FROM ROOTS TO STAR TREK: A CASE STUDY ON SUCCESSFUL PERSISTENCE OF AFRICAN AMERICAN MALE ENGINEERING MAJORS

by

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ABSTRACT

MARQUIS CORNELIUS MCGEE. From Roots to Star Trek: A Case Study on Successful Persistence of African American Male Engineering Majors. (Under the direction of DR. LISA R. MERRIWEATHER)

The United States is competing on a global level for jobs in the STEM fields but retention and graduation rates in the engineering disciplines are lower than desired. African American males make up 5 % of the population of American colleges and universities (Strayhorn, 2010) and many of those pursuing an engineering degree often are not academically prepared for a career in engineering. There are African American males who have successfully persisted in engineering; however, limited research is provided about the success of these African American males and their experiences in engineering programs. The purpose of this study was to understand factors that impact successful persistence of African American male engineering majors at a predominantly White institution. Critical Race Theory was used as a framework to gain a broader scope of the underlying themes interwoven into the fabric of American society and a better understanding of the perceptions about African American male engineering majors. A qualitative case study was conducted to understand real-world phenomena through the experiences of successful African American male engineering majors. Using constant comparative analysis technique, two major themes were identified: Overcoming challenges and social identity. Early academic experiences, developing a positive identity, and a connection to others experiencing similar challenges were found to contribute to successful persistence.

DEDICATION

This dissertation is dedicated to my mother, Patricia Ann McGee, who was not physically present to share the joy of my educational accomplishments in higher education but spiritually present to influence my drive to succeed. Thank you for always believing in me and encouraging me to reach beyond stars. Nothing can ever repay what you have done for me.

This dissertation is also dedicated to those who came before me and those who will come after me. My ancestors paid the price so that I could have an opportunity to receive a quality education and share the voices that were once silenced. It is my hope that my children, future grandchildren, and future great grandchildren will know they were the inspiration that kept me going when I wanted to give up. I could not let them down. I hope they too will follow their dreams and not let anyone nor anything get in the way of accomplishing those dreams.

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CHAPTER 1: INTRODUCTION

Background

LeVar Burton is an African American male actor who starred in STAR TREK: *The Next Generation*, a sci-fi TV series about a future time where all humans are viewed as equal and differences are celebrated. As the Chief Engineer of the Starship Enterprise, he is born blind but his special device over his eyes enables him to see things in a unique way. In his day and age, his skin color is irrelevant and accepted in society. His unique ability to see people and things on a different spectrum and skills as an engineer are highly valued. If one could imagine a future where skills are valued as well as cultural wealth in the Science, Technology, Engineering, and Mathematics (STEM) fields, this sci-fi series would be the cornerstone of how this could happen.

The U.S. is competing on a global level for jobs in the STEM fields. To remain competitive, it is essential that the U.S. strengthens the STEM skills of those who will be competing in the job market. Since the 1990s, there has been continual improvements for preparing students to succeed in college; however, there are increasing concerns that students are not sufficiently prepared in the STEM areas (Kuenzi, 2008). Further, there has been a decline in the number of high school graduates pursuing a major in STEM-related fields in college. In 2006, only 15% of high school graduates enrolled in college were STEM majors (Chen, 2009). When these graduates get to college, something happens and a percentage of those who initially pursued a STEM degree discontinue in STEM majors. Chen (2009) found that among all students entering a STEM field in their first year of postsecondary enrollment, 55% of students switched to a non-STEM field or

left postsecondary education without earning any credentials. The 6-year degree-completion rate of undergraduate science, technology, engineering, and mathematics (STEM) majors at U.S. colleges and universities is less than 40% (President's Council of Advisors on Science and Technology [PCAST], 2012). At this rate, the U.S. will not be able to compete in the STEM fields at a level equal to their counterparts.

It is projected by the U.S. Census Bureau "that underrepresented minorities will account for about 45 percent of the U.S. population by the year 2050" (National Research Council, 2011, p.24). If the trend holds then the number of eligible minority students who could enter college will increase. The National Research Council (2011) reported that under-represented minorities comprise approximately 28% of the college population. Enrollment figures of the intent to study STEM in college for African American males show levels around 33% whereas White males are 40%. However, graduation rates for African American males in STEM are around 14%. White males are 69%. Even more discouraging is that African American males make up only 9% of the STEM workforce. This point demonstrates that the issue is multifaceted. The National Research Council submits that it is not a single pipeline that feeds the STEM workforce pool, rather it is the convergence and divergence of intertwined segments fed by a range of factors that pull minority students into and push them out of STEM curricula. These segments result in the U.S. missing out on opportunities for developing scientists, technologists, engineers, and mathematicians that look like LeVar Burton who may show signs early in childhood that they have the skills to be a chief engineer on a starship or a medical doctor for a well-known hospital. Something happens between elementary and high school that deters African American males from pursuing a career in the STEM field.

Palmer, Maramba, and Dancy. (2011) suggest that unless the disparity of STEM minority student graduation rates is addressed, the participation gap in the STEM workforce will inevitably decrease. These issues and concerns surrounding the "educational pipeline" problem for minority students within STEM are unfortunately not new but they are more important today than ever before, because fixing this problem could significantly impact and help the participation of African American males in STEM careers. There are several factors that disrupt the educational pipeline for African American males. For instance, issues of recruiting STEM majors at large disrupt the pipeline while having African American males as role models and mentors plays a significant role in improving STEM outcomes for the future. Examining factors that facilitate success for African American male engineering majors may help to mitigate these disruptions.

Problem Statement

Seventy-two percent of African American students in America graduate from high school. However, drop-out rates for African American males are well above 50% in most states (Schott, 2010). What happens to the ones who beat the odds in American schools? Although 75% of all White high school graduates enroll in college after graduation, only 35–50% of African American high school graduates do so (Strayhorn, 2009).

African American males make up 5 % of the population of American colleges and universities (Strayhorn, 2010). Those pursuing a STEM degree often are not academically prepared for STEM careers. Academically, many students struggle to complete introductory science and math courses based on insufficient preparation in high

school (Chang et al., 2014; Elliott et al., 1996). The NCES (2009) report contended that students who took higher-level mathematics courses were more likely to persist to STEM degree completion. For African American males who enter a STEM discipline without higher-level mathematics courses, these students are more likely to struggle in introductory courses involving science. Often, these issues lead to withdrawal from STEM discipline and eventually college itself.

The repercussions of African American males failing in college impact them on a personal level but also impact the community from which they come and that society. If a student fails to continue his college education, he limits his employability. In addition, college drop-outs often incur student loan debt that is an added stress to finding work that will cover this expense. In the U.S., there are a lot of STEM jobs available but not enough skilled workers for the positions. African American males could qualify for these positions but are not able to do so if they cannot complete their degree. Thus, making the U.S. lacking an employable, qualified workforce and falling further behind its global competition.

Purpose of Study

The purpose of this study was to understand factors that impact successful persistence of African American male engineering majors at a predominantly White institution.

Research Questions

1. How do self-efficacy beliefs impact successful persistence?
2. How does racial identity impact successful persistence?

3. What contributes to the development of positive self-efficacy of African American males pursuing an engineering major?

Significance of Problem

This study is significant because it has the potential to extend current understanding about factors that African American male engineering majors perceive as having a significant impact on their successful persistence in STEM education. The results from this study may also inform faculty and administrators, in academia as well as high school, that African American males who pursue engineering can be successful when certain support systems are put in place to achieve these goals. Through an anti-deficit inquiry, this study acknowledged students of color as experts of their lived realities and encouraged them to offer counter narratives of their successes in STEM (Harper, 2009; Solórzano & Yosso, 2002).

Often, African American male college students and students pursuing an engineering major encounter considerable challenges as they attempt to attain their educational goals. This study encompassed both subgroups into one group that has successfully persisted, despite the odds that are stacked against them. Findings in this study will provide insights that are transferable to these subgroups and will also has the potential influence current educational practices and policies. This research provided information that can be transferred to any university interested in the persistence of African American males in engineering. Moreover, rethinking how we interact with members from this group could encourage additional members to pursue an engineering degree in the future, advancing STEM diversity, persistence, and success.

Theoretical Framework

Critical Race Theory (CRT) is the theoretical framework that was used for this study. It allows marginalized people to share their viewpoints or counter narratives of their lived experiences.

Methodology

This researcher used the qualitative case study method for this study. Data was collected from questionnaires, field notes, and interviews then coded for data analysis.

Limitations

The researcher was a former employee of one of the universities in the study and there was a slight possibility that the researcher would know some participants. This point may have concerned some participants about confidentiality, but the researcher continuously reminded participants about the obligations of the researcher to conduct the study in an ethical and professional manner. Also, the researcher's own experiences as an African American male pursuing a STEM major at a PWI may have influenced his interpretation as participants gave personal accounts of lived experiences similar to his lived experiences. Another concern for this study was generalizability. Case study findings generally cannot be generalized to the larger population (Yin, 2014). Therefore, findings from this study cannot be generalized to this population at these universities.

Delimitations

The research recognized that this study was delimited to African American males at universities in the Southeastern United States. No other ethnic group, gender, or major other than engineering was a part of this study. This study only included males who had

a 2.75 GPA or better. This study was further delimited to males majoring in engineering who had successfully persisted as opposed to those who had not persisted in Engineering.

Assumptions

The researcher assumed all participates were open and honest during the interviews and would answer all questions. The researcher also assumed he would effectively use interviewing techniques, data collection, and data analysis to gain a broad understanding of the participants' lived experiences of how they have successfully persisted in their Engineering major.

