying and selecting participants who could share meaningful experiences related to this phenomenological study. The data were analyzed and results indicated that minority STEM mentoring and enrichment programs are critical components in developing social capital and the enhancement of self-efficacy among Black male students who attend HWIs. Potential implications for positive social change could result for HWI policymakers, administrators, and educators who may benefit from the results of this study to begin to create academic environments that ensure academic success and equality in the STEM career fields for all students of color, especially Black male students.

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Dedication

I dedicate this dissertation to *"Inspire"* the bridge builder's bridge to the unattainable dream. To those individuals who take the time without obligation to be mentors, create social change, and become transformational leaders while ensuring academic excellence for students of color, especially Black male students.

To the loving memory of my son Qui'co Miquel Carter, a young man who spent nine months with us, I will always build bridges in your memory, and to his grandparents, Raymond (T-Ray) and Hattie Mae Carter, thanks for your inspiration. I feel the comforts of your loving smiles everyday as they shine down on me.

To the educator and spiritual wisdom of my life, my grandmother, Mary Frances Nevers. Thank you for the everyday lessons of life, love, and trust in a society where equal education is still a dream.

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Chapter 1: Introduction to the Study

Introduction

The lack of suitable minority mentoring and enrichment support systems in the science, technology, engineering, and mathematics (STEM) career fields obstructs motivational influences, causes cultural and social isolation, and discourages academic achievement among low-income Black men (Chavous et al., 2018; Douglas, 2017; Edwards & Thomas, 2015; Sinanan, 2016). Developing a belief system within an individual's abilities to meet academic challenges is a critical component in any academic environment and reinforces the academic identities of underrepresented minority students (Chavous et al., 2018; Douglas, 2017). Mentoring and enrichment programs increase positive social networks and enhance self-efficacy among low-income Black men (Carroll & Barnes, 2015). However, Black men lag in degree attainment in the STEM career fields (Williams, 2017). In addition, research studies have shown that the rate of postbaccalaureate degrees attained by Black men is alarmingly low compared to other disadvantaged minority groups (Gibson, 2014; Williams, 2017).

There is an absence of scholarly works supporting the essential elements of minority STEM mentoring and enrichment programs related to the development of self-efficacy and social capital in Black male college students (Brooms et al., 2015). Scholars have documented the academic achievement rates of underrepresented Black men who participate in mentoring programs (Booker & Brevard, 2017; Gibson, 2014; Mondisa & Comb, 2015). In their research, Chavous et al. (2018) noted a lack of support faculty and

staff representing students of color in STEM mentoring and enrichment programs supporting underrepresented minorities at predominantly White institutions.

In this study, I aimed to understand the lived experiences, concerns, and needs of Black male college students who matriculate into STEM fields on the campuses of historically White institutions (HWIs) of higher learning. My goal was to provide data that would inform administrators, educators, policymakers, stakeholders, and individuals working to impact an academic system that lacks diversity, equity, and inclusion. Additionally, I hope that this study will provide insight into how STEM mentoring and enrichment programs can improve the self-efficacy and development of social capital among Black male scholars, resulting in positive achievement and outcomes that can enhance social change in underserved communities of color, especially for Black men.

This chapter includes contextual information related to self-efficacy and the development of social capital among Black male scholars who matriculate into STEM careers on the campuses of HWIs of higher learning. Additionally, this chapter includes information related to previous research supporting the scope of this study, the research problem, the purpose of the study, and the need to create an understanding and awareness in support of Black male scholars who are entering underrepresented career fields. Finally, in this chapter I provide discussions on the research question, the theoretical framework, the nature of the study, definitions of terms used in the study, assumptions, delimitations, the significance of this study. The chapter concludes with a summary.

Background

Based on a review of the literature, minority mentoring and enrichment programs are beneficial in developing social capital and enhancing self-efficacy among Black male students. Although the contributing factors remain unsupported, the larger body of literature has defined mentoring using many descriptors. However, each definition shares the same objective: the creation of a professional relationship between an experienced person (the mentor) who assists another (the mentee) with the development of specific skills and knowledge the mentee will need to enhance their professional and personal growth (Booker & Brevard, 2017; Carroll & Barnes, 2015). In addition, the National Academies of Science, Engineering, and Medicine (2017) posited that the roles of the mentor may vary from formal to informal, long term to short term, and planned to spontaneous.

A smaller body of scholarly works supporting minority STEM mentoring and enrichment programs related to Black men in the STEM fields has produced results such as declining college graduation rates and higher dropout rates among Black men (Dulabaum, 2016; Flowers & Banda, 2019; Ingram et al., 2016). At the same time, essential contributing factors such as the need to develop social capital in STEM mentoring and enrichment programs have little to no supporting studies.

In their study of social capital and summer bridge programs, Davis and Bost-Laster (2019) found these programs provided minority students the time to build a relationship that was beneficial to their academic success. In comparison, Salunga (2018) argued that the lack of social capital contributes to the achievement gaps within

underserved communities. Brouwer et al. (2016) identified social capital as a network of relationships and investment in resources working together to support the efforts of individuals to achieve goals. Social capital for Black male STEM college students is essential in creating a learning environment or successful cultures in their academic achievements.

Studies have shown self-efficacy to be a critical component in the academic achievement of Black male STEM college students, and self-efficacy is the belief that an individual has to execute the required steps to achieve a specific goal (Flowers & Banda, 2019). For Black male STEM college students, self-efficacy is related to their belief in their confidence and ability to compete in an HWI learning environment that lacks diversity, equity, and inclusion platforms. Buzzetto-Hollywood et al. (2019) found that self-efficacy beliefs and mindsets are critical components influencing academic success and how students respond to situations and setbacks with their learning environment.

This research is needed because it introduces the critical elements of social capital and self-efficacy related to the successes of Black men who participate in STEM mentoring and enrichment programs at HWIs. The research expands on the development of social relationships and social capital between underrepresented Black men as they struggle with integrating into their HWI campus environments. Additionally, this study is critical because it expands on the theoretical works and current gaps in the literature.

The literature supports the need to conduct research documenting the effectiveness of minority STEM mentoring and enrichment programs and the development of self-efficacy in underrepresented Black male students who matriculate

into the STEM career fields (Ingram et al., 2016; Lavallais, 2017; Luedke et al., 2019), but is limited in its introduction and support of the importance of building social capital. For example, Brooms et al. (2015), in their study of the Black Men Achievement program, presented evidence of academic success among Black men who develop a positive relationship. In a similar study, Thomas-Rogers et al. (2018) focused their attention on the positive effects of mentoring and enrichment programs on self-efficacy and the development and transfer of social capital on the campuses of Historically Black Colleges and Universities (HBCUs).

In this phenomenological study, I focused on providing administrators, educators, policymakers, and stakeholders with insightful analysis of mentoring and enrichment programs, self-efficacy, and the importance of building social capital among underrepresented Black men who matriculate onto the campus of HWIs. The study is needed because of the disparities between the development of mentor-to-mentee relationships, academic achievement, self-efficacy, and the development of social capital for underrepresented Black men who enroll in STEM career programs at HWIs.

Creating a clear understanding of the lived experience that stimulates Black male student successes and goals is critical. Furthermore, creating an understanding of cultivating cultural environments that document the success and aspiration of Black male college students is essential. This study documents the experiences, strengths, and views of Black men who have successfully enrolled in STEM mentoring and enrichment programs.

Past studies have shown that STEM mentoring and enrichment programs can increase graduations rates, lower dropout rates, and increase participation of minority men in STEM career fields (Salto et al., 2014; Thomas-Rogers et al., 2018; Yomtov et al., 2017). In their study of Black male achievement rates, Salto et al. (2014) found that STEM mentoring programs can positively impact academic achievements. In a similar study of HBCUs, Thomas-Rogers et al. (2018) found that when in a supportive environment, Black men developed positive mentoring relationships and enhanced self-efficacy and social capital on the campuses of HBCUs. However, the question remains whether underrepresented Black male students have similar successes in STEM career fields on HWI campuses. Thomas-Rogers et al. also found that HBCUs represent the top 20 institutions to award STEM degrees to Black students due to their campus environments.

In addition, Yomtov et al. (2017) found that peer-to-peer mentorship is beneficial. Because of the support received, students could better integrate into the campus environments, benefited from their mentors emotionally, were more motivated, and received encouragement from the mentors (Yomtov et al., 2017). Luedke et al. (2019) found that students of color who participate in mentoring programs are more receptive to their academic and emotional lives. Therefore, addressing gaps in the literature will also allow for the opportunity to emphasize the impact minority STEM mentoring and enrichment programs have on Black male college students and their ability to develop self-efficacy and to build social capital in STEM career fields.

Problem Statement

According to Flowers and Banda (2019), Black men account for the least amount of STEM degrees. Brown (2019) found that Black male college students pursuing bachelor's degrees are more prone to dropping out before the end of their first year. Young and Young (2018) found that mentoring and enrichment programs can be a critical component in aiding the academic successes of Black men. While in a similar study, Williams et al. (2017) identified that mentoring and or coaching programs can be helpful in the development of self-efficacy in Black male students. In their study, Ransaw and Green (2016) discovered that mentoring and enrichment programs are critical as Black men develop social capital. Schwartz et al. (2016) suggested that the development of mentoring relationships for minority students enhances the value placed on social capital and self-efficacy.

Falcon (2015) found that when Black male students believe in their academic capabilities, they are more likely to engage in learning strategies. Gaps in the literature suggest further research is needed to measure the importance of mentoring programs designed to help Black men. This study may not fill all the gaps in the literature, but it will create an understanding of the academic needs, achievement, and degree completion rates of Black male college students who enter STEM education. The information could help coordinate efforts between administrators, policymakers, educators, stakeholders, and mentoring and enrichment program coordinators to develop programs designed to support better Black male college students who matriculate into HWIs.

Purpose of the Study

The central issue explored in this phenomenological qualitative study was how self-efficacy and social capital impact Black male students in STEM mentoring and enrichment programs. This study is critical because existing literature has not exhaustively investigated the lived experiences of Black men who enroll in STEM fields at HWIs. Studies have shown that positive interactions through minority mentoring and enrichment experiences on college and university campuses contribute to increases in self-efficacy and the development of social capital for Black men and are linked to the academic achievements of Black male students (Carroll & Barnes, 2015). Exploring the lived experiences of Black male undergraduates currently enrolled in STEM career fields at HWIs would help to create an understanding of the benefits of positive interaction between mentor and mentee. In addition to understanding the benefits of positive interactions, I explored the relationship between self-efficacy and social capital as critical elements in minority STEM mentoring and enrichment programs.

Researchers have argued that without mentoring and enrichment programs, the dropout rates of Black men are higher and degree completion among them lower than any other group (Amechi et al., 2016; Douglas, 2017; Gibson, 2014). Studies have also documented the negative experiences Black men face as they attempt to assimilate into the campuses environments of HWIs. These experiences include the lack of diversity, racism, discrimination, lack of social support, and lack of faculty that represent students of color, predominantly minority male students (Amechi et al., 2016; Booker & Brevard,

2017; Carroll & Barnes, 2015; Douglas, 2017; Gibson, 2014), and all attribute to the low success rates of Black men in STEM career fields.

Research Questions

The following three research questions guided this study:

RQ1: What role do STEM mentoring and enrichment programs play in the development of self-efficacy among low-income Black male STEM undergraduate students?

RQ2: How would low-income Black male undergraduate students describe their academic success (i.e., self-efficacy) while engaging in STEM mentoring relationships?

RQ3: What are the unique challenges low-income Black male undergraduate students face in developing social capital and self-efficacy in STEM career fields?

Theoretical Framework

The theoretical framework for this study included Bandura's (1989) theory of self-efficacy and social cognitive theory of how people's self-beliefs and actions influence outcomes and social capital. These theories were used to help understand the experiences of low-income Black male undergraduate students.

Self-Efficacy Theory

Bandura's self-efficacy theory is based on an individual's belief in their ability to succeed and in their sense of struggle, combined with resilience to meet the inevitable obstacles and equities of life. Bandura (1994) defined self-efficacy as an individual belief in their ability to do a behavior needed to achieve the desired outcome. Bandura (1997)

identified primary sources of influence from which people develop confidence in their efficacy.

Social Capital

There are several different theories linked to social capital; however, for this study, the theoretical foundation was focused on Robert Putnam's research. The theoretical aspects of social capital are centered on social relationships, whereas the significant elements of social capital are concentrated on community engagement, social networks, and generalized trust (Putman, 2001). Thus, Putnam (2001) described social capital as an integrated group of benefits consisting of social relationships, values, beliefs, social networks, trust, and organizations that support relationships and joint action for the welfare of the community.

In his book *Bowling Alone*, Putman (2000) explored the critical elements of society and the importance of bonding social capital and bridging social capital. He described bonding social capital as "good for getting by" and bridging social capital as "crucial for getting ahead" (p. 23). In a poor community, the shared educational experiences or bonding social capital are unlikely to afford Black men the social capital needed to succeed in the STEM career at an HWI. However, if provided the necessary tools and attention, such as STEM mentoring and enrichment programs to develop social capital, Black male students could use their social resources to develop the social capital needed to increase their success. An example of this would be that dropout rates among Black men in STEM career fields are among the highest in the nation. In contrast, Brooms (2018) found that when Black men receive the proper attention and are provided

opportunities, mentoring and enrichment programs aid in their sense of belonging, increase capital (social, cultural, and navigational capital), create spaces that allow for peer bonding, and reduce isolation, leading to higher retention and achievement rates.

Researchers have conceptualized bonding social capital and bridging social capital to possess a specific type of trust (Putman, 2001). Trust for Black male college students in bonding social capital would be a type of sacrifice trust, and Black male college students bridging the trust would be a generalized type of trust. When arriving on HWI campuses, Black male students may lack the bridging social capital needed to succeed and the bonding social capital needed to provide the necessary guidance to survive.

In this study, I explored the lack of social capital (bonding, bridging, and linking) needed by Black male college students pursuing STEM degrees at HWIs to assimilate into their new academic and social environment properly. I sought to address the gaps in the literature and lacking examinations of the relationship between self-efficacy and the developmental impact of social capital on college campuses. In addition to the critical need for bonding social capital, bridging social capital, and linking social capital, I explored the link between minority mentoring and enrichment programs, influences on self-efficacy, and the academic success of Black male STEM students. Additionally, I addressed the need for more faculty and staff of color and student support programs and initiatives supporting low-income Black men on HWI campuses. More importantly, I explored the need to build a support system that creates social capital and enhances self-efficacy for Black male students within the academic environment of HWIs.

Nature of the Study

In this research study, I employed a qualitative, phenomenological research design, which allowed me to understand the research problem through the in-depth exploration of concepts and phenomena (Creswell, 2009; Hancock et al., 2009). A qualitative research design also allowed me to create a broader understanding of the world (Hancock, et al., 2009) and explore the process and relationships relating to social life (Crossman, 2018). Creswell (2009) posited that qualitative research is an exploratory methodology used to explore unknown variables and theories.

When engaging the target population, qualitative researchers employ their own eyes, ears, and intelligence during the data collection process (Crossman, 2018), or researchers may employ a theoretical lens (Creswell, 2009). Qualitative research produces descriptive data a researcher interprets through transcribing, trend analysis, and coding (Crossman, 2009), which for this study was explicitly interpreted using a phenomenological approach (Hancock, 2009). I used this phenomenological study to explore the relationship between STEM mentoring and enrichment programs and the development of self-efficacy and social capital among low-income Black male undergraduate students who have chosen to enter STEM career fields.

I used semistructured interviews with a sample of low-income, Black male undergraduate students who had chosen to enter STEM career fields at HWIs. The selected research design was expected to ensure opportunities that can produce vital data, are suitable in the context of the problem, and are replicable (Bloomberg & Volpe, 2019; Creswell, 2009). In addition, the qualitative research methodology associated with this

phenomenological study was also better suited to yield data applicable to answering the research questions.

I used purposeful sampling, particularly snowball sampling, to recruit participants. This sampling method has been demonstrated to be effective with more minor, complex populations. Snowball sampling also provided a means of recruiting study participants who would typically not be reached. Black men are least likely to enter STEM career fields and find academic success at HWIs due to their sense of belonging in campus environments and differences in social capital when compared to their peers (Ottley & Ellis, 2019; Patterson, 2021). According to the literature, Black male college students have the lowest degree attainment rates (Fries-Britt, 2017; Ottley & Ellis, 2019; Patterson, 2021). Therefore, I elected to use an interviewing process.

All data were collected and analyzed using verbatim transcripts. I used qualitative analysis software program NVivo as an organized workspace to analyze the data. The first step in my data analysis process was to search all data to determine obvious recurring patterns and themes (Rubin & Rubin, 2012). The second step focused on extensive reading, summarizing, and coding data (Bloomberg & Volpe, 2019). The third step was to revisit the data to add, combine, or eliminate codes and themes. The fourth step was to conduct a summary of the critical findings. The fifth step was to document the data. In the sixth and last step in data analysis process, I documented the links between mentoring, self-efficacy, and social capital through a narrative description of themes and participant experiences.