Subjectivity Statement

I am an African American male who was born and raised in the South. My early years in public schools were during a time when children in marginalized neighborhoods were bussed to more affluent schools in the school district. My neighborhood was predominantly Black with poor and working-class residents. My parents were working class residents who did not attend college. They were from big families, so I had a large familial support system, growing up with family a few minutes within driving distance. I was pushed to attend college and pursue a degree in the STEM field. My parents provided me with basic tools I needed to entertain life as a scientist or as an engineer. I became fascinated with the idea of studying the elements of space and exploring the "final frontier". I had several junior high teachers who took notice of my passion for science and math and enrolled me in advanced science and math courses in high school. In high school, I took advantage of being at a predominantly White, affluent school by taking as many advance level courses as possible (including science courses not offered anywhere else in the district).

During my senior year, I had to make a hard decision: choosing between a predominantly Black college and a predominantly White college. I had lived in two worlds my entire life. One world dominated by Black culture (home) and one dominated by White culture (school). Because of this experience, I was consciously aware of how others perceived me as a Black male. At home, I was the cool nerd (because I also played sports) and at school, I was often the token Black student who had to represent his culture. Eventually, I decided to attend a small PWI because of the academic scholarship offered to me and the students and faculty I met each time I visited campus.

While attending college, I encountered overt and covert forms of racism that I often confronted while still feeling connected to campus through various support systems. My grades were good in all subject areas except biology. This was not good since that was my major. After my junior year, I decided to switch to Psychology which was a welcoming environment and natural fit. I graduated with a B.A. in Psychology and worked a few years in higher education before returning for my Master's in Counseling.

I have worked in education all my professional years at a PWI working tirelessly to help students navigate college. My passion has been to work with students of color, specifically Black males, and serve as a guide as they crossed the burning sands and tumultuous waters of academia. I do not regret changing my major, for it led me to wonderful opportunities in life. However, I believe if I had a "guide" and supportive environment, I might have performed well in biology. Because of this experience, I had a personal connection with African American males pursuing STEM degrees. It is my hope that this study may reveal information that others can use to set students up for success both in and out of the classroom.

Definition of Key Terms

STEM Majors

Students who are pursuing an undergraduate degree in Science, Technology, Engineering, or Mathematics (STEM).

Black or African American

U.S. citizens having origins in any of the Black racial groups of Africa (Harper, 2003)

Persistence

Students who continue as STEM majors throughout their undergraduate programs.

Summary

African American male college students pursuing an Engineering degree are faced with challenges and barriers. Limited research is provided about the success of African American males attending a predominately White university. There is even less published about the experiences of African American males who major in Engineering and are successful in college. By shedding light on this issue and hearing the voices of those who overcame those challenges, this study may inform faculty, administrators, and policy makers within the field. Chapter 2 discusses the literature review for this study.

CHAPTER 2: LITERATURE REVIEW

Introduction

Adjusting to the demands of college and integrating into a college environment can be stressful for any student. Like most students, African American males enter this environment having little or no experience of the demands commonly placed on students. However, African American males' experiences are often unique to their population, which contributes to them having the highest attrition rates of any demographic (McClure, 2006). At predominantly White colleges, some African American males experience racial prejudice, social isolation, and preconceived negative attitudes (Campbell & Fleming, 2000). These factors may lead to stress and poor academic performance (Cohen et al., 2006; Smith, 2005); however, there are Black males who overcome these challenges and persist to graduation. The review of literature explores factors that contribute to the success of African American males at predominantly White institutions, particularly African American males majoring in engineering. This review includes an overview of Critical Race Theory, African American males in college, African American males in STEM, and African American males in engineering.

Theoretical Framework

The Critical Race Theory (CRT) served as the framework in which this study was grounded to help the reader gain a broader scope of the underlying themes interwoven into the fabric of American society and a better understanding of the perceptions about

African American males. CRT is a valuable lens through which one can view the relationships among race, racism, and power (Delgado & Stefancic, 2001). With roots in legal studies, CRT is a convergence of scholarly perspectives from law, sociology, history, ethnic studies, education, and women's studies that highlight racial subordination and the inequitable distribution of power and privilege in the United States (Bell, 1987; Delgado & Stefancic, 2001). Although no single definition of CRT exists, many scholars agree upon the centrality of these six tenets:

1. Permanence of Racism: Racism is a part of everyday life in the United States, making it difficult to eliminate because it is neither recognized nor acknowledged (Delgado, 1995; Delgado & Stefancic, 2012; Ladson-Billings, 2005; Solórzano, 1998;).

2. Interest Convergence: CRT recognizes interest convergence, the process by which racial progress for Blacks is tolerated when it benefits the White power structure (Delgado & Stefancic, 2012).

3. Critique of Liberalism: Liberalism perpetuates the myth of colorblindness and the neutral principle of institutional law. CRT rejects the notion of a colorblind society, which often leads to misconceptions of racial fairness in institutions and conceals the socially-constructed meanings of race (Harper, Patton, & Wooden, 2009).

4. Counter-storytelling: Counter-storytelling allows minoritized groups to share their lived experiences. It gives voice to unique perspectives that provide an alternative to traditional stories conveyed to society from the lens of the majority group. (Delgado & Stefancic, 2012).

5. Revisionist History: Revision history "reexamines America's historical record, replacing comforting majoritarian interpretations of events with ones that square more accurately with minorities' experiences" (Delgado & Stefancic, 2012, p. 24).

6. Critique of Meritocracy: CRT continues to critique claims of meritocracy that attempt to sustain White supremacy (Bergerson, 2003).

Permanence of Racism

The permanence of racism is the view that racism is normal, and it shapes the political, social, and economic realms of American society. Hidden assumptions and stereotypes that impact everyday life are not questioned because they are a part of social norms in the United States. By not acknowledging the impact of race systematically and its effects on how we engage, racism is maintained (Bonilla-Silva, 2003). The struggles that African American males face in the educational system may imply that the historical effects of slavery or the perception of these males of past generations has impacted their success today in K-16 education to some degree. While covert forms of racism are not always apparent to the dominant culture, African American males at Predominantly White Institutions (PWIs) routinely encounter racist stereotypes and racial microaggressions that undermine their achievement and sense of belonging (Bonner II, 2010; Harper, 2009; Smith, Yosso, & Solórzano, 2007). Racial prejudice leads to feelings of social alienation, which can create a contentious university experience that may result in stress, anxiety, and poor academic performance (Fleming, 1984). Thus, the combination of racial prejudice, social alienation, and the preconceived negative attitudes regarding Black males make race a paramount issue for Black male student retention at PWIs (Campbell & Fleming, 2000).

Interest Convergence

Race has played a significant role in the fabric of American society. Interest convergence, or material determinism, claims that racism advances the interests of White

elites and the working class. If racism is eliminated, the dominant group would not be able to hold onto their interests, so there is no need to eliminate racism. Even when the dominated group is granted opportunities in society, White people are often the beneficiaries of these opportunities; therefore, CRT scholars question the motives of the dominant group when actions are taken to lend opportunities to the dominated group. For example, this research study on African American male engineering majors may not capture the interests of the dominate group until one understands how this study can benefit those in power.

The government is aware that the dominated group is necessary to achieve the goal of increasing the engineering workforce. Funding is offered to those who will find ways to increase workforce presence of a minoritized group. White scholars may see this funding opportunity as a way to benefit monetarily and professionally with little interest in the identified group. CRT scholars may claim that the dominate group's interest in financial increase and professional growth and the dominated group's interest in succeeding in engineering creates a convergence of interest. Therefore the real motive behind finding opportunities to increase minoritized presence in engineering is that it will also benefit the dominate group.

Critique of Liberalism

CRT scholars reject the idea of a colorblind society where people are seen as having equal treatment, regardless of their different histories and current statuses. Colorblindness is a futuristic concept that does not resolve the damage created from the days of slavery and segregation. Accordingly, CRT scholars argue that if racism is embedded in our social structure, institutional practices, and thought processes as an

everyday norm, then minorities will stay in subordinate positions (Delgado & Stefancic, 2012).

Liberalism fails to acknowledge the differences of marginalized groups, which essentially denies the value of one's culture. Johnson (2005) asserts that we live in an invisible system of oppression where privilege impacts social class, race, ability status, and gender. To bring this system to light, Johnson says we should begin by naming race and privilege, so it becomes difficult to ignore it. Thus, a liberal view of race and its impact on society perplexes the challenges of overcoming these problems.

Fries-Britt and Turner (2002) found that students attending PWIs encountered one major problem from which their peers at historically Black colleges and universities (HBCU) found immunity: constant confrontations with racial stereotypes. Feagin et al. (1996) describe the racialized experiences of Black students at a large, predominantly White research university, including racist confrontations with White students and insulting remarks from White instructors and staff. Davis et al.'s (2004) study on the experiences of Black students at a PWI in the Southeastern United States noted that participants believed others assumed their admission to the institution was because of affirmative action, not academic talent. Also, every participant in Fries-Britt and Turner's study felt tremendous pressure to prove her or his intellectual competence and belongingness.

In addition to verbal insults, African American students frequently encounter rude stares and avoidance, exclusion from study groups and other campus spaces, and doubts about their academic ability from non-Black students (Allen, & Carroll, 2002; Cunningham & Courseault, 2006; Feagin, 1992; Hayes, Solórzano et al., 2000;

Solórzano). Specifically regarding Black undergraduate men, common misconceptions are that they: lack intellectual prowess, need remediation, and express more interest in athletic accomplishments than in academic achievement (Fries-Britt, 1997; Harper, 2009, 2013; Harper & Davis, 2012). They often find themselves as a part of the "prove-them-wrong syndrome," working hard to prove to White peers and professors that they excel at particular subjects, such as math and science, and they have earned admission to the institution (Moore et al., 2003).