Definitions

The following terms are defined according to their use related to this study.

Black men: For this study, Black men are defined as a man of color whose skin pigmentation is light, medium, or dark and whose genealogy is of African, West Indies, or African American ancestry.

Historically White institutions (HWIs): Institutions of higher learning in which the White population of student enrollment is 50% or greater.

Low-income: Individuals who have lived or are currently living under the poverty threshold for family size and composition based on their family household income (Stone et al., 2018).

Self-efficacy: An individual's belief in their own ability to meet a certain challenge and successfully achieve that challenge (Bandura, 1969).

Social capital: The ability to use social resources of an individual group or organization to gain a social advantage through the development of interpersonal or social relationships (Engbers et al., 2017).

STEM careers: Career fields identified as science, technology, engineering, math, biomedical, and medical career fields. Examples are biomedical engineering, mechanical engineering, computer science, and math majors. In addition, students enrolled in biology in pursuit of degrees in the medical and dental career fields were also included.

Undergraduate students: Individuals who are currently attending an institution of higher learning and are in the second year or above of the undergraduate stage of their studies.

Assumptions

Several fundamental assumptions were made concerning this study based on my experience as a community-based education specialist and minority mentoring program coordinator. First, I assumed that the nature of the study would attract willing Black male college participants who have enrolled academically in STEM career fields at HWIs. I also assumed that Black male college students would be willing to share their lived experiences as they navigate the academic and social environments of their respective HWIs. Additionally, I assumed the study would motivate each participant to take advantage of the interviews and encourage other Black male students to participate and share their lived experiences.

Scope and Delimitations

The specific aspects of this study linked minority STEM mentoring and enrichment programs, Bandura's self-efficacy theory, and the evolution of social capital for underrepresented Black male students. Self-efficacy is an individual's ability to set and achieve a goal or exercise control over vicarious experiences developed through social models and social influences (Flammer, 2015). Self-efficacy theory within a qualitative research design was essential to the study because the theory allowed me to explore how mentoring can influence the achievement of an academic goal in underserved Black male students.

Social capital is an individual's ability to develop networks and access those people and resources associated with the network. Social capital was chosen, like self-efficacy, to explore how mentoring can help underserved Black male students develop

people and resources not generally associated with the social group (Engbers et al., 2017). For example, STEM mentoring and enrichment programs are pipeline programs designed to help introduce low-income minority students to the career field; outside these programs, these students would not typically have such exposure.

A primary delimitation for the study was that I did not include underserved Hispanic male students and I did not include Black and Brown female students, which, like underrepresented Black male students, are a group not generally included in STEM career fields. The third and final delimitation I used was the term *Black* in preference of the term *African American* as an identifier for the research population, which prevented the potential for further restriction on the study population.

Transferability is defined as the point to which the results of qualitative research can be transferred to another setting (Korstjens & Moser, 2018; Moon et al., 2016). Kirsten et al. included that transferability can be critical to the application of research findings. According to Bosma (2021), transferability relates to the knowledge created in qualitative studies to better understand the study population. The current research study was conducted using participants from various HWIs of higher learning located in the Eastern seaboard region of the United States. The participants of this study represent a small group of Black male college students enrolled in STEM career fields at HWIs. The use of a different ethnic group or gender under the condition of this study may or may not have rendered different results.

Limitations

I experienced limitations during this study. First, conducting interviews on such a sensitive subject made the interview process difficult for both interviewer and interviewee, potentially affecting the level of trust between researcher and participant, and as such, potentially affecting the openness and honesty of participants during the interview process. The COVID pandemic caused all academic institutions to transfer to online learning, which created a shift in data collection procedures. The Black Lives Matter movement also could have affected the response of the Black male participants.

Because I had experience with minority-based enrichment programs as a community-based education specialist and then as a program coordinator for minority mentoring and enrichment programs, I recognized that maintaining objectivity may be challenging. Therefore, I employed a dynamic reflexive approach to acknowledge and understand the consequences of personal experiences with the issue under study (Ratner, 2002). I did not attempt to validate participants; experiences through presumptions and beliefs. Instead, I employed bracketing to ensure all personal presuppositions were exposed and brought into clear view by purposefully examining and holding them in temporary suspension (Tufford & Newman, 2010). By controlling and exposing personal expectations and assumptions through bracketing, I focused on the data collection process and the participants' prior experiences.

Significance

The significance of this phenomenal qualitative study is to provide critical information to aid administrators, educators, policymakers, and stakeholders in their

understanding of mentoring and enrichment programs as they relate to the development of social capital and the increasing self-efficacy. The results of this study are also an essential element in understanding the importance of building social capital and increasing self-efficacy for Black male college students who enroll in STEM career fields at HWIs. Additionally, this study will aid in filling the gaps in the literature. Furthermore, the results of this study can provide researchers and practitioners insight into the lived experiences and perspectives of Black male college students enrolled in STEM career fields at HWIs.

Past studies in the literature reflect Black men as having the lowest rate of success in STEM career fields and the highest college dropout rates of all cultures in their peer grouping (Green et al., 2015; Mondisa & McComb, 2015; Salto et al., 2014; Watson et al., 2015). Additionally, the literature suggests that when entering the higher education classrooms of an HWI, Black male students are often assigned at-risk categories to expect their academic career to end due to being placed on academic probation (Watson et al., 2015).

The implementations of social change are entrenched in the development of social capital and increase of self-efficacy combined with the influences of minority STEM mentoring and enrichment programs, which are a vital link in increasing enrollment and academic success of minority students, especially Black men in STEM career fields. In addition, positive mentoring experiences on historically white college and university campuses can increase positive social interactions for low-income minority students. This student has potential implications for positive social change by introducing STEM

mentored and educated Black men, inspiring hope for generations of young Black male STEM students. Black male students are statistically expected to follow a pathway to incarceration or succumb to street violence. The concept of social change and the impact on underserved communities of color is a critical element as it creates a different view through increased self-efficacy and the creation of social capital. In addition, this study can impact social change by adding to the existing works to eliminate traditional barriers that limit diversity, equality, and inclusion in social and academic environments.

Summary

In Chapter 1, I presented the desire for creating an understanding of the critical elements of Putman's theory of social capital and Bandura's self-efficacy theory and their relationship to minority STEM mentoring and enrichment programs through the lived experiences of Black male college students enrolled in STEM fields at HWIs. The process of matriculation into the social and academic environments of HWIs can be challenging for Black male students as they transition into STEM fields that lack diversity, equity, and inclusion. These challenges may differ from institution to institution, but the overall results are that they can discourage Black men from degree attainment, which adds to the dropout statistics that plague Black male college students. However, the relationship between STEM mentoring and enrichment programs, the development of social capital, and the influences that increase self-efficacy promote Black male students' academic successes in STEM fields at HWIs.

In this study, I used the lived experiences and views of Black male college students enrolled in STEM fields at HWIs to gain knowledge of the importance of social

capital and self-efficacy and the link to academic success and social relationships. In this chapter, I also presented the purpose of the study, which is to add to the literature and create an understanding of the lived experiences of Black male college students enrolled in STEM at HWIs for administrators and educators, and policymakers and stakeholders. Chapter 2 of this study will include a review of the literature and provide a brief overview of the academic and social challenges Black male students face on the campus of HWIs.

Chapter 2: Literature Review

Introduction

Over the past decade, national college graduation rates have increased, yet the achievement gap between Black male students and their White counterparts continues to widen, especially in STEM fields. Evidence shows Black men continue to fall further behind in earning college degrees in STEM. For example, Black men are disproportionately failing at a rate higher than their White counterparts. STEM college enrichment initiatives designed to help Black male students build social capital and increase diversity have shown positive results (Davis & Bost-Laster, 2019), but these programs often lack financial support. Many underserved Black male students arrive on college campuses only to leave during their first year (Broom, 2017; Broom et al., 2015; Chavous et al., 2018). Several studies have documented that Black men also struggle to integrate into HWI environments due to an inability to connect with the campus community (Patterson, 2021). In addition, research has shown that underserved Black men are less likely to pursue degrees in STEM fields and their chances of graduating without a degree beyond their undergraduate years in STEM are even higher (Broom et al., 2015; Chavous et al., 2018; Gasman et al., 2016).

Black men are more likely to enter institutions of corrections than institutions of higher education. Research has shown that underserved Black men can succeed in higher education and STEM through initiatives designed to help develop self-efficacy and social influence (Broom, 2018; DeAngelo, 2016; Ottley & Ellis, 2019; Sharma & Nasa, 2014; Strayhorn, 2015). These mentoring and enrichment support initiatives can help reverse

the negative statistics for Black male college students. The relationship between a positive mentor and a mentee is critical, and the development of self-efficacy can also help influence Black male students' success in STEM fields.

This qualitative, phenomenological study aimed to explore the lived experiences of Black men who enter STEM-related career fields at HWIs. Additionally, I aimed to understand the importance of minority STEM mentor relationships and the development of self-efficacy and social capital for Black male college students who enter STEM fields. Without the support of mentoring and enrichment initiatives, Black males can become isolated in a narrowing gate of opportunity on U.S. college campuses. The My Brother's Keeper Alliance and summer bridge programs have created opportunities for Black men to enter STEM, but these students continue to lag behind their White counterparts in degree attainment. Black men struggle with difficulties in higher education such as underpreparation, racism, stereotypes, microaggressions, and lack of academic support (Alston et al., 2017; Burt et al., 2019; DeAngelo, 2016; DePass & Chibin, 2015; Gibson, 2014; Hussin & Khan, 2017). Additionally, shortages in Black male professionals, especially in STEM fields, have been identified as a contributing factor to a lack of Black male presence on college campuses (Broom 2018; Burt et al., 2019; Hussin & Khan, 2017).

In this chapter, I summarize the limited literature concerning the importance of STEM mentoring and enrichment programs and the development of self-efficacy and social capital in underserved Black men who matriculate on the campuses of HWIs. In addition, I explore the critical elements presented in the literature of mentoring

relationships and academic success of Black men who enter STEM career fields. The literature review was conducted to create a better understanding of the research phenomenon.

Literature Search Strategy

I employed various strategies to ensure I provided a comprehensive review of the literature. I reviewed over 120 peer-reviewed articles, news articles, journals, and books. The lack of recent research focused on mentoring and enrichment programs supporting underrepresented Black male students in STEM fields became evident during the search. I began my search with the Walden University EBSCO PsychINFO search engine, which yielded fewer than four resources. I then used search engines such as Google Scholar, Education Resource Information Center, and SAGE databases. Each search engine provided valuable resources, but most literature was not published within the required timeline. The Walden University library EBSCO social work and education search engines also proved helpful.

I used several different combinations of search terms during the literature search that included various combinations of the following: *self-efficacy, mentoring, Black male graduate students, college STEM mentoring and enrichment programs, Black males, mentoring Black males, development of social capital, mentoring underrepresented minority college students, Black male college mentoring programs, mentoring at-risk minorities,* and *minority STEM college mentoring enrichment pipeline programs*. Additional terms used were *mentoring* and *the development of educational success for Black male STEM graduates*. The use of terms directly related to the actual research topic

often yielded little to no resources. However, when employed, the Walden University EBSCO search engines provided me with a large body of literature on the subject matter; still, the lack of current research confirmed the need for more study on mentoring minority students, with a particular interest in Black men in STEM education.

The literature used for this study were published between 2014 and 2021. The small body of literature in the research required the addition of studies conducted on minority mentoring and enrichment programs from the different levels of higher education and academia. In addition, older studies were significant to developing a theoretical and conceptual framework that reflects a newer synthesis of ideas.

Theoretical Framework

The theoretical framework used for this study was Albert Bandura's (1969, 1994) self-efficacy theory and Rodger Putman's (2001) theoretical aspects of social capital centered on social relationships, community engagement, social networks, and generalized trust. The two theories allowed me to explore the theoretical link between the importance of college STEM mentoring and enrichment programs designed for minority students, especially for underrepresented Black men in STEM education and social capital and self-efficacy development.

Bandura (1994) described self-efficacy as an individual's personal belief in their own ability to self-achieve or an individual having the confidence to accomplish an action-based behavioral performance. According to Bandura (2012), self-efficacy is developed in four ways. The first mastery experience describes the individual ability to overcome obstacles through perseverant efforts; the second is social modeling or the

imitating of successes of people who are similar and inspire belief in one's capability; third is social persuasion, the persuasion of the individual to believe in themselves; and fourth are self-beliefs and the self-development and change in an individual. In addition, Bandura suggested that observation, imitation, and modeling are three behavior concepts humans learn.

The theoretical aspects of social capital are centered on social relationships, community engagement, social networks, and generalized trust (Putman, 2001). Thus, Putnam (2001) described social capital as an integrated group of benefits consisting of social relationships, values, beliefs, social networks, trust, and organizations that support relationships and joint action for the welfare of the community. The three main concepts of social capital are bridging social capital, bonding social capital, and linking social capital. According to Putman (2001), bonding social capital is defined as the networks having relationships within a group or community members, and individuals are interconnected through their frequent interaction (Putman, 2001). Examples of bonding social capital are ethnic fraternal organizations, church-based groups, and fashionable country clubs (Putman, 2001). Putman (2001) suggested bridging social capital is the relationship between race, religion, social groups, social class, or socioeconomic characteristics. Examples of bridging social capital are civil rights groups like Black Lives Matter, youth services groups, and ecumenical religious organizations (Putman, 2001). Claridge (2018) conducted a study in which linking social capital describes networks developed through trusting relationships between individuals that interact across official, explicit, or traditional powers or authority within a society. An example of

linking social capital is developing a relationship where the individual may have the power to provide access to jobs, services, or resources. Additionally, Claridge (2018) credited scholars from the World Bank with linking social capital, which demonstrates the central well-being of poor communities where bankers charge higher interest rates and the absence of teachers who fail educational systems.

Black Males' Experience

Low-income or poor Black men are matriculating in the campus environments of HWIs, lacking the self-efficacy and social capital needed to succeed. Noted throughout the literature are the insufficient enrollment and success rates among underrepresented Black male college students (Brooms et al., 2015; Chavous et al., 2018; Douglas, 2017; Gibson, 2014; Hines et al., 2021; Malcom & Feder, 2016; Sinanan, 2016; Strayhorn, 2015). A lack of professional support and lack of academic preparation suppress the ability of the underrepresented Black male student to succeed in academia, especially in STEM fields, which is one of the contributing factors to this phenomenon (Alston et al., 2017; Brooms 2018; Burt et al., 2019; DeAngelo, 2016; DePass & Chibin, 2015; Hormell & Knight, 2019; Hussin & Khan, 2017).

According to Minor et al. (2021), among Black male students, self-efficacy, as it relates to academics, is essential because these students are prone to contend with structural barriers and institutional racism. In a similar study Claridge (2018) suggested that social capital provides the opportunity for exchanging information, ideas, and access to social credentials, which can help generate a sense of belonging; these are critical elements as Black men transition into their new learning environments. To create social

capital, HWIs need to provide mentioning and enrichment programs, support resources, and spaces where students of color can feel safe developing social capital and increasing their self-efficacy.

Hypolite (2021) studied support programs such as Black culture centers and found that when fostering social integration in support of the development of social networks, HBCUs have better successes with a support system like a Black cultural center, whereas HWI programs were found to foster an environment of survival for Black male students. Hines et al. (2021) noted the importance of academic and career enrichment programs, experience, and meaningful opportunities. Academic and career programs can create the needed access and exposure necessary to experience connections, which is needed for students of color. Howard and Williams (2018) found that Black male college students are viewed as anti-intellectual, disengaged, or not interested in their future. In addition, the authors identified how Black men are negatively affected by constructions of gender and race (Howard & Williams, 2018).

Black men, particularly those seeking a career path in STEM, are entering academia without the needed guidance and professional relationships to support their success due to a lack of professional and academic support. According to Sharma and Nasa (2014), *mentoring* refers to a professional relationship between an experienced individual and an individual seeking guidance and a role model to assist the latter in growing similar professional knowledge and career development, which can be accomplished with the development of self-efficacy through social modeling.

The development of self-efficacy through feedback adds to unique variance in academic outcomes and is essential to Black male college students (Sharma & Nasa, 2014). In their qualitative study, Sharma and Nasa (2014) outlined the relationship between the development of self-efficacy and an individual's personal experiences. Underserved Black men bring to the college environment a wealth of personal experiences. However, without the proper preparation and support systems, which can influence the development of academic self-efficacy, achieving their academic goals may remain out of reach.

Sharma and Nasa (2014) focused on enhancing academic achievement as the students relate to academic demands in a new educational era. The researchers posited that individual self-related perception is a strong predictor of academic success deeply rooted in the individual's past academic achievements. Furthermore, building self-confidence or developing the belief in one's strength is essential among minority students (Sharma & Nasa, 2014). Sharma and Nasa noted that self-confidence centers around an individual's situation and conditions to accomplish a given task and setting high achievement bars is related to self-efficacy.