According to Steele (1997), an achievement "threat" is posed when a member of a socially stigmatized group encounters stereotypes advanced by those outside the group. In this context, the stereotypes regarding gender and academic ability that have favored White males in educational settings appear to be replaced by "racialized" gendered stereotypes. This point can be readily seen in discussions of academics and African American college student athletes, which tend to focus on males in revenue-producing sports (Chavous, 2002).

Smith et al. (2007) found that Black men often encountered stereotypes on campus of criminality and violence. As a result, they faced extreme policing on campus from law enforcement officials (p. 45). While Black men are often feared for their perceived violence and hypersexuality, they are also exotically ostracized for their perceived athleticism (Collins, 2005). The Black male body has historically been represented as animal-like, with strong bodies suited for athleticism (Collins, 2005). Athleticism is connected to class in that popular notions of Black male athletes originate as urban, low-income youth who struggle to attain a better life through professional sports (Boyd, 1997). This misconception is due to popular notions of racialized poverty

that constructs Blackness as being synonymous with low-income status (Anderson, 2012).

Counter-storytelling

Counter-storytelling gives a deeper understanding of how America sees race (Delgado & Stefancic, 2012). It allows marginalized groups to share their lived experiences, making them the experts in telling their stories. According to Solórzano (1998), "CRT recognizes that the experiential knowledge of women and men of color is legitimate, appropriate, and critical to understanding, analyzing, and teaching about racial subordination in the field of education" (p. 122). These counter-stories shed light on how the storyteller views the world in which CRT scholars highlight discrimination and offer different interpretations of current policies. Counter-storytelling gives voice to the silence. For this study, the researcher valued the stories that participants shared as they became the experts of their lived experiences which might influence or change current and future practices in STEM education.

Revisionist History

CRT strive to uncover the unknown chapters of history that involved racial struggle of minoritized people (Delgado & Stefancic, 2012). This point suggests that the interpretation of U.S. history is to be challenged and reinterpreted as opposed to being accepted as the whole truth. Delgado Bernal (2002) used CRT to illustrate how racial minority students are made to feel that their histories, experiences, cultures, and languages are devalued or often omitted in educational settings. Kumashiro's (2000) theory of anti-oppressive education sheds light on four approaches to conceptualizing oppression and establishing curricula, policies, and pedagogies to bring about change in

education. These four approaches are 1) Improving the experiences of students who are in some way oppressed (aka "Othered") in and by mainstream society 2) Integrate otherness throughout the curriculum 3) Advocating a critique and transformation of hegemonic structures and ideologies and 4) Teaching involves unknowability. Ladson-Billings (2014) advocates that teachers should educate students through culturally relevant pedagogy that allow each student's history and voice to be heard. Most recently, she has extended her research to not only make the culture of others relevant but also sustain that culture. Culturally sustaining pedagogy "layers the multiple ways that this notion of pedagogy shifts, changes, adapts, recycles, and recreates institutional spaces to ensure that consistently-marginalized students are repositioned in a place of normativity" (p. 76). In working with African American males at all educational levels, it important to allow them to hear history from different perspectives, share their unheard history, and experience education that make them the subject in the instructional process.

Critique of Meritocracy

CRT scholars question the fair distribution of meritocratic benefits as rational and just. Valdes, McCristal Culp, and Harris (2002) maintain that these three central beliefs of mainstream culture must consistently be challenged: (a) blindness to race will eliminate racism; (b) racism is a matter of individuals, not systems; and (c) one can fight racism without paying attention to sexism, homophobia, economic exploitation, and other forms of oppression or injustice. If there is a fair distribution of meritocratic benefits, why have African American males consistently finished as a cohort at the bottom academically for over 40 years (McDaniel et. al., 2011)? Is it because they do not apply themselves? Are they intellectually inferior to other populations? CRT scholars debunk

these statements and maintain the notion that African American males are not to be taken for granted in higher education (Harper, Patton, & Woodson, 2009).

Several sources (Cuyjet, 2006; Ogbu, 2003; Raffaele Mendez, 2003; Voelkle, 1999) have identified that African Americans often underachieve academically. In addition, these studies suggest that many African American students have a difficult experience in school as evidenced by the high rates of suspensions, expulsions, and poor attendance records. The issue of poor academic performance is particularly true for African American males. African American and Latino males are noticeably distinguished from other segments of the American population by their consistent clustering at the bottom (Schott, 2010). African American males are more likely to be classified as mentally retarded or to be identified as suffering from a learning disability and placed in special education (Noguera, 2012). Several studies have shown that many African-American males began their early school years behind their counterparts and show strong academic improvement by second grade (Edwards & McMillion, 2000; Kunjufu, 1995; Wilson-Jones, 2003). These studies suggest that between third and fourth grades, African-American males may encounter a poor transition between the primary and intermediate division (Davis, 2003; Gentry & Peelle, 1994; Kunjufu, 1995). Kunjufu (1995) identifies factors that contribute to the decline of African American males' academic achievement during this transition. These factors are:

- A decline in parental involvement
- An increase in peer pressure
- A decline in nurture
- A decline in teacher expectations
- A lack of understanding of learning styles
- A lack of male teachers

If these factors are not circumvented, African American males will continue to decline in academic achievement throughout middle school and high school and face a greater risk of dropping out of school than their White male counterparts (Hoffman, Llagas, & Synder, 2003; Kunjufu, 1995). African American males consistently experience more behavior problems, grade retentions, and suspensions than any other students (Wilson-Jones, 2003). African American males also receive harsher consequences for misbehavior than other students who break similar rules (Monroe, 2005). These disciplinary gaps further enhance the likelihood of delinquency and recidivism of African American males (p. 45).

Issues concerning persistence and graduation in STEM-related majors overlap with some of the issues facing African American males. Identification of barriers that keep African American males from persistence toward graduation could also help halt the STEM "pipeline" problem that the U.S. is facing today. In addition to identifying these barriers, attention should be placed on African American males who are succeeding in STEM majors to understand factors that impact successful persistence.

African American Male College Students

Research has looked at the connections between the African American male dynamic, facets of their college life, and how various factors prior to and during college impact their success (Anglin & Wade, 2007; Basu & Barton, 2007; Harper, 2012; Jackson & Moore III, 2006; McCullough, Crull, & Thomas, 1994; Moore III, 2006; National Research Council, 2011; Palmer, Davis, Moore, & Hilton, 2010; Palmer, Maramba, & Elon Dancy II, 2011). Despite the challenges African American males face, we do know that 36% of them graduate within 6 years. What separates them from the

64% that never complete their 4-year degree? Harper's (2012) in-depth study on 219 African American males from 42 college and university campuses focused on common factors that contributed to their success. Harper's inquiry shed light on three major points 1) Pre-College Socialization and Readiness, 2) College Achievement, and 3) Post-College Success. For the purpose of this research, the researcher will focus on the first two points.

Pre-College Variables

Prior to the start of college, there are variables that influence the probability of successfully adjusting to college from high school. Pre-college variables mentioned in this section have been identified by scholars as factors that have contributed to the success of Black males.

High expectations. Harper (2012) discussed the significant role that parents play in the lives of academically successful Black students. Conversations emphasized the importance of hard work and its tie to success. Parents had high expectations of academic success during students' pre-college years. Berry (2002) investigated success of African American male middle schoolers who were part of a pre-college program at the University of North Carolina at Chapel Hill. Examining factors used to overcome barriers, he found that parental involvement and high teacher expectations were critical contributing factors.

Unique schooling environments. Harper and Griffin (2011) found that students attributed their college readiness and access due to unique K–12 schooling environments. For students who were from low income, working or non-working families, many were afforded access to magnet schools that emphasized particular academic specialties (such

as science, technology, and performing arts) and promoted a strong college-going culture. These K-12 schools often had competitive admissions processes. Other students spoke of initiatives that provided opportunities for lower-income urban youth to attend high-tuition private high schools that enrolled few minoritized students (Harper & Griffin, 2011).

Urban Prep Academy (Englewood Campus) is an example of a unique schooling experience. This college preparatory public charter high school for African American males offers a comprehensive, high-quality, college preparatory education in each of its academies. Distinctive elements of the school's program include:

- A rigorous college prep curriculum;
- Extended school day and year;
- Focuses on language arts and math;
- Extra-curricular activities;
- Community service requirements;
- Parental engagement expectations;
- Positive school culture;
- Regular professional development for teachers
  (Urban Prep Academy, 2017)

Urban Prep has also surpassed the national average for African American males, graduating 100% of their first eight classes (Urban Prep Academy, 2017). In addition, all graduates have been accepted to a four-year university (Urban Prep Academy, 2017). It is a combination of high expectations, community and parental involvement, and a dedicated school staff that has led to the success of their charter schools. Rutledge's (2010) study compared the academic achievement of African American males enrolled at two non-traditional high schools and found that these high schools (one early college and the other performing arts) were designed to prepare all their students for college. Their

curriculums were created to be progressively challenging as students persisted each year but also provided a supportive environment that included maintaining a culturally relevant curriculum that validated who the students were and addressed their individual needs.

Pre-college programs. In addition to a unique K-12 experience, pre-college programs that emphasized study skills, resource acquisition (i.e. how to acquire financial aid, applications, mentoring, and curriculum exposure), and experiential opportunities played a significant role in academic success (Harper & Griffin, 2011). Parker, Elliott, and Tart (2014) conducted a study on African American male high school students and their involvement in the Advancement Via Individual Determination (AVID) program. AVID is "a fourth grade through high school system to prepare students in the academic middle for four-year college eligibility" (AVID, 2009, para. 10). The program's mission is to ensure AVID students will be successfully prepared to attend a four-year college by providing academic and social skills through a rigorous curriculum. Scholars recognize that the AVID system improves the achievement of students, particularly Hispanic and African American high school students (Lozano et al., 2009; Watt et al., 2006). Parker, Elliott, and Tart's study found that the AVID program: 1) Provided supportive family-like relationships, 2) Encouraged African American males to do better academically (high expectations) 3) Used AVID methodologies to improve preparation for college and 4) Encouraged a positive attitude towards education. Pre-college programs help students to make connections between academics and career success later in life. In the case of the AVID program, supportive peers and teachers as well as a rigorous curriculum have helped these young men find the path to a better future (p. 163).