Sharma and Nasa (2014) described self-efficacy as self-confidence, self-reliance, and trust in self, a variable needed for academic success among minority students. Self-efficacy is the building foundation for motivation, an individual's well-being, and accomplishments (Sharma & Nasa, 2014). Therefore, self-efficacy is a critical influence and contributor to learning and academic success. Academic self-efficacy is deeply embedded in the individual desire to achieve academic success (Sharma & Nasa, 2014),

which is reinforced through the support and feedback of professional mentoring. The development of academic self-efficacy through feedback not only adds to a unique variance in academic outcomes but is essential to the academic successes of Black male college students. Further, self-efficacy development is directly related to an individual's personal experiences (Sharma & Nasa, 2014). Once developed, academic self-efficacy could lead to changes in behaviors and motivation that can either improve or hinder performance (Sharma & Nasa, 2014).

Strayhorn (2015) conducted a qualitative study to examine factors that influence preparedness. Black males may need to succeed in the STEM fields in higher education. The study examined factors that could negatively and positively affect Black male students in the STEM fields (Strayhorn, 2015). Strayhorn identified socialization, gender, and other factors, such as racism within the campus environment, as factors that might hinder the success of Black men in STEM. Conversely, Strayhorn found precollege enrichment programs, self-efficacy, and the sense of belonging to be factors that could positively affect the academic success of Black men entering STEM education in a college environment. The Strayhorn study identified academic preparation, educational and occupational aspirations, and academic self-efficacy as three essential factors that positively affect Black students who enter college-level STEM majors. The study also suggested that Black men who lack adequate college-level preparation for gatekeeper curricula, such as math and science courses, may opt to leave the STEM majors (Strayhorn, 2015). Thus, Strayhorn suggested the Black male departure from the STEM fields may result from a lack of exposure to rigorous math and science courses delivered

by a well-qualified teacher or the fact that most underrepresented men may have attended low-performing high, high need schools.

When considering pre-college self-efficacy, Strayhorn (2015) found Black males identified as having a firm belief in their academic abilities. The study found that over 65% of Black males were interested in the STEM fields during their early childhood, and another 55% reported having at least one parent who worked in STEM (Strayhorn, 2015). The Strayhorn study also suggested that academic self-efficacy is essential to the academic success of Black males. The research found that 26.3% of the individuals interviewed were confident in the academic preparation received during their high school years (Strayhorn, 2015). In addition, Strayhorn found deficiencies in Black male college readiness were due to the lack of advanced programming and inadequate resources. The results of the Strayhorn study suggested the need for further research on clarifying the Black male sense of belonging in the STEM fields.

Literature Review

In a literature review, Brunsma et al. (2017) found that academia has failed to do a suitable job mentoring students of color. Using over 80 studies, Brunsma et al. (2017) sought to answer questions related to the effectiveness of mentoring students of color enrolled in the graduate program. The team found that students of color experienced a change in complex interrelations, which affected levels of self-efficacy and social integration, and mentoring opportunities (Brunsma et al., 2017). Similar to most studies, the team found the motivational push behind the desire to pursue graduate education among students of color is their desire for knowledge, their desire to research in the field

of interest, and their desire to become educators so that they can benefit others in their communities and the community at large (Brunsma et al., 2017). One significant data point associated with mentoring minority students noted in the Brunsuma et al. (2017) literature review was how useful mentoring programs are when adequately supported. However, consistent with the literature are issues related to doubt when mentoring students of color, their desire to pursue graduate opportunities, and many related issues stemming from racial, discrimination, environmental, and social issues. The Brunsuma et al. (2017) literature review suggested negative race-related issues were found to be at high levels, which could negatively affect an already marginalized Black male.

Brunsma et al. (2017) found minority students throughout the literature expressed their desire for more mentoring, advising, feedback, structured opportunities, information, guidance, and guided reflections, all of which can be provided through structured mentoring programs. More importantly, the literature review by Brunsma et al. suggested that if high dropout rates among students of color are to be addressed, an analysis of race would need to be conducted. Brunsma et al. (2017) asserted that without an analysis of race, the experiences of students of color become marginalized in academia.

Lastly, looking toward the question of faculty representation, Brunsma et al. (2017) found that students of color persistently stressed the need for faculty that look like them. The lack of minority faculty and staff hurt the efforts of mentoring programs and enrichment programs. This lack of Black male professionals available to mentor is in addition to the growing problems stemming from the lack of financial support for

minority mentoring and enrichment programs. Brunsma et al. (2017) also found that there is little to no effort placed on recruiting minority faculty members. More importantly, the team found systemic racism within the broader social environment of higher education, combined with daily macroaggressions, which leaves the question as to what is indeed known about mentoring students of color (Brunsma et al., 2017).

Effective Programming

Effective mentoring programs can also provide opportunities for Black males to overcome several unique challenges; one such challenge is the development of social capital. Hussin and Khan (2017) conducted a qualitative study on the relationship between social capital and self-efficacy among postgraduate students. Black male college students, especially those considered underserved and with less than good backgrounds, may struggle to develop a social relationship and social capital as they enter graduate studies. Hussin and Khan (2017) identified three constructs for building a professional relationship, self-efficacy and social capital. The first was language, which is a critical part of communication and sharing ideas. The second was a shared vision related to collecting goals and aspirations or ideas and resources shared (Hussin & Khan, 2017). The development of shared vision or self-efficacy for Black males is essential and having the connection between a mentoring relationship and the development of goals and a shared vision are just as important. The third predictor was trust, which was identified as the belief or expectation an individual may share with other members of society (Hussin & Khan, 2017). Hussin and Khan (2017) identified trust as an essential component in

developing mentoring relationships among Black males when entering new social relationships.

The research also identified on-campus mentoring and enrichment programs to help establish trusting relationships between underserved Black males and their mentors. (Hussin & Khan, 2017). In their study, Hussin and Khan (2017) also noted the importance of trust through knowledge transfer; trust is a crucial component in sharing knowledge when students enter their postgraduate studies. As with similar studies, Hussin and Khan (2017) identified gaps in the literature, which fail to support the significance of social capital and self-efficacy development between at-risk Black males and their mentors.

Why does mentoring matter? The question creates a strong place marker for asking why mentoring enrichment programs should exist on college campuses. Booker and Brevard (2017) asked the equivalent question in the title of their article, Why Mentoring Matters African American Students and Transition to College. The authors suggested that mentoring programs are a crucial component to the success of African Americans who transition into higher education (Booker & Brevard, 2017). Their findings showed similarities to other scholarly research, suggesting that mentoring and enrichment programs that serve students of color are effective. Booker and Brevard (2017) found that 66% of those students surveyed felt their mentoring relationships helped them during their college transition, while another 60% felt the relationships developed were good or excellent experiences.

Most importantly, 76% of students of color identified using their mentoring experience to discuss academic issues (Booker & Brevard, 2017). For most students of color, especially Black males, this conversation would typically not happen until the student is facing some academic probation or deferment. In addition to having professional support to provide guidance usually not readily available to underserved minority students, Booker and Brevard (2017) found the development of lasting relationships influenced interpersonal support and guidance, which are critical components in the growth of mature young men and young women. The research results identified the importance of an early mentor to mentee interaction as critical to underserved minority students' academic success (Booker & Brevard, 2017). Participants of the study felt their first-year college experience was more favorable than those students who did not participate in college mentoring and enrichment programs (Booker & Brevard, 2017).

Booker and Brevard (2017) identified the benefit of developing professional mentoring relationships and the influences of academic successes of underserved minority students to be a common theme directly related to similar studies. The authors also found the development of professional mentor relationships and setting goals to be significant to the academic success of underserved minority students. In addition, the results of the study identified that early-career guidance provides opportunities for minority students to develop critical academic, social, and career achievement skills (Booker & Brevard, 2017). Early career guidance has been identified as an essential element in the academic success of Black males entering STEM career fields; however,

the lack of scholarly works leaves the critical elements of mentoring at-risk Black males and the development of self-efficacy through academic support and enrichment programs unsupported. Booker and Brevard (2017) also proposed that as changes continue to occur in higher education, the challenge is for administrators, faculty, and staff to ensure that the bridge between academic and personal success is in place for underserved minority students.

Young and Young's (2018) study of Black students who participate in out-of-school enrichment programs found a direct relationship between out-of-school (OST) enrichment programs and Black students who engage in advanced science and academic preparation. The research suggests that Black high school students actively engage in OTS enrichment programs to enroll in advanced science courses (Young & Young, 2018). For underserved or economically depressed students of color, enrichment and mentoring programs become college pipeline gateways to academic success in the STEM fields. However, similar to other research, Young and Young found that afterschool activities like OST enrichment programs and other mentoring and enrichment support programs are helpful but lack support. Economically underserved Black students have also been found unable to participate in enrichment and mentoring program due to environmental challenges, such as the need to work and provide financial support to the household income (Young & Young, 2018). For those students entering pre-college and college enrichment programs, the lack of financial support can also stunt the ability to participate in their respective academic programs, especially STEM mentoring and enrichment programs.

Williams et al. (2017) took a hard stance on the importance of coaching and vicarious learning in their study of underrepresented minority Ph.D. students enrolled in The Academy for Future Science (The Academy). Williams et al. (2017) used a qualitative methodology to develop self-efficacy and career development through academic coaching. Informed by social scientist theories and concepts, such as self-efficacy theory, Williams et al. (2017) found coaching programs designed to help underrepresented minority doctoral students in the biomedical sciences to be influential in developing self-efficacy and vicarious learning models. Williams et al. (2017) found that in the absence of a mentor group or coach, programs can be hurtful in creating opportunities for under representative minorities (URM) students to develop self-efficacy and vicarious learning opportunities. The study also suggested that coaching programs can be a critical tool in addressing the lack of career development opportunities that most URM students face in their learning environments (Williams et al., 2016). In addition, Williams et al. (2017) found that coaching provided URM students a platform to openly and honestly discuss challenges they faced in academia. The team also found coaching beneficial to URM students because coaching models provided students with an alternative to success (Williams et al., 2017).

Academic success in the minds of under-representative Black males, especially in the STEM career fields, means harboring fears of peer pressure brought on by educational, environmental, and social interaction between their peers and their community. Ransaw and Green (2016) found in their literature review that underserved Black students arriving on college campuses face several unique challenges. The authors

found Black males are steered by peer pressure, controlled by the fear of losing communal and ethical solidary. The article also suggested that African American students cannot successfully balance their social and educational capital (Ransaw & Green, 2016). Without the opportunity for social interaction with professionals that look like them, the Black male college student can find individual challenges not mutual to their cultural norms as they enter STEM career fields. Ransaw and Green (2016) found that such changes can be related to social and economic status in the Black community, which allows Black families to move as their social, economic status changes.

Ransaw and Green (2016) also noted that Black students could face peer pressure suggesting they sold out their Black culture due to academic achievement. More importantly, this form of peer pressure could leave Black males trapped in a battle between their peers and their academic achievement (Ransaw & Green, 2016). Ransaw and Green (2016) also found that high academic achievements, speaking correct English, and reading books among Black students could lead to bullying and being labeled as acting outside their race. One crucial factor noted in the Ransaw and Green (2016) literature review was the Black males feeling isolated due to their academic achievement. The article also identified a direct relationship between cultural peer pressure, the influence of self-efficacy in Black males as they attempt to set high academic expectations (Ransaw & Green, 2016).

The literature suggests underserved Black men are faced with several unique challenges when entering the STEM fields, such as being unprepared for the academic rigor required by most STEM programs. Black males have also been unable to reach

above-average achievement marks on general or advanced science measures. In their desire to create an understanding of the declining rate of Black males enrolling in medical school, the Association of American Medical Colleges (AAMC, 2015) published a research document that highlights the low participation rate of Black males in the STEM career field, which also affects medical school enrollment. The AAMC (2015) suggested pipeline programs designed to create and retain a Black male interest in the medical field are generating increases in applications; however, data show a decline in enrollment of Black males in Medical school compared to data taken from 1978 (AAMC, 2015) and suggested that in 2014, enrollment for Black Males was lower than any other ethnic group (AAMC, 2015).

Black Male Professionals

When responding to questions related to the Black male professional influence on Black male college students who enter the STEM fields of study through STEM mentoring and enrichment programs, the role of Black male professionals and their influence through mentoring programs are documented in scholarly journals, but their effects lack support. Brooms et al. (2015) conducted a qualitative study of one such program titled the Black Male Achieve program, a Mid-South University mentoring and enrichment program designed in response to the declining Black male college achievement rates and retention crises.

Brooms et al. (2015) found three primary themes in their study: meaningful interaction, self-empowerment, and building and engagement. Each suggests a meaningful mentor to mentee experience. Brooms et al. noted that Black male students

are motivated through meaningful interaction and connection with their mentors. They were also found to have opportunities to network and improve their knowledge base. Empowerment, self-awareness, and self-discovery afforded Black males the time to reflect on self and why earning a college degree is essential (Brooms et al., 2015). The researchers found Black males through the BMA mentoring and enrichment program and discovered how empowerment helped increase Black male participants' non-cognitive skills, especially goal setting, and the drive to improve practical skills.

In addition, Brooms et al. (2015) noted that the study participants found their mentoring experience essential because positive professional role models allowed them to network. Black males in the study found that mentoring helped with professional development and helped create social capital (Brooms et al., 2015). In line with similar studies, Brooms et al. posited that research shows the importance of mentoring programs like BMA. The overwhelming portion of the literature suggests more research be conducted on the effectiveness of mentoring programs designed to help improve retention and achievement rates of Black male college students. The literature also failed to document those students who have succeeded at the graduate level (Brooms et al., 2015).

Historicistically Black Colleges and Universities (HBCU) have significantly influenced Black males' success and achievement in the STEM fields. However, the role of the HBCU in the STEMs and STEM programs serving underrepresented minorities remains absent in the literature. Gasman et al. (2016) conducted a study of the Black male achievements in STEM and STEM pathway programs at an all-male HBCU to enhance the understanding of the role in which HBCUs play in STEM education. There is

a powerful connection between influence, motivation, and Black male professionals related to Black students' achievements. The research suggests HBCUs are known to be some of the top producers of Black STEM graduates. The image of the Black professional can inspire dreams and influence the development self-efficacy of Black male college students. HBCUs were historically created to educate the sons and daughters of former slaves. The original goals of the Black college were to train Black students to become teachers. This era has ended, and now HBCUs thrive on academic excellence and academic achievement for students of color. For decades, HBCUs have produced many successful Black professionals in all educational masteries, especially STEM careers. However, for Black males who attend HWIs, the road to academic success and achievements in the STEMs have been less attractive. In their review of the literature Gasman et al. (2016) noted that Black students who transfer from PWI found HBCUs afford better opportunities to develop relationships with the Black professional than they experienced at PWI. The study also posited that Black students who enter their first year of STEM education at HBCUs found the experience identifying same-race professional mentors to be much more accessible, encouraging self-motivation and persistence (Gasman et al., 2016). When Black male professionals mentored Black male students, the researcher found that long-term relationships were established, and the Black male students openly sort help when needed on the college campus (Gasman et al., 2016). The influence of Black faculty at HBCU has created positive attitudes, improved social capital, retention rates, and student engagement for Black males pursuing careers in the STEMs. The impact of on-campus Black male professionals has on the retention

and development of Black male college students in the STEM career fields is critical. Especially in the early developmental stages of Black male college student academic careers in the STEMs

Program Effects

Brooms et al. (2015) conducted a qualitative study on the experimental effects of the Black Men Achievement Program (BMA), a Black male college mentoring and enrichment program. Brooms et al. (2015) found that programs similar to the BMA program help influence academic and professional achievement amongst Black male college students. Brooms et al. (2015) suggests that minority mentoring and enrichment programs empower Black males, increasing awareness and opportunities that would not be offered or brought to the Black male attention. Additional notable enhancement afforded through the BMA program was the opportunity to connect with members of their direct peer group and the destruction of perceptions that limit the Black male college student (Brooms et al., 2015). The finding was not a surprise in 2001. The 45th presidents of the United States signed the no child left behind (NCLBA) legislation to send underserved minority children to college. However, the NCLBA has not adequately prepared underrepresented students of color for the academic rigor required by institutions of higher learning, especially the Black male. Brooms et al. (2015) noted that recruitment of Black males has increased, but with the increasing efforts, retention and graduation rates among Black males continue to be the lowest among all racial groups. Brooms et al. (2015) suggested that as few as 34% percent of the Black males entering a four-year institution will graduate nationally due to the unique challenges Black males

face. The graduation rate for Black males entering the STEMs fields is even lower due to the low number of Black males entering the STEM fields. Consistent with the literature, Brooms et al. (2015) identified similar challenges that impact the academic success of Black male college students. Challenges include Black males struggling to attain academic success on PWI campuses and social barriers associated with racism and discrimination while on campus (Brooms et al., 2015). In their study, Brooms et al. (2015) noted that when engaging in social activities and mentoring that support their social identity and the building of social capital, Black males report feeling a sense of security. However, like most studies, Brooms et al. (2015) identified a lack of scholarly works identifying mentoring and enrichment programs that help Black males create social interactions.