College Variables

In addition to pre-college variables that assist student adjustment to post-secondary education, there are variables that aid students in retention and persistence while in college. These variables help students feel connected to the institution and create a sense of belonging as they pursue their degrees. Variables discussed in this section contribute to the success of Black male persistence.

Faculty involvement. Adjustment is an aspect of retention and persistence. Mentoring experiences appear to contribute to adjustment. Interaction with faculty has been found to be a critical factor in student retention and persistence (Astin, 1993; Santos & Reigadas, 2004). Therefore, faculty/staff-student mentoring programs can be a dynamic way to help African American male students adjust to college (Pope, 2002; Santos & Reigadas, 2004), particularly at predominantly White institutions.

Financial assistance. Availability of financial assistance is a significant predictor of African American success and performance (Simms et al., 1993). More emphasis should be placed on creating public policies to eliminate the burden of cost, to reduce loan debt for lower-income people, and increase populations that historically have been underrepresented at the most elite and expensive state universities. Doing so may contribute significantly to postsecondary enrollment for African American males (Harper, 2011).

Classroom environment. Harper and Quaye (2007) recommend that faculty bring cultural inclusivity in the classroom. The interest and academic performance of African American students is more likely to increase when professors integrate information about the accomplishments of African Americans into the content of the class (Robertson et al.,

2005). As with any university classroom, professors should facilitate discussion that allows for opinions to be heard and respected by all students.

Academic and personal support resources. Campbell and Fleming's (2000) suggest that a positive self-concept is a corollary of favorable social adjustment which is a major determinant of African American male college student success. It is imperative for campus administrators to provide resources, such as summer bridge programs, tutoring, mentoring, academic advising, and personal/professional development that will enhance the African American male learning experience. To help African American males make the most of their experiences both inside and outside the classroom, same-race peer support and opportunities for meaningful engagement with other African American students are also suggested (Harper, 2006). Bryant's (2000) article supports the notion that the use of resources or support services enhances African-American males' academic performance and their overall educational experience.

Extracurricular activities. Athletic participation is an important component of self-esteem, facilitating social adjustment and ensuring college completion among male African American students (Pascarella & Smart 1991). Also, fraternal membership in Black Greek-lettered organizations has been shown to support positive social and academic integration, which in turn is correlated with better grades and retention (McClure 2006; Tinto 1993). Membership in Black fraternities has yielded an increase in political involvement and community involvement, as well as facilitated the development of positive social networks among African American male college students (McClure

2006). It can serve to counteract the alienation that Black males often experience on White college campuses.

The literature suggests four practical implications for higher education administrators can assist with the matriculation and graduation of African American males (Harper, 2006):

1. Support (financial and otherwise) for predominantly Black clubs and minority student groups is imperative, as those organizations serve as the primary venues through which Black leadership is developed and achievement is embraced.

2. Given the role of the five historically Black fraternities in offering social support and academic encouragement to African American male undergraduates, attempts should be made to sustain these organizations and increase African American male interest in membership.

3. Because they afford opportunities for the cultivation of meaningful relationships with others who share similar values, goals, and experiences, administrators should commit financial resources for African American students to attend conferences and participate in leadership retreats. This is especially important because student leaders may find peer connections, validation, and support in these external venues that may not be available locally.

4. Programming (i.e., a conversation series) brings together members of different African American student subgroups to discuss the importance of peer support and confront internalized racism is necessary.

African American male students' ability to handle racism. Several studies have revealed the impact of African American male college students' ability to handle racism and academic success (Harper, 2012; McClure 2006; Strayhorn, 2009) Paramount

among those needs are: 1) a non-threatening educational environment that encourages the nurturance of academic success; and 2) the deconstruction of stereotypical negative images of Black males (e.g., non-intelligent, thugs) (Fleming, 1984). It is important for institutions to educate the campus about diversity, provide opportunities to experience diverse cultural worldviews, and create a safe environment for all students, especially African American males.

African American Males in STEM

Some African American males have successfully persisted and completed programs in STEM. In this section, the researcher will discuss factors that specifically impact the success of African American males in STEM programs.

Self-efficacy

Changes in behavior and successful performances on tasks are linked to a person's belief that she/he has the ability to be productive and can meet her/his goals. Bandura (1977) explains the idea of self-efficacy in a social context as people choosing or avoiding situations they either believe or do not believe they can cope with based on their skills. This self-reflection often dictates and translates to students not performing well in academia if they do not believe they have the skills. Calhoun's (2013) study on self-efficacy beliefs and African American male freshmen pursuing a STEM degree found that even the earliest interactions that a student has socially and academically influence the choices he makes and its effects on his efficacy beliefs, goals, and interests. Lent, Brown, and Larkin (1986) suggested the significance self-efficacy beliefs have on

students are linked by past academic success and the prediction of grades, persistence, and perceived career options in the future. As confidence and motivation are critical for STEM persistence, it follows that increasing success in the introductory core science curriculum is an essential component of encouraging higher levels of persistence among STEM majors (Graham et al., 2013). African American males who have early experiences in science and math increase their self-efficacy beliefs and are more likely to persist in STEM majors. Harper (2012), Bonous Hammarth (2000), the National Science Board (2012) highlight the significance of earlier academic preparation, financial considerations, social interactions in school, and the opportunity to explore and experience programs promoting life after high school.

College Preparedness

Adelman (2006) contends that a student's high school record dominated by a high academic intensity curriculum is better predictor of degree attainment than standardized test scores. African American males who have a rigorous academic curriculum are more likely to persist in STEM disciplines because of the exposure of complex problems and familiarity with terminology. In addition to a rigorous high school curriculum, summer STEM pre-college programs have been found to increase persistence and retention of students of color (specifically African American males) (Palmer, Miramba, & Dancy, 2011). It is important for African American males who aspire to work in the STEM disciplines to gain exposure early to increase the likelihood of graduating with a STEM degree.

High Engagement Practices

Pascarella (1985) proposed a model for assessing changes in learning and cognitive development based on Tinto's core constructs. The model first suggested that students' background characteristics and the institution's structural and organizational characteristics have a direct influence on the "agents of socialization" (p. 50), namely faculty and peers, and the institutional environment. The interaction with faculty and peers directly affects the quality of student effort. The institutional environment directly influences students' quality of effort and interactions with faculty and peers which both directly influence learning and cognitive development (Pascarella, 1985; Pascarella & Terenzini, 2005). African American males in STEM disciplines benefit from interactions with their peers and faculty. One factor supporting retention of African American males in STEM education is participating in research experiences as undergraduates (Barlow & Villarejo, 2004; Hurtado et al., 2008). Undergraduate research gives students the opportunity to work closely with a faculty member who also serves as mentor. This experience allows them to grow within the department and feel connected to the university. Engaging in research has been shown to enhance knowledge and understanding of STEM disciplines, have greater contact with faculty, foster problem-solving, implement technical and presentation skills, facilitate self-confidence, and provide greater insight and clarification of career goals (Carter, 2002; Hurtado, et al., 2008; Lopatto, 2004). Support that African American males receive from peers, mentors, and faculty are critical to success in STEM education (Bonous-Hammarth, 2000; FriesBritt et al., 2010).

African American Males who major in engineering have specifically been the subject of research inquiry. There has been a need to identify influences that encourage African American males to choose engineering and to persist in their programs. Several researchers have identified pre-college preparedness, academic self-efficacy, and supportive relationships as key indicators of African American male success.

Pre-College Preparedness

According to the National Science Board (2012), African American males made up 4% of students in engineering programs. Academic preparation or college readiness is a key indicator of how successful African American males will be in Engineering programs. Atwater and Simpson (1984) indicated that there is a positive association between high school characteristics, prior academic achievement, and future success in science and engineering programs. Researchers have stressed the importance of a rigorous high school curriculum, especially in math and science, for students pursuing Engineering programs (Adelman, 2006; Bonous Hammarth, 2000; Harper,2012; National Science Board, 2012). Strayhorn (2015) and Grandy (1998) also found that African American males' attitudes towards math and science courses influence success in their programs.

Academic Self-efficacy

Academic self-efficacy refers to an individual's belief that they can successfully perform academic tasks at designated levels (Schunk, 1991). Strayhorn (2015) found that African American males pursuing an Engineering degree were impacted by their academic self-efficacy. Participants in his study believed that confidence in their

academic ability was essential to their success. They developed a "never give up, never quit" attitude which enabled them to persist when facing challenges in their academic programs.

Supportive Relationships

African American males make up a small portion of students in engineering programs, and sometimes, represent the only African American student in their courses. They may experience feelings of isolation and struggle to gain a sense of belonging in their program of study. If they do not make connections or gain a sense of belonging in their major, they are more likely to stop the pursuit of an Engineering degree and find another program that will support their education aspirations. Strayhorn (2015) discussed his "belonging theory" that posed several key points that support African American males' need to stick with pursuing their engineering degree. Support is a key factor for success of African American male Engineering majors. Family, professor, and peer support are all key indicators that impact success in engineering for African American males.

Familial support. With a program that has few African American males, support from family members can have a significant impact on whether a student continues in his engineering program. Flowers (2015) found that family support assisted with the persistence of African American males in engineering programs. Participants interviewed indicated that parental expectations, involvement, and encouragement influenced them to continue the pursuit of their Engineering degree

Professor support. Professors are often the first professionals in academia that African American male Engineering majors will encounter in their departments. What

they say and how they react also play key roles in the persistence of African American males. If they create an environment where they are distant or have low expectations of their African American students, this may lead to feelings of isolation and a disconnection to the Engineering program. Flowers (2015) found that professor expectations influenced her/his participants' decision to persist in their engineering program. Professors' availability and willingness to assist African American males in understanding the material taught outside of class is also crucial to their success.