A qualitative case study focused on one-year in the life of Ph.D. students in a group coaching program at the Academy for Future Science Faculty (the Academy). Williams et al. (2017) sought to provide a statistical analysis of the effects of group coaching programs. The study conducted by Williams et al. (2017) suggested that the Academy, a coaching program designed for biomedical Ph.D. students interested in teaching careers, can help underserved minority students achieve their goals and promote persistence toward their academic careers. Williams et al. (2017) also noted that coaching could provide unrepresentative minority students with more opportunities to develop self-efficacy while increasing social learning opportunities. Factors identified by Williams et al. (2017) as beneficial to under representative minorities who participated in the Academy are that coaches can act as independent advisors. Because they are not a part of

the institution, having a conflict of interest is less likely and time through coaching programs is more dedicated, allowing space for more discussion. The study's goal was to impact achievability in academic career fields, but Williams et al. (2017) focused on a more critical effect: the desirability of underrepresented minority students. Overall, in their study, Williams et al. (2017) found that increasing diversity will require a broader approach beyond classical mentoring. The literature is full of issues minority students face daily, yet mentoring and enrichment programs like the Academy, which focuses on coaching instead of one-on-one mentoring, continue to suffer due to the lack of proper support.

Lavallais (2017) conducted a study to show the relationship between African American male undergraduates identified as at-risk and the perception of achievement, persistence, and postgraduate job placement. The Lavallais (2017) study revealed a common theme between the substantial positive impact of mentoring relationships and the academic success of African American males. Lavallais (2017) found there is no easy way to empower African American students with backgrounds that deprive them of social, economic status, and inadequacies of self-efficacy as they matriculate into large public institutions, private institutions, and predominantly white institutions of higher learning. However, Lavallais (2017) also noted that when enrolled in mentoring and enrichment programs, African American males have higher grade point averages and are more likely to succeed when compared to those who did not participate in the same program. Lavallais (2017) also found that over 50% of the research participants found on-campus mentoring programs helped develop skills and concepts to connect them with

opportunities they would not typically have directly. More importantly, the study identified a direct connection between mentoring and increases in grade point average and retention rates of at-risk African American males (Lavallais, 2017). Additionally, Lavallais (2017) found that mentoring provided both the mentee and mentor with benefits identified as greater satisfaction, stronger organization ascension, social networks, and professional achievements.

The literature suggests that Black male college students are less likely to succeed in most college environments. These grim statistics include lower graduation rates for Black males pursuing degrees in the STEM fields. When enrolled in urban community colleges, the drive for academic excellence was influenced by several motivational factors in Black males. In their qualitative study, Ingram et al. (2016) found that Black males feed off persistence fueled by the desire to improve their current status. Ingram et al. (2016) identified pressures associated with societies, their roles as the man of the house, and the encouragement of the faculty and staff as critical elements for Black males. Ingram et al. (2016) suggested five primary domains identified by scholars who support programs that influence success in Black male community college students. These factors were listed as pre-college consideration, academic domain, the environmental domain, the non-cognitive domain, and the institutional domain (Ingram, et al., 2016). When selecting support programs to improve the success of Black males, the study suggested community colleges not use “off the shelf programs.” When underrepresented African American students decided to explore academic goals, Ingram, et al. (2016) found that the absence of self-efficacy impacts their ability to obtain goals.

Empowerment Through Mentoring

The empowering of Black males in an academic setting is critical. However, the research consistently suggests that the lack of faculty and staff that represent students of color hinders the retention and academic success of Black males. Mentoring fills voids that most Black males typically lack. Ingram et al. (2016) found that positive engagement from faculty and staff of color increases the persistence of Black students. However, setting realistic goals can be difficult for African American students. The study identified a direct relationship between the lack of goal setting and environmental issues, which force underrepresented Black males to compete between family obligations, financial support, and homework (Ingram et al., 2016).

Mentoring Black males who typically would not have a gender-specific role model in their lives, especially in an academic setting, has proven to create a positive relationship that inspires academic goal setting and academic success (Ingram et al., 2016). Long-term relationships between mentors that look like the Black male student can also fill voids that most underserved Black male students may lack in their home environment (Ingram et al., 2016). Ingram et al. (2016) found African American males are suffering from the lack of opportunities to share experiences, lack of support by faculty and staff to create bonds, and the lack of opportunities to socialize, all of which obstruct the ability of African American males to develop social capital, self-esteem, and self-efficacy (Ingram et al., 2016). The study also supported the importance of mentoring and enrichment programs designed to help increase enrollment, retention, and more import graduation rates of African American males (Ingram et al., 2016).

When considering the unique challenges that underrepresented minorities face and the importance of mentoring relationships, a common theme in the literature suggests the lack of minority faculty and staff. Zambrana et al. (2015) conducted a study relating to the mentoring of underserved minorities at research institutions. Zambrana et al. (2015) studied a small body of data that suggested the absence of professional support from minority faculty at research institutions could be a crucial link in the lack of success among underserved minority students. The group focused their research on the three critical areas the development of social capital, barriers associated with undervaluing research such as community engagement, and the connections between mentor and mentee. Each area identified the need for more attention (Zambrana et al., 2015). Zambrana et al. (2015) noted many critical trends with student interviews and existing data, including the lack of professional mentoring and enrichment support programs. The group found the absence of mentoring and enrichment programs discouraging minority students who rely on advisors to help navigate them through academic career pathways (Zambrana et al., 2015). The Zambrana et al. (2015) study also suggested that the lack of effective mentoring halts the transfer of knowledge and the accumulation of institutional and social capital.

When entering new educational environments, Black males have been known to face different environmental and emotional challenges. Some of these challenges may be unique to the Black males, especially those who identify as having underserved backgrounds. Gibson (2014) discovered in a qualitative study of the impact of mentoring programs for Black male community college students that Black males face many

destructive influences, such as campus environments that are not favorable or supportive based on racial preferences and the lack of sufficient financial aid (Gibson, 2014). Gibson also noted the lack of enrichment activities that support the social and cultural needs of Black males and the institutional failure to conduct the necessary research to support minority achievements and retention rates. For most PWIs, the lack of faculty and staff that look like the Black male college student can also negatively influence the achievement and retention rates of Black males (Gibson, 2014).

In addition, PWIs lack the fundamental knowledge of the Black male's actual home environment or their different realities related to lifespan struggles and the lack of support or mentoring programs designed to help Black male achievement. Interventions or mentoring programs designed to help minority students have been noted by Gibson (2014) and other scholars to increase the achievement and graduation rates of minority students. However, most institutions of higher learning fail to provide the necessary funding to support minority intervention or mentoring programs. A notable theme within Gibson's (2014) study and other scholarly works is the desire to build social capital. Gibson (2014) suggested in her study, the development of professional relationships with Black male role models from the local institution and community help minority students develop speaking and social skills usually not available to them before entering college. Gibson (2014) identified the community-type mentoring programs as traditional to the Black male college student. Gibson (2014) also noted serval successful Black male mentoring initiatives operated by college support programs.

Influencing Academic Success

There are a number of ways to answer questions, such as how Black male college students would describe their academic success while engaging in STEM mentoring relationships, is not as simple as it sounds. However, in a qualitative study conducted by Chavous et al. (2018), the findings demonstrated that underrepresented minority graduate students described their experience as contextual or experiences that influenced their academic identity. The study suggested that minority students have also found their experience to be the driving force when considering how, as learners, they engage others in their disciplinary context and view themselves as members of their respective STEM discipline (Chavous et al., 2018). On the destructive side of the process, the study found that underserved minority students were numerically disadvantaged (Chavous et al., 2018). They were also noted as having encountered racial microaggressions and racial stigmatization within their respected STEM fields. Participants in the study also described their experiences while in the STEM fields as lacking the academic and environmental social support needed to achieve their goals (Chavous et al., 2018). However, when minority students are engaged in positive relationships with a mentor, the study found their goals are established based on their overall academic growth (Chavous et al., 2018). Participants in the Chavous et al. (2018) study also suggested that the lack of investment in mentors worked against the institution's diversification goals.

Vital mentoring programs are designed to help aspiring, motivate, and create change through the development of mentee self-achievement and self-efficacy. Chavous et al. (2018) identified four characteristics of mentoring and motivation in an effective

mentoring relationship. These four-character foci on the importance of the student achievement and the development of potential, the development of a personal joint relationship, professional relationship between mentor and mentee, and a relationship that includes the mentor's investment in the mentee's emotional and psychological desires, as they aspire to set goals (Chavous et al., 2018). However, if the development of solid mentoring programs happens, Chavous et al. (2018) stressed the importance of institutional involvement and the creation of positive relationships that eliminate biases and racialized cultures.

The perception a student may have of his or her ability and opinions and the beliefs of other individuals is considered one of the most powerful yet the most difficult influences to measure (DePass & Chibin, 2015). However, consistent with most literature, known influences, such as stress associated with navigating through the STEM career fields, feelings of isolation, unwelcoming or hostile social and campus environments, racism and cultural stereotypes, and the reaction to biases or being treated less than equal have shown to have an undesirable influence on the experiences of underrepresented students in the STEM career fields.

In summary, Identity, Bias, and Self-efficacy, DePass and Chibin (2015) chronicled discussions on the effects of bias that negatively impact African American male students who desire to enter STEM college and career fields. In their report, DePass and Chibin (2015) acknowledged that underrepresented minorities represent 29% of the STEM career field while only 9% of underserved minorities make up today's workforce. DePass and Chibin (2015) also noted that minority students are deciding to leave the

STEM career field at a rate that is twice that of their white and Asian counterparts, which strongly suggests there are reoccurring problems and missing components. In their report, Depass and Chibin (2015) posited that 3.1% of the minority students who received baccalaureate degrees from top research universities receive PhDs each year.

Three possible solutions to the problems are first rethinking or repairing the leaks in the pipeline in science education; the second solution is rethinking the investment and payoffs; and the third solution would be understanding the differences in privilege and change in behavior or placing more emphasis on the impact of how the other person is treated (DePass & Chibin, 2015). In addition, DePass and Chibin (2015) found that vocational interest is not the single significant factor contributing to the African American males persistence in a career field. DePass and Chibin (2015) also found that self-efficacy and interest contribute to many unique occupational variances in African American males in the STEM fields. Also noted in their study was the importance of opportunities that help expose African American males to STEM majors, as options that suggest self-efficacy to be a predictor of workforce desires and interest (DePass & Chibin, 2015).

The results of the DePass and Chibin's (2015) study supported that African American males' belief in self-development and growth in STEM career fields proved to provide opportunities and are more likely to pursue careers in the STEMs. Support from family, whether nuclear or nonnuclear, was not only a significant factor for African American males but was critical to the success of all students. The study found that family support is vital in the efforts of African American males who pursue STEM

degrees (DePass & Chibin, 2015). Overall, DePass and Chibin (2015) found that self-efficacy at all levels of the STEM educational trajectory and support programs are essential factors influencing African American males to pursue STEM majors and careers.

Consistent with the literature, the AAMC (2015) found that Black males often face several barriers when considering the STEM fields. These barriers include the lack of or limited knowledge of STEM career pathways, the lack of positive role models, financial instabilities, and their attraction to academic programs that are not as intensive. The study also supported that pipeline and enrichment programs are critical elements in developing Black male interest and social networks (AAMC, 2015). The creation of enrichment programs and early interactions between mentor and mentee can be vital to the successes of young Black males. The AAMC (2015) report suggested that due to inadequate preparation, the desires of Black males to enter college are adversely affected.

A recurring theme in the research was Black males' struggles when entering the STEM field (AAMC, 2015). Black males have been found to struggle with various stereotypes, including being labeled when they respond to a situation or act out of line, which can cause them to be removed from mainstream programs and diverted into less productive pipeline programs (AAMC, 2015). The AAMC (2015) also noted the absence of Black male role models as a recurring theme and the perception of Black male students when they are in academic environments, which could adversely affect their academic outcomes.

The deeply rooted beliefs and self-related perceptions of an individual when they enter a particular environment, especially the college environment, could also follow the Black male as they transition higher into their academic careers. DeAngelo (2016) found academic mismatch to be a potential problem that underserved students may face. DeAngelo described academic mismatch as the academic overmatching of at-risk minority students. Being mismatched suggests students of color are overmatched and set to perform poorly academically, which causes them to feel their chances to succeed in graduate education are not possible (DeAngelo, 2016).

When considering a mentor, DeAngelo (2016) identified four factors that encompass a healthy mentoring relationship: the characteristics of achievement and development, reciprocal relationships, influence and achievement, and a relationship committed to the career aspiration of the career mentee. Also noted in the study and throughout the literature were examples of bias and unique challenges a minority student may face as he or she pursues the dream of earning a college degree (DeAngelo, 2016). A recurring theme in the literature is the lack of positive influence regarding a Black role model that looks like Black students, on college campuses, especially in the STEM career fields.

DeAngelo (2016) also identified that the lack of program investment works against earning a graduate education. However, the study noted that underserved minority groups become goal-oriented and create social networks (DeAngelo, 2016). In addition, the DeAngelo study identified the importance of mentoring programs as critical to quality education for at-risk minority students. The development of positive mentor to mentee

relationships can also create shifts in campus culture, which help influence diversity and the development of pipelines into professional degree choices for Black males and other at-risk minority groups.

Mentoring in the STEM career fields is not a single individual's endeavor; it takes strong individuals. Research has shown that Black male students enter college environments underprepared and lack the academic groundwork needed to succeed in the STEM fields. In their qualitative study of the graduate professoriate, Alston et al. (2017) sought to gain an understanding of the influences of mentoring and the link between the development of career and scientific identity as they relate to the understudied population of Black male students who pursued a Ph.D. in STEM. Black males have, for years, struggled with constructing their identity and the link with career development. They often enter a stage of code-switching to survive in their new environment. Alston et al. (2017) suggested that Black males are more prone to draw off races outside of their Black peer group when interacting and developing a sense of belonging. The group found that socialization associated with mentoring is linked to the central component of identity development for Black male graduate students (Alston et al., 2017). The study found stereotypes in a white, male-dominated field where historical characteristics suggest the scientists were Eurocentric (Alston et al., 2017).

This qualitative research by Alston et al. (2017) noted the lack of literature supporting the experience of Black males who enter doctoral studies. The study also focused on the significance of early interaction through supportive actions between students of color and competitive advantages for developing the necessary competencies

to succeed within the academic culture (Alston et al., 2017). In addition, Alston et al. (2017) found that professional mentoring relationships contributed to the academic skills development of the Black male mentoring relationships and helped develop the necessary social skills needed in their new social environment.

Self-Efficacy

When underrepresented minorities arrive on college campuses, many lack the social capital needed to succeed; however, their level of self-efficacy may be higher. In a study on self-efficacy, author and psychologist August Flammer (2015) suggested self-efficacy references an individual's ability to produce significant outcomes and encompasses the individual's self-perception of how they feel and the ability to put into controls into action. However, individuals feel powerless when they enter a situation believing they are in control, but they do not have control. They may also have the confidence to achieve but do not put the necessary control into action. Flammer (2015) suggested that the state of not having control of critical situations can create a feeling of being vulnerable, which in the worst scenario can demotivate the individual.

However, Flammer (2015) proposed that when an individual is put in a situation, such as an unknown campus environment, an individual's self-efficacy can support striving to achieve goals or striving for compensation. In addition, Flammer posited that individuals entering a situation with firm self-efficacy beliefs are willing to take the necessary steps to support achievement. However, gaps in the literature suggest the need for further research on the systematic association between cultures. Flammer (2015) also suggested that researchers take a more critical look into the conditions fostering change,

such as the efficacy beliefs of those individuals interacting with each other in a given environment or the concept of shared control.

In the battle to achieve academic excellence, Black males could face environmental challenges due to their lack of self-belief and academic battles due to lack of academic preparation. In their article, "Academic Self-Efficacy: A Reliable Predictor of Educational Performances," Sharma and Nasa (2014) suggested academic self-efficacy is a description of the individual's confidence in the ability to attain a designated performance, described as a set of beliefs that influence the way individuals feel, think, respond, and motivate themselves to achieve educational tasks. Sharma and Nasa (2014) noted that self-efficacy is concerned with individuals' personal beliefs in their ability to reach the desired outcome. Sharma and Nasa (2014) also noted the personal belief in the individual's own strength and self-confidence. It is these beliefs that help in the development of the individual's foundation for human motivation and personal accomplishments (Sharma & Nasa, 2014).

Academic self-efficacy was identified by Sharma and Nasa (2014) as the individual's conviction to achieve academic goals in a specified scholastic subject area successfully. The team identified academic self-efficacy as a critical element in Banduras (1994) self-efficacy theory, which is unlike the usual concepts of self-esteem or self-concept based on an evaluation of oneself. Sharma and Nasa (2014) also identified academic outcomes and academic efficacy as two elements in the belief expectation. In comparison, academic outcomes are identified by Sharma and Nasa (2014) as the

student's belief leading to a specific outcome, and academic efficacy is the expectation as the student's belief in the ability to achieve that outcome.

Social Capital

Although Engbers et al. (2017), in their study of social capital, focused on several categories associated with social capital, one aspect of social capital stood out most, which was the development of trust. The team found institutional and individual trust to be studied as a single concept and very research supporting the study of both individual and institutional trust simultaneously. Likewise, the team noted that researchers have focused on building trust in institutions, but not the individual. For underrepresented black males, building both institutional and individual trust is a crucial factor when they arrive on the campuses of PWIs. In addition, the authors found group membership and participation beginning to receive attention in social capital studies.

When building social capital, Engbers et al. (2017) found that the proximity of social groups to institutions of higher learning may influence the development of social capital. However, social participation among underrepresented Black male undergraduate students should occur when they arrive on the campuses of PWIs. These interactions between the campus environment and the Black male participant should occur in support and student engagement spaces (Engbers et al., 2017). The authors suggested that such interaction, when provided, can provide avenues where ideas can be shared and can establish and develop social connections.

In their quantitative study of first-year undergraduate student success, Brouwer et al. (2016) found gaps in the research that fail to address the effects of social capital on

academic success. The group also found little research on social capital and its effectiveness in addressing difficulties undergraduate students face when assimilating into the campus environment. Examples provided by the team included the lack of social support and the struggle to adjust to campus environments. The authors also noted that the absence of family capital affects social capital building during matriculation, creating challenges for first-generation students.

Because first-generation students lack family capital and specific information about the college experience, Brouwer et al. (2016) suggested first-generation students struggle during assimilation, attributing to higher dropout rates among first-generation students. Family capital, or parental knowledge, was also noted by the authors as a valuable resource for first-year students as they transition into the college experience. Just as import, the authors suggested that the support of faculty and staff, or faculty capital, helps first-year students provide much-needed advice, feedback, and motivation. Overall, Brouwer et al. (2016) found family capital helpful, but further research is needed to consider the impact of social capital and self-efficacy related to social environments and performance feedback provided by faculty and mentors.

Ajay et al. (2021), in their study of under representative minority students, suggest that eliminating disparities such as structural racism can help increase minority student degrees attainment at predominate white institutions (PWIs). The group defines structural racism as the “process by which racial discrimination is maintained, through mutually reinforced systems of inequality in education, housing, criminal justice, employment, and health care.” The team presents two strong arguments into why PWI

needs to make underrepresented minority student retention a priority. The first is college retention and the impact of students of color dropout rates, and the second is the benefits of creating a diverse college environment that caters to all students' equality.

Creating a diverse and inclusive environment is a critical step in the development of social capital on college campuses. Ajay et al. (2021) suggests all-inclusive college campus environments and allow opportunities for all students to have equal space to achieve regardless of their social or cultural backgrounds. The team also asserts that the academic identity of underrepresented student rest in the hand of the faculty who can encourage academic achievements within the campus environment. However, the group warns of the possibility of thinning students of color by providing interactive support through programming that single, which can leave them labeled as a token among their peers. Enrichment programs can be helpful in the quest to develop social capital and increase self-efficacy for minority students, especially the Black male in STEM career fields, but being in a single group could also create the sense of not feeling accepted in these groups. Ajay et al. (2021) postulate that by developing a more vital self-awareness of faculty stereotypes and biases, the faculty can create learning environments in which students of color can understand campus diversity issues and create emotional intelligence. Thus, faculty self-awareness in the campus environment is an element that influences the self-efficacy and social, academic experiences of students of color.

Hypolite (2021) found in her study on-campus Black cultural center staff could facilitate the development of social capital among students of color. The author presents a compelling argument on the history and how often underfunded Black cultural center

(BCC) can be a critical element in HWI campus environments. The study suggests the BCC is where students of color can go and not feel isolated in their new environments. The study focused on two research questions. The first questioned whether the staff of BCCs served as instructional, cultural, and entrepreneurial agents. At the same time, the second question presented a challenge to how the staff of BCCs develops social capital for those students of color who matriculate on the campus environment of HWIs.

BCCs were established in the 1960s and 1970s in response to protests and the demands of students of color. The study posits that BCC proved to increase diversity on HWI campuses, but in the early 80s, BCC began to merge into multicultural centers due to a lack of financial support the anti-affirmative action campaigns combined with student demands forced institutions to expand their mission beyond Black students, leaving the BCCs to fight for survival (Hypolite, 2021). However, due to the wide variety of programs provided by the BCCs, Black students were afforded academic, social, and career opportunities.

According to Hypolite (2021), the BCCs faculty and staff were facilitators of social capital for Black students. The study the difficulties students face when trying to connect resources. Without the availability of resources, Black students were found to become isolated when entering the different academic college environments this is well documented in predominately white academic environments like STEMs. However, with the addition of BCCs, the information was readily available, and Black students were using the space to connect the different resources. Thus, bonding social capital where the resources are used to help create a network of resources for Black students especially

Black males who enter STEM career fields. In addition to using the BCCs to create a place to centralize resources, the study shows how the faculty and staff were used as resources to share information that would help Black students create positive outcomes and set goals that would typically be hard to achieve increasing self-efficacy.

Summary and Conclusion

The literature does not hesitate to demonstrate how college administrators and other officials question Black males' ability to succeed in higher education. However, when examining the lack of research crucial to supporting positive mentoring and the development of self-efficacy for underrepresented Black males, especially those participating in STEM enrichment programs, there is a lack of supporting research. Gaps in the literature identified underrepresented Black males who arrive on college campuses supported by mentoring and enrichment pipeline programs as having a higher rate of academic success and development of self-efficacy. However, the lack of social environment, cultural bias, and financial support from the institutions coupled with the lack of on-campus professionals that look like students of color continues to limit the presence of such empowering programs on college campuses (Brooms et al., 2015; Ingram et al., 2016; Zambrana et al., 2015).

The literature also suggests that HBCUs have established active mentoring and enrichment program pipelines. These mentoring programs have not only influenced the development of self-efficacy between Black male college students but have also proven to develop long-term relationships and increased academic success (Gasman et al., 2016). The literature suggests a significant increase in the search for more faculty of color at

PWIs, but the number of hires remains consistently low, especially in the STEM fields. The literature failed to identify the successes of HBCUs, especially the development of Black male self-efficacy and the influence of STEM mentoring and enrichment programs, as they relate to high academic achievement. While PWIs struggle to provide the necessary social environments and programs to develop Black male self-efficacy in STEM education.

Chapter 3: Research Method

The purpose of this qualitative phenomenological study was to explore the lived experiences of Black male students and how their participation in STEM mentoring and enrichment programs has impacted their ability to develop social capital and increase self-efficacy. This study contributes to current research in self-efficacy, the development of social capital, and STEM mentoring and enrichment programs by gaining viewpoints from Black male undergraduate students who are currently or have previously participated in STEM mentoring and enrichment programs. In this study, I sought to fill gaps in the literature by exploring the lived experiences of Black male students who matriculate at HWIs and pursue degrees in STEM.

My goal for the study was to obtain a significant understanding of how Black men continued to increase their self-efficacy while building social capital in STEM career fields once they matriculate into the campus environments of HWIs. According to Dyer-Barr (2014), STEM mentoring and enrichment programs are a vital link in increasing enrollment of minority students in STEM fields. In addition, positive mentoring experiences on college and university campuses also contribute to increases in self-efficacy and positive social interactions for low-income minorities (Carroll & Barnes, 2015). Similarly, these experiences help push forward the development of social capital (Aikens et al., 2016).

In this chapter, I present the design and methodology employed in this research. In addition, I reference the components involved in conducting this research, which

include population, sampling, and ethical considerations. Finally, I explain the selected methodology used for analysis and data collection processes.

Research Design and Rationale

The following research questions guided the study:

RQ1: What role do STEM mentoring and enrichment programs play in developing self-efficacy in low-income Black male STEM undergraduate students?

RQ2: How would low-income Black male undergraduate students describe their academic success (i.e., self-efficacy) while engaging in STEM mentoring relationships?

RQ3: What are the unique challenges low-income Black male undergraduate students face in developing social capital and self-efficacy in STEM career fields?

The central concepts of this qualitative, phenomenological study are self-efficacy, social capital, and STEM mentoring and enrichment programs among low-income Black men. Self-efficacy is an individual's ability to set and achieve a goal. STEM mentoring and enrichment programs are pipeline programs designed to help introduce low-income minority students to career fields they otherwise might not have experienced. Low-income Black men are individuals who live or at some time in their life have lived below the poverty line or may have received free lunches at some point during primary and secondary education. In addition, low-income Black men are college students who are currently receiving financial support through a Pell grant or federal student aid.

For this study, I used a qualitative phenomenological research design, which allowed me to create an understanding of the research problem through the exploration of concepts and phenomena (Creswell, 2009; Hancock et al., 2009). Qualitative research

also helps a researcher create a broader understanding of the world (Hancock et al., 2009) and explore the process and relationships relating to social life (Crossman, 2018). In addition, qualitative research is an exploratory methodology used to explore unknown variables and theories (Creswell, 2009).

When engaging the target population, I employed my own eyes, ears, and intelligence during the data collection process (Crossman, 2018). According to Crossman (2009), qualitative research produces descriptive data about the participants' lived experiences, interpreted through transcribing, trend analysis, and coding. This form of data interpretation is known as the phenomenological approach (Hancock, 2009).

Qualitative methodological processes closely align the research problem and the research question while employing exploratory strategies, such as in-depth interviews. I used this phenomenological study to explore the relationship between STEM mentoring and enrichment programs, the development of self-efficacy, and social capital among low-income Black male undergraduate students who have chosen to enter STEM career fields. The selected research design allowed me to produce strong, detailed, and more suitable contexts that are replicable (Bloomberg & Volpe, 2019; Creswell, 2009). In addition, the research methodology associated with this phenomenological study was suited to yield data applicable to answering the research questions, in which I sought to gain a detailed understanding of participants' experiences.

Role of the Researcher

My role in this qualitative research was to isolate and define the phenomena so that learning takes place (Fink, 2000). According to Fink (2000), my role as a researcher involved the following.

- Answer the research question, and seek to discover the study's what, why, and how.
- Plan and prepare the various steps in the research methodology section, including coordinating time schedules and sequencing the methodology section.
- Conduct interviews per the interview guide.
- Transcribe recordings and notes collected during interviews.
- Analyze or code data to make sense of the data. During the coding or analysis stage, my objective was to take the raw data and understand the overall narrative.
- Verify the data to ensure the information was correct. I contacted interviewees to review and confirm the information was correct and there were no questions or concerns with the analyzed data.
- Report findings by creating a report and presenting it to the research chairs and associated committee.

I also ensured that no professional relationships such as supervisory or instructor relationships involving power over the participants were revealed in this research.

Maintaining objectivity was challenging because of my experience as a community-based education specialist and a program coordinator for minority STEM mentoring and enrichment programs. I understand total objectivity is neither humanly

possible nor desirable, but I used a robust reflexive approach to acknowledge and understand the effects of personal experience with the issue being studied (Ratner, 2002). No attempts were made to validate the participants' experiences through my presumptions and beliefs. Instead, I ensured personal presuppositions were exposed and brought into clear view by deliberately examining and holding them in temporary suspension using bracketing (Tufford & Newman, 2010). By controlling and exposing personal expectations and assumptions through bracketing, I focused on data collection and the primary experiences of the participants.

Other ethical issues or concerns applicable to this research could include researching within my work environment, conflicts of interest or power differentials, and justifications for using incentives. I clearly understood that it could be challenging to anticipate ethical issues and the difficulties and dilemmas in qualitative research. In addition, I understood ethical issues might materialize in the field while the researcher is interacting with study participants or when the views of study participants are allowed to become viewed as a means to an ending or excluding data point, without concern for the status as human beings. Although obtaining verbal consent may have been a friendlier method to eliminate barriers between research and participants, I know it could be considered unethical practice if participants are not fully informed or did not give consent to their participation in the inquiry. However, I also knew gaining access to study participants was not by design to introduce ethical issues to this study.

In addition, I took measures to ensure I would not harm any of my study participants. For example, my obligation to the participants was not to volunteer

information nor respond to questions concerning their background and experiences in STEM mentoring and enrichment programming at any point in the study process. I also ensured that all interviews only focused on the participants' experiences or information relevant to answering the research questions.

Methodology

Participant Selection Logic

For this study, I selected a study population, including current members or associations with a nationally known nonprofit organization committed to the educational and specialized achievement of Black engineering, technical students, and professionals. Being one of the most significant student-run associations, the organization includes more than 500 chapters nationwide and overseas, geographically divided into six regions governed by a national executive board. This national association has more than 17,000 members and hosts more than 13,000 attendees at its annual convention. In addition, the association has 148 junior or precollegiate chapters, 291 collegiate chapters, and 84 professional chapters.

The association's mission is to increase the number of Black engineers who excel academically, succeed professionally, and assimilate into their communities to create a positive impact. Additionally, the association enhances its dedication to educating its members and becoming influential leaders by providing leadership training, professional and academic development, mentoring opportunities, encouraging participation in community service and outreach programs, and awarding scholarships.

Identification and Justification Sampling Strategy

My goal was to examine the effects of STEM mentoring and enrichment programs on low-income Black male undergraduate students who enter STEM career fields at HWIs of higher learning and develop self-efficacy and social capital. In this study, low-income was as an individual eligible who received a Pell Grant or who received free or reduced lunches in primary or secondary education. In addition, low-income populations are identified as individuals who have lived or are currently living under the poverty threshold for family size and composition based on household income (Stone et al., 2018). For this study, Black male students were defined as men of color whose skin pigmentation is light, medium, or dark, and whose genealogy is of African, West Indies, or African American ancestry. Finally, undergraduate students were individuals who are currently attending an institution of higher learning and are in the second year or above of academic preparation at the undergraduate stage of their studies.

STEM careers are identified for this study as science, technology, engineering, math, biomedical, and medical career fields. Examples of STEM careers are biomedical engineers, mechanical engineers, computer scientists, and math majors. For this study, students enrolled in biology in pursuit of degrees in the medical or dental career fields were also included. The age group for the study participants was between 20 and 26. HWIs are identified as institutions of higher learning having an enrollment rate of no more than 40% minority students and 50% or higher White student enrollment.

Based on the study population, I selected a purposeful sampling strategy for this qualitative research design. Purposeful sampling strategies are used in qualitative

research to identify and select information and cases for the most effective use of limited resources related to the phenomenon of interest. Purposeful sampling strategies allowed me to use snowball sampling due to the small, difficult-to-find population of low-income Black male undergraduate STEM students enrolled at HWIs of higher learning. In addition, snowball sampling allowed me to gather contact information of possible study participants from current study participants. I conducted interviews with participants to gather data to understand how STEM mentoring and enrichment programs help low-income Black male undergraduate students develop self-efficacy and social capital.

Using snowball sampling allowed me to reach a population that is otherwise difficult to locate or is small in numbers. By gathering information on possible study participants, I expected to reach sample saturation. The sample size in this study was seven participants. Seidman (1998) argued that saturation is reached when the interviewer notices that the collected information is consistently repeated.

Participant Selection Criteria

The target population were male students who identify as African American or Black, who have lived in a low-income household, were between 20 and 26 years in age, currently enrolled in their second year or higher of undergraduate academic studies at an HWI, enrolled in STEM fields at the undergraduate level, who participated in a STEM mentoring and enrichment program at some stage in their academic career. To ensure each participant met the study criteria, I required each participant to produce a valid student identification card from an HWI of higher learning and a valid state-issued

identification to confirm their age. In addition, each study participant was required to complete a demographic questionnaire to ensure they met the research requirements.

The purpose of the sampling was to identify participants who could address the research questions and provide me with sources of data that were prosperous (Ravitch & Carl, 2016). The decision to limit the research population to HWI of higher learning hurt recruitment efforts because of the limitations. The number of participants for this qualitative inquiry only yielded seven low-income Black male students who met the participation criteria. The participants were all beyond their second year of undergraduate studies, enrolled in the STEM, and had been or currently were enrolled in STEM mentoring and enrichment programs. The participants' various experiences and achievements also ensured the reliability and validity of the study findings (Bloomberg & Volpe, 2019).

I found that purposeful sampling strategies best fit this qualitative study when considering sample size and information saturation. Employing a purposeful sampling strategy allowed me to recruit participants to form an otherwise difficult participant population. Purposeful sampling strategies also allowed me the use of a smaller study participant group to achieve saturation. According to Seidman (2013), saturation is reached when the information being gathered by the researcher is consistently repeated, which can happen with as few as three participants.

For this qualitative phenomenological study, I elected to use snowball sampling to recruit study participants. Snowball sampling strategy is employed when the researcher finds it problematic to recruit study participants (Noy, 2008) or when the researcher faces

difficulties recruiting individuals from the study population (Etikan et al., 2016). Often, the researcher may find the study population not as populated, which may lead the researcher to use the original study participant or source and snowball sampling strategies for additional help with the recruitment of relevant study participants.

Instrumentation

I created a matrix linking research questions to interview questions because I did not use a published interview protocol. Therefore, all the interview questions were justified using the literature. I also employ a modified version of Seidman's (2013) qualitative interviewing a guide for data collection. My first interview protocol form contains interview questions related to the research questions. At the same time, the second interview protocol form was used to conduct follow-up interviews. Each question was designed to capture the participant's reflection during the interview process, member checking, and any possible deletion or additions to the data already gathered.