Summary

CRT scholars discuss the consciousness gap in education and why we need to consider race, oppression, and privilege in the U.S. educational system. Race is a factor in all areas of our lives, and education is one of the main pieces that need continued examination and critique. Because college campuses are microcosms of larger American society, first-generation African American males must find ways to adapt to a new environment while still dealing with racism that is woven into the cultural fabric of most postsecondary institutions. CRT helps to expose ways in which race neutral institutional policies and practices reinforce racial or ethnic subordination.

Limited research is provided about the success of African American males attending a predominately White university. There is even less published about the experiences of African American males who major in Engineering and are successful in college. The purpose of this research is to understand factors that impact successful persistence of African American male engineering majors at a four-year, predominantly White institution.

CHAPTER 3: METHODOLOGY

It is often quantitative results that determine the success of an institution, with retention and graduation being the bottom line. While these numbers provide some insight for institutions, they do not provide a rich story about how students were able to persist towards graduation. Further few qualitative studies have investigated African American males who successfully persist in STEM education. This information could provide valuable insights for institutions and it is the author's belief that a better understanding of this phenomenon would allow administrators and educators to become more informed on how African American men navigate their way toward earning a bachelor's degree.

This study aimed to understand factors that impact successful persistence of African American male engineering majors at a predominantly White institution. The research questions were as follows:

Research Questions

1. How do self-efficacy beliefs impact successful persistence?
2. How does racial identity impact successful persistence?
3. What contributes to the development of positive self-efficacy of African American males pursuing an engineering major?

Research Design

Qualitative researchers take a holistic approach to inquiries that require extensive involvement in the collection and interpretation of data. Qualitative methodologies bring deeper understanding to human behavior and to people's lived experiences (Denzin &

Lincoln, 2011). The researcher's goal was to "make sense or interpret phenomena in terms of the meaning people bring to" (p. 3) their lived experience. Qualitative research allows the researcher to explore, discover, or construct meanings of phenomena (Johnson & Christensen, 2008). It also allows the reader to gain experiential understanding of the phenomenon being studied.

Creswell's (2013) text lists five traditional methodologies: ethnography, phenomenology, narrative, grounded theory, and case study. For this study, case study was the ideal methodology. The main purpose for a case study is to understand a real-world phenomenon that is likely to involve important contextual conditions important to the case (Yin, 2014). Yin (2014) defines case study in terms of scope and features:

> *Scope of a case study*
>
> An empirical inquiry that investigates a contemporary phenomenon in depth and within real-world context, especially when boundaries between case and context may not be clearly evident.
>
> *Features of a case study*
>
> An inquiry that copes with the technically distinctive situation in which there will be many more variables of interest than data points, relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and benefits from prior development of theoretical propositions to guide data collection and analysis (pp. 16-17)

The case study research design is comprised of five components. (1) Case study questions answer the "how" and "why" for the case being studied; (2) Propositions (if any) focus attention to what should be examined within the study; (3) Unit of Analysis involves defining the case and bounding the case; (4) Logic linking the data to the propositions makes the researcher aware of his choices and how they suit the case study;

and (5) Criteria for interpreting data helps the research identity and address rival explanations for his findings (Yin, 2014).

Yin (2014) identifies four types of designs for case studies: single-case (holistic) designs, single-case (embedded) designs, multiple-case (holistic) designs, and multiple-case (embedded) designs. The researcher chose a single-case case study approach to gain an in-depth perspective and meaningful understanding about African American male engineering majors who have successfully persisted at a PWI. Yin (2009) considers use of a single-case case study to be appropriate when the case represents an extreme or unusual type in which the value could be connected to a larger population. The case identified in this study is African American male who majored and were successful in engineer majors. This case was bounded by the parameters of including only African American male students in engineering programs. Engineering technology majors were excluded. Insights learned through this study could be applicable to the larger population of African American males pursuing a degree in STEM. Marshall and Rossman (2006) suggests, "because thoughts, feelings, beliefs, values, and assumptive worlds are involved, the researcher needs to understand the deeper perspectives that could be captured through head-on interactions" (p. 53). A single-case case study can facilitate the researcher's understanding of these deeper perspectives.

Merriam (2009) describes case study as particularistic, descriptive, and heuristic. The particularistic significance is important because this research addresses a specific population: African American males participating and successfully navigating the STEM pipeline as engineering majors. There is very little research on African American male success pursuing an engineering degree. Hearing the voices of these young men who

have successfully navigated this pipeline will provide a descriptive account of the challenges they have endured and how they overcame those challenges. Finally, this study serves as a heuristic tool, allowing the researcher to gain insights to this population's STEM pathway.

Participants

The researcher conducted individual interviews with eight African American male undergraduate students from two four-year predominantly White institutions (PWI) in the southeastern region of the United States. Each university had more than 25,000 enrolled students. The researcher attempted to interview 12-16 African American male participants but after several attempts, only eight participants responded and agreed to participate in this research study within the researcher's time limit. Participants were selected based on the following criteria:

1. Self-identified as Black or African American male
2. At least sophomore standing (30 or more earned credit hours)
3. Earned a minimum grade point average of 2.75
4. Declared a major in Engineering, exclusive of engineering technology

The researcher recruited by requesting that the associate dean of engineering at each school send out a recruitment email (Appendix A) to all African American males who met the criteria. In addition, the researcher requested lists of all the student organization presidents and vice presidents from the assistant director of the institutions' multicultural resource center, if one existed. Student organization presidents and vice presidents were contacted through email by the researcher to share provided flyers of the research opportunity with the members who met the criteria. The researcher also posted flyers

(Appendix D) in areas where students frequented (e.g., student union, recreation/fitness center, dining halls, lobby areas of each department). The flyer provided information about the research study, the criteria, and a link (QR code) to the questionnaire (Appendix C). Students who responded and met the criteria were contacted through email and phone by the researcher and asked if they would like to participate in a face-to-face interview or phone interview. Five interviews were conducted face-to-face and three were conducted by phone. At the end of the interview each participant received a $25 gift card to Walmart.

Participants' Profiles

The following section is a profile of all the participants in this study. The names of the participants and schools listed are fictitious to protect the identity of the participants. Participants who have spent their college years at the same university are identified as native students. Participants who attended another college or university before attending their current university are identified as transfer students.

Michael

Michael is the youngest of four siblings. He is from a single parent household and his mom is from a country in Africa. He is a 25-year old transfer senior at UNO, majoring in Electrical Engineering. Michael was born and raised in North Carolina. His mother has a high school diploma and father, who has not been a part of his life since he was three, has a bachelor's degree in engineering from UNO. His current GPA at UNO is a 3.15 and he's attended UNO for four years. Prior to transferring, Michael attended different four-year research university.

Reggie

Reggie is an only child, born and raised in a country in Africa by his grandparents in a small village. His parents were not able to care for him financially in a nearby city, so his grandmother decide he should live with her and his grandfather. He eventually made his way to the Georgia before transferring from a community college to attend school at UNO where he has been the last three years. Reggie is a 30-year old transfer senior at UNO, majoring in Mechanical Engineering. His mother did not finish school while his father earned a bachelor's degree in Ghana. He is currently in the Naval Reserves and has a 2.99 GPA.

Bernard

Bernard was born in a country in Africa but raised in a large city in North Carolina since he was a preschooler. He is a 21-year old native junior at UNO, majoring in Civil Engineering. He is from a two-parent household and the oldest of two boys. His father earned a trade from vocational school and his mother has an associates' degree. Bernard currently has a 2.80 GPA and has attended UNO for three years.

Imari

Imari was born and raised in a small city in North Carolina. His father, an Animal Scientist, is from a country in Africa and mother, a registered nurse, is from North Carolina. Both parents have bachelor's degrees. He is the middle child of three kids who are all interested in STEM careers. His sister, the oldest, will be in her first year of medical school in fall semester while his brother is a junior in high school who plans to major in engineering also. Imari is a 21-year old native junior Mechanical Engineering major at UNO where he currently has a 2.94 GPA and has been there for three years.

Jeff

Jeff is a 20-year old native sophomore Civil Engineering major at UNO. A large city in North Carolina is his hometown where he was raised by a single mother who earned a high school diploma and his uncle. He has attended UNO for two years and has a 3.40 GPA. Jeff is also a student athlete on scholarship at UNO.

Jerry

Jerry was born and raised in a small city in North Carolina. He is from a two-parent household where his mother has a master's degree and father has a high school diploma. He is the oldest child in the family and believes it is very important to get involved on campus. As a 20-year native sophomore at UNO, Jerry is majoring in Civil Engineering. He has attended UNO for one year and has a 3.10 GPA.

Trey

Trey is a 21-year old transfer senior Biomedical Engineering major at TGU. His hometown is a large city in Georgia where he was raised in a two-parent household. His father received some high school education and his mother has a master's degree. He has attended TGU for one year and has a 3.87 GPA.

Allan

Allan is a 21-year old native senior Biomedical Engineering major at TGU. He was born and raised in a large city in Illinois where he is the middle child of five kids. His younger brother died during his junior year. His parents are currently divorced, but he is close to both. His mother has a bachelor's degree and his father has a PhD in Psychology. Allan has attended TGU for four years and has a 3.70 GPA.

Method

This study used in-depth interviews to collect data. Qualitative interviewing allowed the researcher to talk to those who had knowledge about the topic of interest. Interviewing focuses on a research question(s) and pursues the question(s) in great depth. It helps to reconstruct events that the researcher has not experienced and create pictures of complicated processes described by interviewees (Rubin & Rubin, 2011). For this study, the researcher conducted an in-depth, semi-structured interview (Appendix C) with each participant, with the hope of gaining a better understanding about factors that impact the successful persistence of African American male engineering majors at predominantly White institutions. All interviews were electronically recorded, and the researcher also recorded field notes. The interviews lasted 45-85 minutes at a location of the participants' choosing. The researcher reviewed the informed consent form before participants were asked a series of open-ended questions.

Data Analysis

The interpretation of the interviews was compiled through constant comparative analysis following verbatim transcription of the recorded interviews (Glaser & Strauss, 1967; Lincoln & Guba, 1985). Constant comparative analysis is a method for comparing data collected by formulating categories, establishing the boundaries of the categories, assigning segments to the categories and summarizing content within each category (Boeije, 2002). Maykut and Morehouse (2005) point out:

> words are the way that most people come to understand their situations; we create our world with words; we explain ourselves with words; we defend and hide ourselves with words ... thus the task of the researcher is to find patterns within

> those words and to present those patterns for others to inspect while at the same time staying as close to the construction of the world as the participants originally experienced it. (p. 17)

Constant comparative method is one way to conduct inductive analysis of qualitative data, which includes transcribing audio data, field notes, documents (Glaser & Strauss, 1967; Lincoln & Guba, 1985). The researcher organized data into categories, then made connections between the categories. After interconnecting the categories, the researcher looked for themes within and between categories. Fielding and Lee (1998) explain that qualitative researchers "want tools which support analysis but leave the analyst firmly in charge" (p. 167). NVivo 11 Pro software was utilized as a tool for efficiency in coding the data, to support organization, and analysis of themes developed through data analysis.

Trustworthiness

Lincoln and Guba (1984) stated that trustworthiness of qualitative research is essential to evaluating its worth. Trustworthiness involves establishing the domains:

- Credibility- confidence in the "truth" of the findings
- Transferability- showing that the findings have applicability in other contexts
- Dependability- showing that the findings are consistent and could be repeated
- Confirmability- a degree of neutrality or the extent to which the findings are shaped by the respondents and not researcher bias, motivation, or interest (p. 17)

Member checking, the sharing of data with participants, is one way to account for more accurate interpretation of the interview and a way to reduce misunderstandings and establish credibility. The researcher followed up with participants to seek clarity about their responses. The researcher had a non-involved peer reviewer to look over field notes and the analysis of data for confirmability. NVivo 11 Pro software served as a tool for transparency through the logging of data and coding patterns. As a final step, the audit trail, through development of rich description of the research process, a strategy for trustworthiness was established. The audit trail includes raw data, data reduction and analysis products, data reconstruction and synthesis products, process notes, materials related to intentions and dispositions, and preliminary development information (Lincoln & Guba, 1985).

Maxwell (2005) speaks of trustworthiness in terms of validity threats and indicates that such threats revolve around two main issues: researcher bias and reactivity. To reduce threats to validity, the researcher acknowledged his vested interest in the data that was collected due to him being an African American male college student and former STEM major. Secondly, the researcher was not reactive and did not impose his interpretation or judgment of the students' stories about what was going on in the students' lives during the semester. Rather he permitted the interpretation to emerge from the data.

Ethical Considerations

This study had no foreseeable risk. Participants and people mentioned were given pseudonyms for anonymity. The researcher attempted to make participants feel comfortable and asked open-ended questions. If students felt uncomfortable about

answering a question, the researcher reaffirmed that the participant had the right to refuse any questions that were uncomfortable to answer. All field notes and printed data were locked in a file cabinet accessible only to the researcher. In addition, NVivo data and digital documents, such as transcripts, were stored on a password-protected computer to keep information confidential. The study was approved by the institutional review board.

CHAPTER 4: FINDINGS

This chapter presents the findings and themes that emerged from the data collected on African American males attending four-year predominantly White universities. The purpose of this study was to understand factors that impact successful persistence of African American male engineering majors at a predominantly White institution. The following research questions framed the development of these themes:

1. How do self-efficacy beliefs impact successful persistence?
2. How does racial identity impact successful persistence?
3. What contributes to the development of positive self-efficacy of African American males pursuing an engineering major?

Thematic Analysis

This section divides the analysis into two themes that emerged from the data collected. The results of this analysis shed light on the lived experiences of eight participants. The themes were overcoming challenges and social identity. These themes will be explored individually and further divided into categories to explain the themes in detail.

Imagine yourself trying to climb a mountain for the first time. Even though you practiced climbing hills which gave you some preparation for the challenge ahead, climbing a mountain is different from climbing a hill and requires additional preparation. First, you should find a guide or someone who is familiar with mountain climbing. Second, you need to determine the type of climbing or route you will choose to pursue. Last, you will need to figure out what kind of gear you will need to make the

climb successfully. Adaptation is necessary to complete the climb. Adaptation is a process of changing to be better suited to an unfamiliar environment or the ever-changing conditions. Being able to adjust as quickly as possible allows one to successfully progress and master the challenges that were once perceived to be a threat to one's existence.

Theme 1: Overcoming Challenges

Transitioning to college in addition to the demands of a rigorous curriculum in engineering is like climbing a mountain. It is no easy feat. Participants in this study discussed some of the challenges they faced before entering college in addition to the transitional period between entering their engineering program and where they are today. The participants frequently shared with the researcher how they were able to overcome some of their challenges to become a successful engineering major. The categories of resiliency, support system, and prior educational experiences resonated within this theme.

Resiliency

Resilience can be conceptualized as a positive response to stressful situations and adversity (Braddock et al., 1991). Participants discovered ways to become resilient to the challenges that attempted to dissuade persistence in their major. Like the example of climbing the mountain, it results from a buildup of ongoing and complex interactions between individuals' attributes and their environment. Some of the participants had challenges early in life that they had to overcome to reach their goals. Reggie, a civil engineering transfer student from Georgia but raised in a country in Africa, recalls his family situation during his early childhood years:

> Life was hard, really hard, when they had me. I was moving from uncles to aunties to people here and there, but my grandmother came around one time and realized that this kid needs a stable environment.

Reggie indicated that his parents were young and could not afford to raise him in the city limits. They sent him to his grandparents' house to live. He was raised in a village where people were very poor and educationally deprived. There was no encouragement for him to seek higher education because people were focused on the basic needs for survival. His circumstances growing up helped him realize the importance of an education and what it could do for him and others.

Determined to pursue engineering, he was resilient to family and educational hardships he faced in his village. He had to take a non-traditional route of going to a two-year tech school in his native land and also the United States before transferring to his university. Before leaving his native country, Reggie tried to enroll at a university but did not have financial support. However, his aunt was able to help pay for education at tech school. After completing his associate's degree, he thought his father would be able to pay for his education at the university, but his father encountered a financial hardship a few months before he enrolled. With no luck in his native land, his resilience encouraged him to choose another route. Reggie enlisted in the navy and was able to travel the world to engage other cultures. Even while in the navy, he was determined to get a degree in civil engineering. He enrolled in a US community college where he received an associate degree in engineering technology then transferred to UNO. For him to do this, Reggie had to go through several hurdles before the navy would allow him to switch to the navy reserves, so he could pursue his degree.

His circumstances also influenced him to believe in the possibilities through inquiry. His resilience centered around his ability to seek education outside the classroom setting and question the very things around him. Reggie said:

> The question of, "What if this had been done the other way? What if they had done this the other way? What if this was that way? What would have happened? What would have been the situation in this environment that I'm in...I grew up with the question of, "What if?" That influenced my curiosity and then influenced my thoughts of coming to, you know, to engineering school.

Despite these personal challenges, participants overcame adversity to continue their educational pursuits. For each personal challenge, participants referred back to their past challenges and how family members motivated them to push forward. Hardships fueled a passion for an engineering degree. Experiencing personal and academic hardship early in life built up a resilience toward other challenges they would face later in their engineering program.

All participants experienced academic challenges early in the major, with all but one failing a required curricular course. Resilience was evident by participants refusing to give up the engineering major because of one failed course and deciding to retake that course to advance in their programs When asked about these challenges and motivation towards academic recovery, Allan, a senior biomedical engineering major at TGU from a large city in Illinois, indicated that the way the material was presented in his first course was different from his high school courses. Because of this, he had a rough start. He had never seen the material before, so it took some time to understand the concepts. He did

not give up when faced with this transition in his first year. When faced with these challenges he stated:

> I've always just been that person where I'm going to keep trying until I can figure it out. Once I can't, then I'm gonna go find help.

His resilience pushed him to seek help when faced with adversity. In addition, he lost his younger brother his junior year at TGU which hit him hard. This did not stop him from continuing into his senior year. When asked how confident he was that he would complete his program of study, he said, “a thousand percent confident.” Allan explains:

> My moral, my drive, the reason why I do it, trying to give tribute to him. It’s why ... I still do what I'm doing. I would say, my brother is the biggest factor now.

The loss of his brother fueled a sense of purpose in his life which built resilience to challenges encountered in his engineering program. Like other participants, Allan’s love for his family (brother) and passion for the field of biomedical engineering developed into a resilience that allowed him to matriculate towards his degree.

Michael, a senior electrical engineering major who transferred to UNO, talked about difficulties he experienced his first time in college at another PWI. He was blown away from Physics 1 and failed it his first semester. This placed him on academic probation. So he took the course again the next semester and failed it again. After the first year in college, he was academically suspended. Michael enlisted in the navy as another avenue for earning money. Due to medical reasons, he was discharged from the Navy within a few months and found himself working at a fast food restaurant for income. He knew that this was not something he wanted to do the rest of his life, so he applied as a transfer student to UNO. Knowing that he had a second chance at

engineering, he did not let this opportunity slip away. He reflected on his thoughts after being accepted to UNO and returning to college:

> While I was at Tremont, I failed [out]. I was afraid to fail. I was terrified of dropping out again. Coming back after that whole Tremont experience. Well, if I'm in now (referring to his engineering program), there's no way I'm getting out of here without a degree.