Due to the COVID -19 pandemic, I had to shift the data collection process to online. During this time, I found the best plate form to conduct interviews was Zoom. In addition to the zoom recordings, I used an audio voice recording device to capture data during the interview process. With such capacity, I was allowed to ensure all interview recordings were uninterrupted. In the case of device failure, I ensured a backup recorder device was available.

The semi-structured interviews allow me to ask each participant a specific set of questions designed to capture the experiences of the study participants. In addition, to ensure reliability, I crafted all interview questions for use during the interview process.

Finally, I ensured all interview questions were consistent throughout the interview process.

During the interview process, I requested that each study participant produce a valid school identification to ensure enrollment and a valid federal driver's license to verify race and age. As a result, the student's identification card and driver's license allowed me to validate that the study participants fit the requirements needed for participation in the study.

Establishing sufficiency of data collection tool, I requested a review of the interview questions by the committee chair. Once I received feedback, I ensured the necessary changes were incorporated into the interview protocol.

Procedures for Recruitment, Participation, and Data Collection

Understanding the importance of identifying the correct study participants, which represents a critical step within the study and controlling all possible biases, was vital to me as the researcher. Therefore, I planned to yield as much information from the selected population as possible. To achieve the data collection goals, study participants were from a nationally recognized minority student-run STEM organization with over 17,000 members and hosted more than 13,000 attendees at its annual convention. In addition, the association has 148 Jr. or pre-collegiate, 291 collegiate, and 84 professional chapters. The organization has 500 chapters nationwide and overseas, geographically divided into six regions, governed by a national executive board.

I sent an initial request to the organization's New England region, Connecticut chapter president, requesting permission to present the study information to their

respective chapter membership. In addition, I included a note asking the regional chapter president to forward an email advertisement recruiting study participants to the chapter's members. Once approval was granted, the request was forwarded, and possible study participants were identified. However, the COVID-19 pandemic halted the nation and caused nearly all colleges and universities to shift from brick and mortal platforms to online. This shift also caused institutions of higher learning to close academic support and enrichment programming, predominantly minority mentoring and enrichment supported programs. The sudden shift in response to COVID -19 and the absents of face-to-face on-campus interaction caused delays in possible participants' responses. However, once the institutions and the nation settled into the new COVID-19 normal, I did receive responses. I contacted each respondent via phone conversation and, using a demographic screening form, determined whether or not the respondent was eligible for the study. After the initial contact and screening with identified prospects, those respondents who met the qualification received a follow-up email invitation. The follow-up correspondence explained the significance and purpose of the study and informed potential participants of their eligibility about taking part in the study. I also provided my personal contact information in the follow-up invitation email.

After identifying each participant and their confirmation to participate in the study, I outlined the interview process. I also requested each participant provide possible dates and times and a location where they are comfortable participating in the zoom interview. Once the date, time, and location of each interview were determined and agreement established between myself and the study participants, I sent a confirmation

email thanking the study participant for accepting the invitation to participate in the study and to confirm the agreed date, time, and location for the interview. Also included in each email was the zoom link for the interview. I also provided a reminder email to each study participant approximately 2–3 days before the interview. Due to the different levels of experiences between the study participants, the interviews were conducted on a rotational basis.

Each interview session was conducted via zoom web. Due to COVID-19, the location was the participant's bedrooms. However, as the researcher, I ensured the following criteria would be followed: each location will allow for privacy of information, the location allowed no interruption during the interview, and a do not disturb sign visible during the interview. The lighting was adequate. The room was comfortable for both the interviewer and interviewee. Before each interview as the researcher, I requested that all electronics be placed in silent mode and that the interviewee refrains from using all electronic devices. The estimated duration of each interview was approximately 60 minutes. Before the interview process, I requested the study participant read and sign a consent form, informing the interviewee of the right to withdraw from the study at any such time they may feel uncomfortable with the process. As the researcher, I also ensured all interview protocol forms were signed, and the interviewee understood the process when the data collection began.

All data collected were via zoom recording, audio recording device, and notes taken during the interview process. In addition, verbatim transcripts were created from the audio recordings, coded, and analyzed by the researcher using NVivo software.

Based on the membership of the organization and the use of snowball sampling, I did not anticipate any problems recruiting study participants from the organization's New England region Connecticut chapter.

However, as mentioned above, the events stemming from the COVID-19 pandemic caused several institutions to suddenly close and shift to online models. With these sudden shifts, the institutions' campus support programs, primarily STEM mentoring, and enrichment delayed participants' responses. In addition, the nation was also experiencing a movement in cultural awareness in the form of the Black Live Matter Movement. These events caused a shortage of study participants, which caused me as a researcher to seek additional help from the organization's Eastern Sea Board chapters.

Once the interviews were completed, I created a transcript of the recordings and notes taken during the interview process. I also contacted the study participants and allowed each study participant the opportunity to review the verbatim transcript and request any deletions of passages. Each review of the verbatim transcripts by the participant was to ensure the researcher captured the true essence of the study participant's experiences. I also confirmed that the material presents a strong representation of the study participant's personal experiences. If the study participant felt that the data or sections of the data were not a good representation of their experience or could place them in a vulnerable position, the participant had the opportunity to request deletions of sections or the entire transcript.

Data Analysis Plan

As the researcher, I understood the importance of qualitative data analysis and planned to evaluate several qualitative software packages, such as NVivo qualitative analysis software, to determine the most helpful tool. In addition, I followed the following steps in reducing data for interpretation:

1. All data were reviewed and explored to determine recurring patterns and themes. Which provided me with an initial framework for the development of the study findings. Rubin and Rubin (2012) suggested that the first step in analyzing data is preparing a transcript containing a word-for-word written rendition of the interviewer questions and the interviewee responses.

2. I conducted an extensive reading, summarizing, and coding of all data. Bloomberg and Volpe (2019) suggested the researcher use the theoretical framework as a guide when assigning codes to each category. Mentoring, self-efficacy, and social capital are the three major elements of the theoretical framework. Each element will form the descriptor placed on the horizontal axis, while the participants' pseudonyms will be placed on the vertical axis. I created an excel spreadsheet data summary table to document coded data.

3. I expected changes as the data analysis evolved. In addition, I understood there could have been a need to revisit the data to add or eliminate codes.

4. I also summarized the key findings of the study in Chapter Four of the dissertation.

5. I documented the analysis and synthesis of the findings of the study.

6. The documentation included the link between mentoring, self-efficacy, and social capital.

As the researcher, I avoided any inappropriate or inadequate actions during data preparation that could negatively affect the data analysis process. All interview data were transcribed in privacy through a process designed to analyze data (Arifin, 2018). Preserving the naturalness of the structure and transcriptions while generating a verbatim account of the interviewer experience is essential (Rubin & Rubin, 2012) while also ensuring the transcripts apply to human and computer use. In addition, I ensured the development of complete and valid verbatim transcription rules. Rubin and Rubin (2012) suggested the following guidelines when creating the rules for transcribing data.

1. Transcribe and create a summary of each interview

2. Code the transcript by finding, defining, and describing the text excerpts that have similarities in theme, events, name, date, time, and place.

3. Once the codes are correctly matched, sort and summarize them into single data files.

4. Within each file, sort the material while comparing each excerpt between the different subgroups. The researcher will also need to summarize the results of each sorting.

5. Create a complete picture of the phenomenon by using the different versions of the integrated descriptions.

6. Test ideas consistently thorough examination while combining the different themes and concepts to generate theories that explain what is being presented.

7. Review all results to create a generalized idea beyond all individual cases.

I elected to present and analyze the data in a detailed document for this study is a data summary table. The elements are taken from the theoretical framework. Mentoring, self-efficacy, and social capital will be linked to each participant to manage and reduce data, formulate finding statements, and provide participant quotations presented in the data summary sheet.

Issues of Trustworthiness

Internal Validity

I recognized that the threat of validity in qualitative research is scrutinizing and questioning the study outcomes. Therefore, establishing creditability is vital to me and the study. As such, I planned to establish creditability through the use of member checking. Member checking is a technique used in qualitative research to establish credibility through sharing data, interpretation of data, and the conclusion with the study participants. Establishing creditability through member checking is a process that allows the study participants to conduct a review of the polished transcripts and conclusions of the analysis (Creswell, 2009). Carlson (2010) posited that member checking is the validation of data that has been interpreted to ensure it is concise and is congruent with the participant's experience. As the researcher, I also used member checking to ensure all interpreted data and conclusions were reviewed and accepted by all participants. I understood member checking is not to be confused with conducting follow-up interviews using raw transcripts. Instead, member checking is the review of the final product (Creswell, 2009).

External Validity

When considering external validity in qualitative research, transferability was used to prove that the study findings apply to other frameworks. Transferability in qualitative research is described as the fit between the research framework and other perspectives, as judged by the reader (Bloomberg & Volpe, 2019). In addition, transferability is the process of ensuring the study is applicable or transferable to a broader framework while maintaining the fullness of the study (Ravitch & Carl, 2016). I ensured transferability by providing evidence through the data, proving that the study finding applies to other populations, frameworks, and reader judgment.

Dependability

Dependability is the establishment of stability and consistency of the study data (Bloomberg & Volpe, 2019; Ravitch & Carl, 2016). I established dependability by allowing a colleague or subject matter expert to conduct an external audit of the processes used for data collection, analysis of all data, and the study results.

Confirmability

Confirmability is the assurance that the study findings represent the participants' experiences and not the researcher's (Bloomberg & Volpe, 2019). Therefore, during the data collection and analysis process, I established a confirmability to maintain a journal containing my critical reflections and reflective thoughts, feelings, motives, and reactions.

Intra- and Inter-Coder Reliability

I ensured consistency between coders. This was accomplished by taking the first coding interview and comparing the results to the second set of codes.

Ethical Procedures

The study followed the guidelines as set by the Agreement to Gain Access. Ethical approaches focus on the inherent rights of research participants, such as respect for the research participants, beneficence, and justice, which are called out in the Belmont Report (Monette et al., 2008). I ensured reasonable care would be taken to warrant harm to all study participants during the study. Furthermore, I ensured ethical consideration would be given to all stages of the in-progress research. These stages encompass interviewing, which is vital to the data collection process. I conducted interviews to ensure the process does not deceive or infringe on the participant's rights, nor that the process results in any unforeseen events or results that could cause harm to the study participants. I understood there was no reason to recreate existing procedures to protect against harm to research participants and the significance of employing a research procedure appropriate to the study.

Recruitment Concerns

For this study, participants were selected by purposeful sampling using a snowball sampling strategy. Coding was used to protect the participants' identity in each category. For example, participant identification was accomplished through alphanumeric representations, such as A1 through A5 for study participants. In addition, after participants have approved the transcripts, all audiotapes will be destroyed. There is no

anticipated perceived risk, discomforts, or inconveniences for the participants of this study; however, if the participants feel discomfort and inconvenience, the researcher will inform the participants of their freedom to withdraw from the study.

Seidman (2013) argued that the potential vulnerability of participants could not be calculated ahead of time. Hence the researcher will mail previsions for participants who may divulge information but later regret sharing that information during the interview process. The previsions I put into place include deleting passages from audiotapes and allowing the participant to withhold parts of the interview if they choose to do so. In addition, I noted Seidman (2013), who suggested that if participants disclose information about violations or unethical practices that later result in discomfort, it will be in the best interest of the participant and researcher to terminate the interview and delete the passages from the tape.

Data Collection and Intervention

I ensured that safeguards were in place to prevent harm to research participants and plans to adhere to the following guidelines to safeguard against embarrassment, physical harm, discomforts, pain, and loss of privacy. These guidelines are as follows:

Obtain consent (voluntary).

Explain the benefits of the actual study.

Ensure participants have a clear understanding of their rights as participants of the study.

I also ensure the following additional approaches are adhered to in terms of the rights of the study participants, which include the right to self-determinism, privacy, and

respect. In addition, I ensured an environment that allowed the study participants the freedom to speak freely and share their personal experiences. I also ensured the environment was accommodating and non-threatening and warranted the comforts and safety of the study participants, which will allow for opportunities for personal expressiveness, emotion, and empathy. Finally, I also recognized the importance of adhering to all environmental attributes, which will allow me to create a safe environment and protect the study participant's rights and confidentiality.

I recognized that the study participants were offered the opportunity to review all information on the management of the study and allow participants the opportunity to withdraw at any time they may desire from the study. I also ensured all risks associated with the study for participants were minimal and corresponded with the study.

Summary

Using low-income, Black male participants from HWIs of higher learning who are enrolled in STEM mentoring and enrichment programs, I initiated contacts with each participant via personal phone calls, emails, or letters requesting participation in the study. I understood that no possible participants would have been excluded from the study based on perceived benefits that could originate during the study. I informed all participants of their right to withdraw from the study if they felt necessary. Seidman (2013) addressed the inability to calculate potential liabilities before the actual study events. The researcher realizes there could be some forms of resistance or apprehension to the study questions, and participants could only provide short responses at times during the interview process. I placed safeguards to protect against potential vulnerabilities

during the study to minimize issues of deception, reduce the need to conduct debriefings, and ensure the confidentiality and right to study participants' privacy.

I also understood the challenges of creating an informed consent document and will work to ensure that documents are prepared that will address the details of the study to include the specific needs and requirements that ensure confidentially. For example, these elements will ensure the hiring of interpreters, insurances of a safe, private place to conduct interviews that will protect the study participants' confidentiality, the disguising of participants' identity and information, and the assessment of the study by the institutional IRB.

Chapter 4: Results

In this qualitative study, I explored how self-efficacy and social capital have impacted participation in STEM mentoring and enrichment programs among low-income Black male students. The influences of STEM mentoring and enrichment programs have been found to be a vital link in increasing enrollment of minority students in STEM fields (Dyer-Barr, 2014). The following research questions guided the study:

RQ1: What role do STEM mentoring and enrichment programs play in the development of self-efficacy among low-income Black male STEM undergraduate students?

RQ2: How would low-income Black male undergraduate students describe their academic success (i.e., self-efficacy) while engaging in STEM mentoring relationships?

RQ3: What are the unique challenges low-income Black male undergraduate students face in developing social capital and self-efficacy in STEM career fields?

In this chapter, I present the results of the study, including the setting, participants, demographics, data collection process, data analysis, evidence of trustworthiness, results of the study, and a chapter summary.

Setting

As a result of the shift from in-person learning to online learning due to the COVID-19 pandemic, the data collection method originally intended for the study was modified. Each interview session was conducted at a location that best fit the study participant. The following criteria were followed: each location allowed for privacy. There was no interruption during the interview. Lighting was adequate, and the estimated

duration of each interview was approximately 60 minutes. Before the start of the interview process, the study participant read and signed a consent form informing them of their right to withdraw from the study at any time. All data were collected from interviews conducted online using Zoom and were recorded using Zoom online software. An additional audio recording device was used as a backup recording device. Verbatim transcripts were created, which were coded and analyzed using NVivo transcription software.

Demographics

Seven Black male students from HWIs of higher learning along the Eastern seaboard of the United States volunteered to participate in this phenomenological study. The New England Chapter of the National Society of Black Engineers provided a means to recruit potential participants. Participants were enrolled in their second year or higher of undergraduate studies at their respective universities and were pursuing degrees in STEM fields. The age range of the participants was between 20 and 23 years of age. In addition, participants had at some point in their academic careers participated in a STEM mentoring enrichment program during high school or college. Each participant had been eligible to receive free lunch during primary or secondary education or were eligible to receive a Pell grant at some point during college as a low-income Black male student.

Organizational or personal conditions that could have influenced participants' experiences were the unfortunate reality associated with the national pandemic and the sudden shift from brick-and-mortar classrooms to learning environments that were no longer consistent with their campus environments, and institutional minority support

systems were eliminated due to staff furloughs and layoff. Cultural events, such as social media outlets being flooded with recordings of Black men of all ages being murdered by law enforcement officers, civil unrest, and a surge of White supremacy. Together, these events could have influenced the responses of the participants in this study.

Table 1

Participant Demographics

	Racial identification indicated	Age	HWI location	Current year of enrollment	STEM mentoring in high school	STEM mentoring in college
P1	Black	20	Connecticut	Junior	X	X
P2	West Indies	20	Connecticut	Junior	X	X
P3	West Indies	22	Connecticut	Senior	X	X
P4	Black	21	North Carolina	Senior	X	X
P5	Black	23	Pennsylvania	Senior	X	X
P6	West Indies	21	Pennsylvania	Senior	X	X
P7	Black	20	Virginia	Junior	X	X

Note. All participants met the study's criteria to be considered low-income, and all participants were currently enrolled in undergraduate study in a STEM career field.

Data Collection

Data were collected through participant interviews conducted and recorded using the Zoom online meeting application; an audio recorder was used as a backup device. All audio recordings were uploaded and analyzed using NVivo transcriptions software. An interview protocol was used during data collection and questions asked were open-ended. Each participant used the security of their private space to share their voice, experience, and perspective in detail. In addition, each participant chose the time and location for their online interview.