Michael built a resilience towards challenges faced at UNO. He often mentioned that courses were hard, but he knew he would finish since he had experienced rock bottom at his first institution. Failure initiated a desire to succeed because he did not want to experience failure again.

Some participants who experienced failure in the classroom discussed resilience through cognitive restructuring. They perceived failure of a course as another opportunity to master the information needed to do well in upper level courses. They saw the big picture and why it was more important to take the course again in order to know the material before moving forward in their program. Reggie met with a professor of a course he was going to fail. The professor encouraged him to continue coming to class even though he was going to fail the course. His professor sold him on one advantage of staying in the course which was exposure to the material, so the second time would be easier. Reggie reflected on this discussion:

> That, I had to really think about it carefully. I was like, this is going to affect my GPA. But, at the same time, I reminded myself that it's not just about GPA. It's also about the knowledge you gain. It's also about understanding what you are doing. So, if I have to take a hit on my GPA, just so I can understand this stuff

> better than most students, then why not. So I went through the class. I didn't pass the class, but I wasn't worried.

He was willing to take the risk of adversely affecting his GPA at the advice of his professor to make sure he understood the concepts in that course which were foundational for future courses. His resilience contributed to him being confident that he would not fail the course a second time.

Support System

Several authors have expressed the importance of a support system to aid students' adjustment to college (Harper, 2012; Palmer, Maramba, & Dancy, 2011; Pascarella, 1985; Tinto, 1993; Strayhorn, 2015). For those pursuing engineering as a major, it is no different and often a crucial factor to survive the demands of the program. The researcher of this study found that participants relied on family, mentors and classmates for support while pursuing their engineering degree.

Family. It is known that significant people in a child's life can have a major impact on their interests as an adult. Sjaastad's (2012) study on the role of significant persons in young people's choice of STEM for post-education identified teachers, parents, and family members (siblings, relatives) as having the most impact on STEM choice. Many participants mentioned how family members encouraged them to persevere through their programs. They were seen as a lifeline for how to navigate the challenging times. When asked who motivated him to keep pursuing his degree in engineering, Jerry, a sophomore civil engineering major from rural North Carolina, recalled:

> It's probably my parents. They're always, like I said, they really do motivate me. Pretty much, I talk to them every day, and of course they do push me. And they can be on me sometimes. The majority of it is positive. But they definitely are big supporters, and they pretty much keep me at it, pretty much, as far just being positive with everything.

Jerry also talked about when he was at his lowest point, his parents told him other people had made it through those courses to become engineers. Saying this reaffirmed his confidence that the information he was struggling with could be learned and that he could pass his classes. It was encouraging words and pep talks with his parents that motivated him to keep moving towards his goals.

Imari, a Junior mechanical engineering major from a small city in North Carolina, also felt the same way about encouragement from family. They encouraged him to keep going no matter how hard it got. He stated:

> Probably my family, their encouragement. They're just helping me just be like, "Stay on target". “We know that this is probably the hardest thing right now, so keep going.” Even my cousin said, "I was in college for seven years." He was like, "Sometimes it may take that long, but still, you gotta just keep going."

Sjaastad’s (2012) research on parents working in STEM careers suggests that parents engaged in STEM are models because they make STEM familiar for their children through conversations and support. In Imari’s case, his parents and sibling are involved in the STEM field. His mom is a nurse, his dad is an animal scientist, and his sister will pursue her doctorate in medicine in the fall. Imari has been raised in a STEM household

which he believed influenced his desire to pursue engineering and encouraged him to continue in his program.

In addition to encouragement, participants talked about family members having high expectations of them which kept them motivated to press through challenges they encountered in and outside the classroom. Several of the participants described family expectations and support as a significant factor in determining whether or not to persevere in the major coursework. Family support inspired them to recover and regain confidence in their academic ability.

Mentor. Mentoring is also a key factor when it comes to college adjustment. A mentor is someone who serves as guide while learning to take on new challenges and opportunities for growth. All participants described at least one person who guided them through their adjustment period and shared invaluable information about the major when needed the most.

Bernard, a junior civil engineering major from a large city in North Carolina, identified two people as his mentors: His National Society of Black Engineers' (NSBE) advisor and one of his civil engineering professors who he credits as having an influence on his academics:

> I've never taken a course with her because she's more electrical engineering, but I definitely ... the NSBE advisor that we have, Dr. King, as well as one of the civil engineering technology professors here, which her name is Dr. Schenck. They've helped shape me into the student that I am today.

Participants conveyed how resourceful and encouraging professors were who served as mentors to them. Mentors made themselves accessible to participants, providing

guidance as they progressed. They were easy to talk to about academic problems they were having in class and some also gave advice about personal issues. All mentors that participants mentioned were also people of color. Some participants had mentors who were not in engineering but influenced them directly or indirectly about the major. Reggie recalled a doctor who frequently visited his village while he was teaching himself how to read and write English. This doctor would check his essays or give him an assignment to improve his skills. He would sit down with Reggie and correct any errors. Reggie was influenced by the local doctor to keep pushing towards his goals until he had achieved them.

Michael talked about meeting a group of Black men at church who took him under their wings. One of the men in the group found out he was an engineering major and invested his time in Michael's professional growth. His mentor helped him to get two internships in his field. Having a mentor for some participants yielded some opportunities that may not have happened without a connection to them.

Mentors provided reassurance that there was someone they could rely on for guidance during challenging times and opportunities to excel in the discipline. Participants were grateful that their mentor was there to answer questions, personal and academic related, and provide insight into urgent matters surrounding their future in engineering.

Male influence. Several participants identified a male who had an influence on them deciding to pursue an engineering degree. These males were viewed as father figures who often encouraged or motivated participants at an early age and their influence continued into college. Reggie recalled his time with his grandfather as a young boy. He

would follow his grandfather around the village to build houses using bamboo sticks, mortar, and clay. Sometimes it would rain and wash the house away. His witness of his grandfather's leadership in the village with building houses influenced his journey to become a civil engineer. Jeff's father was not present in his life, but his uncle was involved in his life and a big supporter of his education. Jeff stated:

> If anyone really encouraged me to like stick with engineering despite it being difficult is probably my uncle. He's always wanted me to go be a doctor or someone, a lawyer, someone to be successful. He raised me growing up. He was like, hey, you gotta be something great. I said I like engineering, he said you stick with it. It's hard, but it's gonna get you where you want to be in life. So, I just stuck with it.

Jeff often referred to his uncle for advice about college in general and valued his opinion about matters that could impact his educational advancement. His uncle helped him to see the big picture and inspired him to keep pushing towards his goals.

Classmates. In engineering, group projects are often assigned and students are encouraged to work together to effectively complete the assignment. Participants believed that classmates were critical to them doing well in their programs. Some of the participants had been working with the same group of classmates since the first time they met. Others intentionally reached out to classmates for project collaborations. All participants expressed the importance of connecting with classmates to succeed in engineering. Jeff, a sophomore civil engineering major from North Carolina, expressed the value of his peers with how important they are regarding teamwork:

> The team work, especially. I can't stress how much teamwork is important. I couldn't imagine trying to figure out ... Like, if I'm in class and the teacher is explaining something and I don't really understand it, and then I go to them after, in her office hours, his or her office hours and I still don't understand it, hearing it from someone else, like a peer, they explain things differently and they all work with you.

Working on team projects often builds bonds between engineering students. Building bonds with classmates was something also mentioned during the interviews. Allan recalled how close he is to a group of his classmates after years together. They met each other in their first engineering class and have studied and worked together since that class. Allan mentions how close they have become:

> Everybody else in the same class, we're kind of taking the same classes now. We know each other better now than it was that first class. Nobody knew each other. And now we look back, we're all helping each other in some way or some form. Maybe I took the class already, they're taking it next semester after me, so I help them. Or they took the class, you know, vice versa.

It is apparent that participants in this study perceived all three groups important to their success in engineering. Whether it was assistance from family members who had a history with the participants, mentors who provided guidance during the process of encountering and adjusting to changes, or classmates who were also experiencing similar challenges, support systems were valuable in helping participants to overcome the challenges they faced.

Prior Educational Experiences

Participants in this study held strong beliefs about the positive influence prior education had on persistence in their educational program. The researcher will discuss these educational experiences in this section.

Unique curriculum. Pre-college preparation is a significant factor when predicting degree attainment in STEM fields (Tyson, Lee, Borman, & Hansen, 2007). Participants in this study had prior educational experiences that peaked their interests in engineering. All but one participant had a specialized formal curriculum in middle school and/or high school that created an interest in their fields. They believed that enrollment in these programs assisted them in overcoming challenges later because it encompassed rigorous studies, promoted critical thinking, and offered intensive science and math courses. These courses pushed them to work hard at resolving problems and prepared them for the rigors of college. Bernard talked about his experience in the International Baccalaureate (IB) program where students are held to college preparatory educational standards that emphasize creative and critical thinking. He attributed some of his success to the demands placed on him in the IB program. He stated:

> I was blessed to be in the IB program. IB program was somewhat like a college prep program. First, you're in the NYP program until you get to the 10th grade. The 12th grade is called the diploma program where you take 8 classes a semester. You have tests every single other week. It's a very hard program, but at the end of the day, the one thing I got from it was how to manage my time, which you need in college. And how to essentially...deal with large workload.

Jerry went to a magnet middle school that focused on science, math, engineering, and technology (STEM). He credited this school's curriculum for preparing him for his high school magnet program. It was there that he had to concentrate in a STEM area. Jerry chose engineering through which the exposure and rigors of his classes prepared him to prevail over his challenges in college.