At the time of data collection, universities were using virtual platforms to maintain social distancing for the COVID-19 pandemic; thus, a strain was placed on student participation. In addition to the delayed response, most, if not all, social clubs and activities generally held on campus were canceled. I conducted seven different interviews over 4 months.

Data Analysis

During this phenomenological study, I avoided any inappropriate or inadequate actions during data preparation that could have negatively affected the data analysis process. The data collected from the interviews were transcribed using NVivo transcription software. Preserving the naturalness of the structure and transcriptions while generating a verbatim account of the interviewees' experiences was an essential part of the study (Rubin & Rubin, 2012). I followed the following the recommended guidelines by Rubin and Rubin (2012) while transcribing data: (a) transcribed and created a summary of each interview; (b) coded the transcript by finding, defining, and marking in the text excerpts that have similarities in theme, events, name, date, time, and place; (c) once the codes were correctly matched, I sorted and summarized them into single data files; (d) within each file, I sorted the material while comparing each excerpt between the different subgroups and summarized the results of each sorting; (e) created a complete picture using the different versions of the integrated descriptions; (f) tested ideas consistently through examination while combining the different themes and concepts to generate theories ti explain what was being presented; and (g) reviewed all results to create a generalized idea beyond all individual and case studies.

Transcribing and summarizing required me to prepare transcripts that contained word-for-word interpretations of the interview questions and answers (Rubin & Rubin, 2012). I first downloaded the audio recording into NVivo transcription software. I listened to the audio recording carefully to ensure the verbatim accounts of the participants' experiences were captured. I made necessary corrections to each transcript and created notes and memos.

The core of the early analysis is the recognition and identity of events, concepts, and themes (Rubin & Rubin, 2012). To code the transcripts, I listened to each audio recording and I read each of the seven transcripts several times to analyze and tease out shades of meaning and similarities. Teasing out shades of meaning requires attention to the variations to differences in emphasis (Rubin & Rubin, 2012). After carefully analyzing the data, I began the process of identifying the various events or occurrences, such as preparing for college, participating in early days on campus, classroom experiences, and STEM mentoring and enrichment program availability and meetings. I labeled each event and moved on to the concepts.

Concepts are defined as ideas normally expressed as a single noun or noun phrase (Rubin & Rubin, 2012). I found myself lock into numerous different concepts so I began to eliminate some the concept that were not relevant to the study. I also during this time considered the confidentiality of the participants and delete identifying information such as professor's names, teacher names support staff names and the school identifier from the transcripts. Each of the participants were assigned a pseudonym to protect their identity. After sorting through the concept and ensuring they were relevant to my study I

began to read to find those concepts that were emphasized by the participants. examples of the concepts are family, relationships, teacher, mentoring, home environment, and social environment. Probing questions were used on occasion to ensure clarification of the participant experience. These concepts led me to the development of themes.

The themes are those summary, statements, causal explanations or conclusions that offer explanation to how the feels about something (Rubin & Rubin, 2012). I noted a number of different themes had begun to emerge throughout the data that were consistent with the literature as presented in Chapter 2. Example of the themes the absents of people that look like them, the lack of sufficient support and resources, and the reliance on one self or self-empowerment, and the use of bonding to create networks. To ensure I was keeping the data relevant to the study and the research questions I also used definition to classify each theme. Example of these definitions are the participants' abilities to create connections with someone with similar interest was themed as bonding, as a principle of social capital, participants' interactions with individuals who were instrumental in opening doors or shared resources which are beneficial interaction and linking which describes the participant development of a relationship(s) with organizations that help create resources needed to achieve their goals. After a careful examination of the data and it relationship to the study I began to create the different codes.

Table 2

Themes and Categories and Participants

Minor categories	Major categories	Themes	Participants
Help Support Different Imposter	Absence of resources Lack of support	Creativity	1, 2, 3, 4, 5, 6, 7
Fraternity Culture National Society of Black Engineers Mentoring Relationships	Positive networks Positive resource	Beneficial interaction	1, 2, 3, 4, 5, 6, 7
Environmental barriers Classroom goals Opportunity Career goals	Self-motivate Self-esteem	Self-empowerment	1, 2, 3, 4, 5, 6, 7
Lack of staff representation Lack of classroom representation Awareness Lack of understanding	Absence of representation Sense of not belonging	Emotional barriers	1, 2, 3, 4, 5, 6, 7
Enrichment program Networking Mentoring Use of resources	Resource development Successes	Bridging	1, 2, 3, 4, 5, 6, 7
Social Programs Teacher Counselor	Providing guidance Providing support	Bonding	1, 2, 3, 4, 5, 6, 7
Fraternity Stride National Society of Black Engineers Gear Up	Organizational support Organizational resources	Linking	1, 2, 3, 4, 5, 6, 7

Themes

The seven Black men shared experiences of success and academic achievements through mentoring and enrichment programs. During the process of sharing their lived experiences each participant revealed experience with STEM mentoring and enrichment programs and the lack support staff that look like them to manage programs. Each participant lived experiences introduced battles with micro aggression, systemic racism, racial biases, and emotional battles with imposter syndromes. The seven Black men have shared their personal experience of how they navigated educational system using STEM mentoring and enrichment program in which they had to self-empower as they develop social capital and increased their self-efficacy. There were seven themes that emerged from the data: 1) creativity 2) beneficial interaction 3) self-empowerment 4) emotional barriers 5) bonding 6) bridging and 7) linking

The data outlined the shared experiences of the participants their experience are revealed in seven themes that that emerged from their lived experiences. Table 3 provide quotes of their experience and the themes that derived from the data.

Table 3

Themes and Quotes

Themes	Interview excerpts
Creativity	P3: "So ultimately figuring out how to pursue this degree was all up to me." P5: "What I realize is it's not like sometimes you're going to get this amazing service." P6: "Actually being able to discuss what like engineering or sciences and math are mostly just came from like me studying in school"
Beneficial interaction	P1: "One thing for sure that I had was a program at my high school honestly if it wasn't for it I honestly don't think I would have made it to this point" P2: "While attending a NSBE event I met people who provided guidance on becoming an engineer." P7: "My best friend father is helping with my internship."
Self-empowerment	P2: "I took a lot of advanced AP courses. I took calculus, bio, AP biotechnology these classes really showed me how to because before I was just kind of doing classes. P3: "They know that you have to take the SATs and that's pretty much all that they can share with me. So ultimately figuring out how to pursue this degree was all up to me." P7: "Basically, all my electives were basically geared around the engineering field and they really got to me in that right direction."
Emotional barriers	P1: "Because everyone has different opportunities and resources available to them, the biggest obstacle was just the comparing myself" P3: "Because as I mentioned, a lot of stuff that we're going through for instants the imposter syndrome." P5: "Some people are not incline to engage people of color so that's kind of like a challenge."
Bonding	P1: "She helped me with my college essay and I still have it today." P4: "If it wasn't for my friend, I wouldn't be an intern" P6: "I met a school representative and she introduce me to some students of color on campus and they became my resource."
Bridging	P2: "I was in a program called Stride, which was for me, it was to create a group of diverse individuals. So it was really just a bunch of minority kids who were just working hard to get good grades together." P3: "The National Society of Black Engineers has been the catalyst for my professional and social development" P5: "I went to a few afterschool programs basically just asking for advice, and they'd like point me in the right direction and give me suggestions."
Linking	P5: "I definitely always look out for them and opportunities, especially when I started college, I told myself I wanted to get more involved. So that's why I joined NSBE, the Black Culture Club, and my fraternity." P6: "So once that groundwork is there, they obviously want us to make sure we succeed academically and we are able to, you know staying within the fraternity and also succeed professionally" P7: "I had any resources, I'm in a fraternity now and my older brothers are some of them are STEM or civil engineers. So, I mean, those are my mentors now or people that would help guide me through whatever"

Evidence of Trustworthiness

Credibility

Establishing creditability was important to the study —creditability was established through the use of member checking. Establishing creditability through member checking is a process that allows the study participants to conduct a review of the polished transcripts such as case analysis, and ground theories (Creswell, 2009) about the study phenomenon. Carlson (2010) posits member checking is the validation of data that has been interpreted to ensure it is concise and is congruent with the participants' experiences. I also used member checking to ensure all interpreted data and all conclusions are reviewed and accepted by each participant.

Transferability

Transferability in qualitative research is described as the fit between the research framework and other perspectives as judged by the reader (Bloomberg & Volpe, 2019). Additionally, transferability is the process of ensuring the study is applicable, or transferable to a broader framework while maintaining the fullness of the study (Ravitch & Carl, 2016). Transferability was addressed by providing evidence that the study finding is applicable to other populations, framework, and reader judgment.

Dependability

Dependability is the establishment over a period of time of stability and consistency of the study data (Bloomberg & Volpe, 2019; Ravitch & Carl, 2016). Dependability was established by the study chair who will conduct an audit of the process used for data collection, analysis of all data and the results of the study.

Confirmability

Confirmability is the assurance that the study's findings are the participant's experiences and not the researcher's (Bloomberg & Volpe, 2019). I established confirmability by creating and maintaining a journal containing all critical reflection and reflective thoughts, feelings, motives and reaction during data collection and analyzing process. As I reflected on the journal notes I had to adjust my personal thoughts to ensure I captured the interviewee's personal experiences. An example of my reflections were imposter syndrome, all of the participants mention different forms of imposter syndrome. As a Black man this is something I have experience for most of my life and I felt it important to not allow my experience to interfere with my research.

Results

Research Question 1

The first research question asked: What role do STEM mentoring and enrichment programs play in the development of self-efficacy among low-income Black male STEM undergraduate students? The participants found gathering resources and information was not easy; however, self-efficacy increased as they sorted different sources to achieve their goal of earning a college degree in a STEM career fields. This is described by participants 3 and 5. P-3 stated, "I had to seek out guidance from the Internet because I myself didn't know what engineering was, or what it took, or what were programs to become an engineer." P-3 & P-5 found acquiring resources and information was important to his academic future. P-5 stated, "I stayed after school basically just asking for advice, and they'd like point me in the right direction and give me suggestions."

After matriculation onto the campuses of HWIs, each participant stated they participated in some sort of minority mentoring and enrichment programs when they first arrived on campus. Most STEM mentoring and enrichment programs afford the participate the opportunity to gain strength as they gather resources, increase their self-worth, increase the personal growth and as they developed a greater understanding of their career field and created of personal and professional networks. Thus, the data suggest minority STEM mentoring and enrichment programs are important in increasing self-efficacy among Black male undergraduate students.

The data also suggest the Black male students in this study continued to increase their self-efficacy as they overcame the odds of successfully entering into and working towards earning degrees as young Black male engineers in the STEM career fields. Notably, P1 shared his experience as he builds self-efficacy:

> I would say definitely. The biggest challenge was myself and the reason why I say that is because when you come to your career or just when you come from a certain place to another place, you're put into an environment in which now everybody is as different from you, if that makes sense. So I'm no longer the smart person, or in fact, I'm probably like the 18th smartest person because maybe that person just had opportunities that were available to them that weren't available to me. So when I come or when I did come across that, the first thing I would do was just compare myself [in terms of] why can't I do what they're doing or [succeed like] how they're succeeding?

Participant 5 stated his biggest challenge is connecting with his white peers and the mild racism faced in the campus environment:

> I would just say not being in the know about what's going on some times. Because, sometimes I feel like it's not like hard core like racism, but it's kind of like soft because they won't, people but won't tell you certain things, like tips and things, like you won't know that professor made a change or something with a class or somewhere else. Some people are not inclined to engage people of color so that's kind of like a challenge.

Participant 6 stated,

> I feel like there needs to be more black males within STEM fields, no doubt. And like, it's kind of like the attitude of like, if not me, who? And if not, and if not now, when? That was something that someone told me. And it's kind of like a situation where, like, there needs to be those black males or those black women as well.

Research Question 2

The second research question asked: How would low-income Black male undergraduate students describe their academic success (i.e., self-efficacy) while engaging in STEM mentoring relationships? Participants expressed how they used the guidance they received from STEM mentoring and enrichment programs to create an academic plan and set career goals. Participant 7 shared his story about how his best friend's father provided him with guidance, and later his frat brothers provided resources and advice on classes to support the achievement of his academic goals. An example, P-7

shared his experience and how he received guidance from multiple resources, such as his best friend's father and mentor and his fraternity brothers. He stated:

> They guided me into the classes I need to achieve my goals. I took technical drawing my freshman year and other engineering classes all through high school. Basically, I took drawing, software, AutoCAD, and I took all the math that I would need to transitions into college. All of my electives were basically geared around the engineering field and they really got to me in that right direction.

In constructing information, P1 found support programs and program staff most helpful as he was preparing for college:

> There was one particular staff member from gear up who helped me with my college essay. And because I didn't know I had to write a college essay to enter university, no one really taught me these things. But they took me to work with each step of the college process of so many applications, filing applications, the FAFSA everything. So gear up was probably the most important resource that I had with regard to college education experience.

Both Participant 2 and Participant 6 described the lack the social capital in the home and the community environment needed to prepare for matriculation into college. P6 said, "In my household, there wasn't really a lot of [focus on] STEM. It was really just being a doctor." Participant 2 also shared his experience with STEM in his household, stating, "I feel like earlier in my life, I didn't really have much of a support system. So because of that fact, it was mostly me and the books."

This led the participants to trust resources outside of the actual home environment. These resource came from STEM programs such as NSBE and Black fraternities.

Participant 6 shared how he used Black Campus community to build social capital: “Alpha Phi Alpha and all those other things I would say I dove directly into the black community within the campus environment and was able to increase my social capital tremendously and exceeded expectations.” Participant 2 noted, “From a student looking at it, NSBE would be the first thing that would help connect with people.” He later shared his educational experience with NSBE. P2 said, “NSBE taught me a lot of leadership skills, and I’m on the E-Board, and I plan on being president next year. NSBE does a lot.”

When engaged in STEM mentoring and enrichment programs, participants described an increase in both self-efficacy and social capital. Participant 5 mentioned how his involvement in the minority STEM mentoring program helped him to create a network. Similarly, P3 made a powerful statement, “The National Society of Black Engineers has been the catalyst for my professional and social development.” This notion was shared by P3, who praised the NSBE organization for his ability to interact with large corporations, stating, “As a student of NSBE, I was able to interact with corporates and I was able to land these numerous internships which ultimately launched my career and launched my interests even further in continuing to use them.” Further, P1 described his connections to STEM mentoring and enrichment program as ideal. He provided the following example of the Bridge program, in which he participated. He started the

program design “was to help build bridges, specifically [in the] engineering program that I had to complete in order to get within the school of engineering, and that was to prepare me for the school of engineering.” Overall the data did indicated participants felt STEM mentoring programs are beneficial in the academic success of Black male undergraduate students. According to participant 5, the NSBE, “They have a newsletter that goes out with tons of resources every week.”

P5 described his engagement with these groups, saying, “I joined NSBE, the Black Culture Club, and my fraternity. I tried to make sure I looked at those mentorship opportunities to get better.”

P6 shared his connection with NSBE and his fraternity, supporting the benefits and suggesting the need for diversity:

> I know in my network, increased my relationships, increased my connections by being able to divulge so much knowledge from those people that I’ve been able to talk to and their experiences and see how America has been and see like what exactly university needs in order to be socially diverse.

Research Question 3

The third research question asked: What are the unique challenges Low-income Black male undergraduate students face in developing social capital and self-efficacy in STEM career fields? Seven of seven participants stated they used some sort of outside source to gather information so that they could earn internships and achieve academic goals. P4 Gather information from his mentor was key to participant 4 earning an internship P4 suggested:

> I've never been a part of a STEM mentoring program where the whole purpose was for mentorship, but I'm a part of NSBE, which is National Society of Black Engineers and, you know, they have a newsletter that goes out with tons of resources every week. I had a friend who graduated last year who I could say is the closest thing I had to a mentor. He's like a year older than me. He's always been more than a friend whenever he found resources that were helpful for him he shared them with me. He works at Microsoft I will be joining him at Microsoft next year.

One interesting note was presented by participant 3 who suggested two disadvantages when attending a predominantly White Institution. He stated:

> My experience has been going to a white predominant college, you're going to face two main disadvantages, one at the university you are not going to see many people who look like you. Secondly, there aren't many programs out there that are facilitating towards black students who are coming from predominately white colleges.

P4 found microaggression to be a challenge, stating:

> Being a Black male in a space where the school is dominated by white people. It's a PWI, so predominantly white institution, I think it's like 55% white at this point. So being a black male here, it's like, there's always a chip on my shoulder, like I've been asked like, oh, like, what sport do you play? Even though I'm here on a full merit based academic scholarship, not an athletic scholarship. So it always feels like I have to do a little bit more to stand out.

P3 shared his views on the challenges he faced with the lack of programs managed by people of color who look like him.

> The sad thing is that the mentors I mentioned themselves aren't minorities, which is completely funny and you're going to see a lot in many different programs, is that most of these programs that are pursuing are pushing for minor and engineer students. They aren't run by minorities themselves. That's somewhat concerning because they cannot really interact with you on a moral or personal level, but they can definitely help you professionally and academically, it all depends on what you want as a student.

Two of the seven participants mentioned the sense of belonging or imposter syndrome while others alluded to the same issues within their environments.

Another issue brought forth was that of microaggressions. P3 shared his experience with microaggressions:

> I came in really shy, really anxious and even now still suffer from imposter syndrome just because there's always this narrative that's constantly pushing your head and you're hearing these different micro aggressive comments made against you. Maybe unbiased by individuals where they're shocked at how much I'm able to achieve, as it's not being done by people who look like me. So I set out a goal from the beginning in my freshman year to help motivate people around me.

P5 used the term imposter syndrome to describe his position on diversity in the school as well as job markets.

Like I said before, the imposter syndrome, like I hope I'm not getting this job because I'm black and like I'm quote unquote, put together or seem like I'm put together. I think that's a challenge on the back end.

Participant 3 added the importance of representation at HWIs:

Before I found NSBE and my mentors, it was mostly a lot of white people and I could I feel like I can't really connect with them as well as I do with, like Dr. Washington or someone who, looks like me. It's easier for me to talk to them and NSBE and working with them help me get out of that little bubble per-se. But that was my only real challenge. I just couldn't connect because, like I said, the white guy in the business suit and I wouldn't feel all the way comfortable talking to him"

Summary

Black males are more likely to end up in problematical systems that are not designed with their social, economic, and academic accomplishments as a source of validation. These programs are leaving Black men trapped in an unjust deteriorating system of assessments without representation characterized as education to incarceration. Is this game of charades the right answer or should it be the lack of positive educational resources or the absence of social capital that continue to plague generations of Black men?

This study engaged seven Black male students enrolled in STEM fields at HWIs in interviews to gain a better understanding of their lived experiences and the perceived benefits of STEM mentoring and enrichment programs in development of self-efficacy,

academic success, and social capital. Answering three research questions, the study used the data obtained from participants in a detailed analysis to form results and conclusions toward informing social change.

Research Question 1 addressed the role STEM mentoring and enrichment programs play in the development of self-efficacy among low-income Black male STEM undergraduate students. The data suggested minority STEM mentoring and enrichment programs are critical components in the development of self-efficacy in Black male undergraduate students at HWIs. Moreover, the lack of representation and positive role models on the campuses of HWIs continue to challenge the academic development of Black males. Similar to the lack of good role models are issues of the lack of support systems and faculty and staff who look like them and represent the ability to achieve academically.

Research Question 2 asked how low-income Black male undergraduate students describe their academic success (i.e., self-efficacy) while engaging in STEM mentoring relationships. Black men throughout the data have shown their ability to continuously build self-efficacy. However, the data on the experiences of the Black male students in this study suggests Black men are not afforded the opportunity to build social networks. The Black men in the study did not build social networks until they became involved in minority STEM mentoring and enrichment programs that properly represent them. The socio-demographics of Black men as they develop social capital appear to be among the top distractors affecting Black men integration into HWI campus environments. The identifiable factors in the data suggest Black men self-efficacy increases, but the non-

integration of Black men as they attempt to build social capital in their non-traditional environments hinders their ability to create social networks outside of their cultural communities.

Research Question 3 investigated the unique challenges low-income Black male undergraduate students face in developing social capital and self-efficacy in STEM career fields. The participant's responses revealed building of social capital was not completely achieved until they assimilated into their campus environments and were involved in minority STEM and enrichment programs. However, Black men have continued to enter getaways into STEM career fields on HWI campus environments that are identical to those presented in the literature. The absence of Black men in STEM education is not just an issue that should be addressed with action statements. This problem must be addressed with live programing and investment in the lives of Black students supporting social capital and providing assistance to Black men through their academic careers.

The themes that emerged from this study support the important need for minority STEM mentoring and enrichment program. Minority STEM mentoring and enrichment programs are a critical component in the development of social relationships for students of color as they assimilate in to HWIs campus environment. However, there is a need for social change, there is a need for mentoring and enrichment programs designed to help Black students, there is a need for equity in social academic environments of HWI. Chapter 5 will review these findings and conclusions of the analysis in relation to the research questions, as well as the previous literature and the theoretical framework to provide the general conclusions of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The central issue explored in this qualitative study was how self-efficacy has been impacted by participation in STEM mentoring and enrichment programs for low-income Black male college students. The influences of STEM mentoring and enrichment programs are a vital link in increasing the enrolment of minority students in STEM fields (Dyer-Barr, 2014). In addition, positive mentoring experiences on college and university campuses also increase self-efficacy and positive social interactions for low-income minority students (Carroll & Barnes, 2015). This study contributes to current research in self-efficacy and STEM mentoring and enrichment programs by gaining viewpoints from Black male undergraduates who have participated in STEM mentoring and enrichment programs.

Nature of the Study

For this study, I used qualitative phenomenological research design to create an understanding of the research problem through the exploration of concepts and phenomena (Creswell, 2009; Hancock et al., 2009). Qualitative research is conducted so that researchers can seek to create a broader understanding of the world (Hancock et al., 2009) and explore the process and relationships relating to social life (Crossman, 2018). Additionally, qualitative research is an exploratory methodology used to explore unknown variables and theories (Creswell, 2009).

When engaging the target population, a qualitative researcher employs their own eyes, ears, and intelligence during the data collection process (Crossman, 2018) or a

researcher may use a theoretical lens (Creswell, 2009). Qualitative research produces descriptive data a researcher interprets through transcribing, trend analysis, and coding (Crossman, 2009). This form of data interpretation is known as the phenomenological approach (Hancock et al., 2009). I used this phenomenological study to explore the relationship between STEM mentoring and enrichment programs, the development of self-efficacy, and social capital among low-income Black male undergraduate students pursuing careers in STEM fields.

Interpretation of the Findings

The findings of this study were in response to three research questions:

RQ1: What role do STEM mentoring and enrichment programs play in the development of self-efficacy among low-income Black male STEM undergraduate students?

RQ2: How would low-income Black male undergraduate students describe their academic success (i.e., self-efficacy) while engaging in STEM mentoring relationships?

RQ3: What are the unique challenges low-income Black male undergraduate students face in developing social capital and self-efficacy in STEM career fields?

The overall results of this study were consistent with findings found in the existing literature as they relate to Black male students, the critical role of minority STEM mentoring and enrichment programs, and the importance of self-efficacy and social capital. Strayhorn (2015) noted that precollege enrichment programs, self-efficacy, and sense of belonging could positively impact the academic achievements of Black males entering STEM career fields. In addition to Strayhorn's findings, Sharma and Nasa

(2014) posited that self-efficacy is a unique element in the academic success of students of color as they assimilate into the campus environments of HWIs. In the current study, all participants shared experiences with mentoring or enrichment programs that positively impacted them academically, personally, and professionally. Examples include help with writing college essays, professional development, and earning internships. Additionally, participants shared their disappointment in the lack of faculty and staff who looked like them on the campuses of HWIs. According to Ransaw and Green (2016), the lack of social interactions with professionals who look like they do can be challenging for Black male college students as they enter STEM career fields.

Research Question 1

The first research question was focused on the role STEM mentoring and enrichment programs play in the development of self-efficacy among low-income Black male STEM undergraduate students. The data showed that as Black males were preparing for college, there were a number of limitations that made their transition difficult. However, the data showed each participant presented strong self-belief and was able to stay focused on their individual goals as they worked to overcome the barriers while their self-efficacy increased.

Additionally, the data indicated that participants began to develop stronger social relationships (bonding, bridging, and linking social capital) after they became involved with the campus Black engineering mentoring and enrichment chapter and other STEM mentoring and enrichment programs. Three of the seven participants reported they also

began to develop strong relationships (bonding and bridging social capital) with their fraternity brothers after pledging to their fraternity.

Research Question 2

The second research question was focused on how low-income Black male undergraduate students describe their academic success (i.e., self-efficacy) while engaging in STEM mentoring relationships. The data presented the positive effects of STEM mentoring and enrichment programs as well as the Black engineering mentoring and enrichment program on-campus chapters had on the seven Black male participants of this study. According to the data, the Black engineering mentoring and enrichment chapters served as a source for creating trusting relationships through bonding social capital, bridging social capital, and linking social capital. In addition, the data showed that the Black engineering mentoring and enrichment chapter created educational opportunities, created professional links, and helped in the development of goals, academic achievements, and careers in STEM. This finding is consistent with the literature (Brooms & Davis 2017; Brooms et al., 2015; Bursuma et al., 2017; Gasman et al., 2016; Gibson, 2014; Ingram et al., 2016; Jackson & Hui, 2017; Ransaw & Green, 2016). The data also revealed that bridging social capital was an essential factor as the participants developed relationships beyond their campus environments.

Research Question 3

The third and final research question addressed the unique challenges low-income Black male undergraduate students face in developing social capital and self-efficacy in STEM career fields. According to the data, all seven participants stated they used some

sort of outside support source or media outlet to gather information as they were preparing for their college career. The data also showed the participants in this study relied on their new campus networks to earn internships and achieve academic goals. In addition, the study participants showed concerns for minority support programs and STEM mentoring and enrichment programs that lacked the faculty and staff who looked like them and understood their needs on the campuses of HWIs. A similar finding was also noted by Brooms and Davis (2017) and Ingram et al. (2016).

The study participants' HWI campuses did have a chapter of the student-run Black engineering mentoring and enrichment program that was helpful in understanding the needs of minority students while providing provided positive support. However, due to the COVID pandemic, these programs may or may not have been fully active during the study. Additionally, the data revealed that when faced with challenges, the participants relied on minority mentoring and enrichment programs as an essential element in the development of positive social engagement, professional relationship building, and academic achievement. This finding was also noted throughout the existing literature (Alston et al., 2017; Depass & Chibin, 2015; DeAngelo, 2015; Gibson, 2014; Ingram et al., 2016; Lavallais et al., 2017; Zambrana et al., 2015).

Additionally, consistent with the literature minority STEM mentor and enrichment programs are critical elements in academic achievement and goal setting as Black men are developing trusting relationships with the different individuals in the HWI campus environment (Brooms et al., 2015; Chavous et al., 2018; Gibson, 2014). The literature have also shown that the absents of STEM mentoring and enrichment programs

can also affect the development of critical social relationships and the development of social capital (Alston et al., 2017; Depass & Chibin, 2015; DeAngelo, 2015; Gibson, 2014; Ingram et al., 2016; Lavallais et al., 2017; Zambrana et al., 2015).

The literature defines three types of social capital bridging, bonding, and linking which are critical in providing the necessary connection to opportunities outside of the immediate cultural grouping of Black males. The study found that the participants of this study had very little to no social capital before the start of their college careers. The study also shows that Black males were not prepared for their STEM careers which is consistent with the literature (Chavous, et al., 2018; DeAngelo, 2016; DePass & Chibin, 2015). However, the study did posit that as Black men are assimilating into the campus environments of HWI and found minority mentoring and enrichment programs that provide professional that look like them they were more likely to set goals and achieve academically and professionally.

Limitations of the Study

Chapter 4 detailed the efforts made to enhance the study's consistency and trustworthiness. This study aimed to gain an in-depth understanding of the participants' lived experiences. In addition, provide a sample of the importance of minority STEM mentoring and enrichment programs related to developing self-efficacy and social capital in Black male undergraduate students who enter the STEM career field at HWI. The limitation of this qualitative study included a small participant group made of 7 Black male undergraduate students from eastern seaboard HWI, which limited the finding of this study to one ethnic group and one gender. Organizational and personal conditions

that could have influenced the limitation of the participants were the COVID-19 pandemic, the sudden shift from brick and mortar classrooms to hybrid online learning. Also, learning environments that were no longer consistent with their campus environments and institutional minority support systems were eliminated due to staff furloughs and layoffs. Historical events of the year such as social media outlets being flooded with live feeds of Black men of all ages being gunned down, racial unrest, the rise in systemic racism and institutional racism in the country educational systems coupled with the surge of white supremacy the country. The impact of the nation protesting the highly publicized killing of George Floyd was also a critical factor. These events could have influenced the responses of the Black men who participated in this study.

Recommendations

Considering the strengths and limitations of this phenomenological study of Black men in nontraditional academic settings like STEM careers, several proposed recommendations for future research should be considered. First, further phenomenological studies should be conducted to expand on the finding of this study's limitations. These studies should include the effect of systemic and institutional racism coupled with COVID-19 and the shift in learning platforms in Black communities.

A second recommendation would be conduct phenomenological studies focused on the relationship between the development of long-term relationships between minority professionals and Black men and the development of social capital. This study has shown that Black men continue to struggle to build the social capital needed to matriculate into

STEM career fields due to the lack of professional representation that looks like them. A final recommendation is to conduct further research on the effects the lack of Black professional faculty and staff has on Black men in educational programs, and the lack of development of social capital for students of color who enter STEM career fields at HWI.

Implications for Social Change

The literature posits that Black men studying in the STEM career field that lack the proper support systems are more likely to not succeed in STEM career fields (DeAngelo, 2016; Gibson, 2014; Zambrana et al., 2015). The current study suggests that if positive social change happens for Black men entering the STEM career fields and the on-campus communities of HWI, policymakers, administrators, and educators need to work together to ensure Black faculty and staff are hired. More critically, policymakers, administrators, and educators will also need to focus on developing minority STEM mentoring and enrichment programs that positively affect Black men as they pursue careers in STEM education. By adequately addressing these issues and providing positive support systems, the campus and academic environments of HWI will begin to set the standards for equality and positive social change. Additionally, the contributions of this study can inspire the next generation of Black men STEM graduates by providing HWI that are seeking to create diverse communities in STEM career fields additional data.

The literature posits that social relations are a critical component in addressing positive academic achievement for Black male undergraduate students (Booker & Brevard, 2017; Brooms et al., 2015; Hussin & Khan, 2017), leading to academic success positive social change. The finding of this study suggests that policies introducing

minority STEM mentoring and enrichment programs that focus on diversity, equality, and inclusion on HWI campuses are just as important. HWI Policymakers, administrators, and educators can also do their part by taking studies such as this and creating an academic environment that ensures equality, for students of color, especially Black men.

Conclusion

This phenomenological qualitative study explores the experiences of Black men who are pursuing degrees in the STEM career fields at HWIs of higher learning. Seven Black men shared their experience without reservation and courage of how self-efficacy increase as they pursued their degrees. The study data identified how through STEM mentoring and enrichment programs, Black men developed social capital. The study shows that Black men can continue to grow and achieve academically with the help of STEM mentoring and enrichment programs.

The finding of the qualitative study broadens the knowledge-based research on the critical need for Black male professionals and minority mentoring and enrichment programs which are a crucial element in the success of Black males who attend HWI (Brooms & Davis 2017; Brooms et al., 2015; Brunsma et al., 2017; Gasman et al., 2016; Gibson, 2014; Ingram et al., 2016; Jackson & Hui, 2017; Ransaw & Green, 2016). In addition, the data showed the lack of Black professionals on the campuses of HWI which is consistent with the literature (Brooms & Davis, 2017; Hussin & Khan, 2017; Ingram, et al., 2016; Jackson & Hui, 2017; Strayhorn, 2015; Zambrana et al., 2015). Based on this study's finding, there is a need for additional research to investigate the impact of HWI

campus environments and the recruitment and hiring of Black faculty and staff, especially Black men that represent the interest of Black males in STEM education.

The literature review, chapter 2, explored the relationship between self-efficacy, social capital and mentoring, enrichment program, and academic success among Black male students (Booker & Brevard, 2017; Hussin & Khan, 2017; Strayhorn, 2015). The data collected from the Black male participants in this study showed how their lived experience positively affected their self-efficacy. Seven participants shared the difficulties they faced as they prepared for college and how they overcame the odds. They also shared their challenges with campus experience as they developed trusting professional relationships, set goals, and created social networks in the STEM career fields.

The study identified the lack of social capital in the home of the study participants especially bridging social capital, which could have provided critical links between their home environment and their new campus environment. The study participants develop social networks (bonding, bridging, or linking) during their first year of assimilation into their respective HWI campus social environments. But, constant with the literature, the finding of this study posited that the participants dealt with levels of social isolation or the sense of belonging (Brooms & Davis, 2017; Hussin & Khan, 2017; Jackson & Hui, 2017; Ransaw & Green, 2016; Strayhorn, 2015), which further research should consider.

Black men can and have consistently achieved success at academic levels that are unintentional. Their desire to outperform their peers academically in the STEM career field at HWI forces them to ignore the oppressive voices and go high. Black men are

forced to never show fear and lead by the unknown examples of success they find in their new academic environments. They become change agents in a society that is bias and unwelcoming. Self-efficacy is consistently enhanced through the mastery of experience, verbal persuasion, and a belief in oneself, not to mention others' events. Black men continue to struggle through systems of oppression in their academic culture. However, Black men continue to develop through bridging, bonding, and linking their resources to build the social capital needed to succeed beyond their college education.

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