Study skills. Time management and carrying a heavy course load are challenges Bernard continues to deal with in his current program. Other participants also discussed making time to manage the extensive amount of work they have in their engineering programs. Some participants like Allan had additional learning opportunities beyond their school campus. His father, a PhD, taught him something in addition to the traditional school curriculum. Allan shared with the researcher how he father taught him study skill techniques. He learned that different course subjects required different study techniques to perform well in class. These techniques contributed to his success before college and he continued to use these study skill techniques in his engineering program.

Early exposure to engineering. There is research to support early exposure to STEM is an indicator of persistence in these majors (Tai, 2007). Many of the participants had experiences of their engineering interests before attending college. Most believed this is what peaked their interest in a specific field of engineering. Early exposure for some participants reinforced confidence in completing their program. Reggie recalls early exposure to civil engineering through his grandfather's work and later on as a teenager. Following his grandfather and assisting him with building houses inspired critical thinking and allowed him to use analytical skills towards finding a better way to build houses. As a teenager, he was able to draw building plans for people in his

village. Some of these plans were used to build homes that he was able to see before leaving to pursue a degree at UNO.

Jeff remembers being placed in academically gifted classes in elementary due to his high math and science EOG scores. From there his took high level math and science courses in middle school. This afforded him the opportunity to take engineering courses in high school. Aerospace and civil engineering courses were two areas of focus at his high school. He chose civil engineering because of the exposure and enjoyment. Jerry also mentioned early exposure to engineering:

> I went to a magnet middle school, which focused on math, engineering, technology, and science, I think, like that. STEM. Then, basically I took higher level classes, which is like honors classes, in middle school, to kind of prepare me for high school. Then, when I went to high school, I went to another magnet school, so they were the same thing. They basically did STEM and they had ... It was required that you kind of concentrate in some area, whether it be math, science, technology, engineering. You had to have some focus. Going through both of those, it pretty much prepared me for college.

Early exposure to the engineering field may have prepared them for the challenges they encountered in their programs. These pre-college experiences enhanced their confidence that pursuing an engineering degree was possible and worth the time invested in mastering those skills needed to be an engineer.

In theme one, the researcher discussed three categories that helped participants overcome challenges encountered in their engineering major. Participants shared insight about resiliency and how past difficulties build a resilience when faced with challenges in

the major. The social support of family, classmates, mentors, and male influences were particularly helpful during times when they doubted themselves completing the major. Last, prior educational experiences contributed to participants' ability to overcome the academic rigor within their engineering programs. Theme two will discuss social identity and the impact it had on participants' persistence in engineering.

Theme 2: Social Identity

This theme focuses on the participants' ability to navigate being Black on a predominately White campus through inquiry about their established identity. Social identity portrayed how participants saw themselves, how they thought others perceived them to be, and their connection to others. The categories explored are sense of self, sense of community, and shared responsibility.

Sense of Self

An individual's sense of self is the way he thinks about and views himself, his beliefs and purpose within the world (Rogers, Smith, & Coleman, 1978). In the society of which our participants live, racial identity may have an impact on how they view the world and how the world views them. Participants all identified as Black or African American when asked about their racial identity. They had a strong sense of self, expressing several times who they are and whose they were in reference to their ethnic group. Most grew up in an academic environment where they were the only one or one of a few Black students in the class. They did not have a major issue with being the only one in the classroom. When asked about their classmates' perception of them as being Black, there were varying answers, but all participants were aware that their racial

identity was not ignored. Imari understood others would judge him based on his skin color. He stated:

> I realized that people were going to judge me on my skin color just because, but it never stopped me or never just made me think like, "Wow, they don't really care," or "They don't like me" or "They don't see me as the same individual." "If you like me, you like me, if you don't like me, you don't like me, 'cause this is how I am and this is how ... I can't change this, and if I could, I don't want to."

His sense of self could have stemmed from his parents' involvement in STEM fields. Seeing them make it may have helped him develop a positive self-image as an engineering major and Black male. Imari's family also instilled in him a sense of pride in who he is as an individual. There was not a discussion about being Black in America in his household but Imari inherently identified with his racial identity. His statement conveys self-pride and an awareness about who he is as an individual and who he is with regards to his ethnic culture.

Some participants shared with the researcher that they felt very confident in the program but know that they must work harder to prove themselves. Bernard expressed his thoughts regarding his belief of others' perception of him as a Black male. His thoughts centered around:

> I feel like being a Black male, because we're a minority in this field, especially in engineering. I can sit in class and let's say I don't understand a concept or something like that, and I ask someone after class, they'll look at me like I'm stupid, or something like that. But it's just that I don't understand the concept. It's

> okay to not understand things at time...you feel like you have to work 10 times harder than everyone else because you're Black.

Bernard has also experienced some difficulty early in his major with some professors and peers perceiving him as “stupid” because he didn’t understand a concept and asked questions for further understanding. To him, they see a Black male who doesn’t belong in engineering. Bernard’s statement illustrates the “prove them wrong” syndrome, where Black students believe they must work harder to prove that they belong (Moore et al., 2003). In this case, Bernard believed that he could not have an average GPA to have a shot at a job, he must be above average just to have an opportunity for a job interview. This statement also further validates CRT’s notion that meritocracy does not apply to race. Bernard was aware of the inequities surrounding advancement in education and the career ladder. His mentality surrounding this issue supports what other participants and African American students believe.

Some participants talked about making themselves known in the classroom to peers and professors. Allan intentionally reaches out to both African Americans and White Americans to help debunk stereotypes they may have about his ability to perform well in the classroom. Allan has taken another approach to the “prove them wrong” syndrome. Not only does he perform well academically but he also reaches out to professors and classmates to make social connections in hopes of dispelling stereotypes about Black males. The researcher believes this behavior may stem from his father’s academic status as a PhD. His father had to learn how to navigate and negotiate in academia. These negotiating techniques may have not only been taught to Allan to debunk stereotypes but also to create a non-threatening environment for him to navigate.

Participants know that they stand out in most engineering courses with being one of a few Black males or the only one. None viewed this as bad but rather an opportunity to stand out in a positive way. One participant expressed being Black having a positive impact at career fair, noting that it is not everyday that they meet a good Black candidate. Most participants expressed a positive view of who they are and how they believe others perceive them based on past experiences. The school environment is where a majority of time is spent learning new behaviors and developing perceptions about oneself. Most of the participants have been educated in a school environment that was predominantly White. It may be that their past experiences in the school environment has empowered them to navigate the challenges at a PWI and retain a positive view of themselves.

Sense of Community

Being the only or one of a few Black males in your classes can sometimes result in feeling isolated. While participants did not feel isolated in classes, they expressed the need to connect with other Black students in engineering. Most of the participants were involved in a social or academic organization related to engineering or connecting with other Black males. It was made known to the researcher that these organizations were essential to participants' persistence in the program. They created a sense of community that connected them to campus and further established their identity within the major. Imari spoke of a particular organization comprised of members who were also Black engineering majors, some he didn't know until he joined the organization. Imari states:

> I've connected with NSBE, National Society of Black Engineers. People who have already taken the classes, they can help me find some of my classes to get study groups. We study for tests and stuff like that.

Several other participants also were members of this national organization. They indicated how important it was for them to be connected to the organization, often referring to the cultural space it provided as well as mentoring from peers and professors involved in their professional development. The African proverb, "It takes a village to raise a child", is an approach that NSBE has taken for these participants. It is an organization that exposes students to engineering in an environment that caters to the cultural needs of the students. Participants received help from other peers, often older engineering students, and learned how to navigate the major as well as the field through professional development opportunities and informal discussions. Just as important as exposure to engineering opportunities, it is the safe space NSBE created for participants to say what they wanted to say and be who they wanted to be without judgement.

Some participants were also involved in other organizations that were not related to engineering. In addition to NSBE, Jerry is in a Christian student organization and applied to be a mentor in STEP, a summer bridge program for incoming underrepresented freshmen. He is also a member of BUA, a Black male program that focuses on academic and social integration to UNO. When the researcher asked why get involved in these organizations, participants referred to networking and making a connection with other students. It was also perceived by the researcher that there was an importance of feeling connected to campus, resulting in the establishment of participants' presence and social identity

Shared Responsibility

Participants in this study exhibited an awareness that their journey was not just about them but also others in their lives and their culture. Several participants viewed obtaining an engineering degree as something bigger than personal attainment. Reggie mentioned why he believes his degree is important. He states:

> The money is good, the money's good in the long run, but I feel like my passion for this or the reason I wanted to do this is to be able ... Not just going to Ghana but going to deprived areas I've traveled extensively, as well. By going back to places that I've been to, that kids who want to do things in a timely manner or get to where they have to get to in a timely manner, will be things that I could help provide for them. Not using my money but using what I have learned in engineering school and the experience that I'm gonna get in the field. I don't know if that makes sense, but that is the thing.

Referring to the days when he assisted his grandfather with building homes for the local village, he will use his knowledge to make life better for others who lack some of the same things he lacked as a boy. Michael also saw his degree attainment as something bigger than him. He said his mother had worked at various hospitality locations for 35 years. She reached the point where her knees were so bad she couldn't work anymore, and workers compensation was not enough to support her. He is getting his degree to support her financially.

Other participants also expressed a need to serve as a role model for their siblings and others who will enter engineering programs after they graduate. Imari talked about

how important it was to be an example for his younger brother who also wants to be an engineer. He states:

> And like I said, my brother wants to do that, as well. I want him to see me walk across the stage and say to him, "You can get this [college diploma], as well."

Even when discussing their success as engineering students, some participants referred to giving back to the community. Trey defined what it looks like to be a successful engineering student:

> As long as he found something that's stable and is actively engaged in something that he enjoys. Or if he continues to better himself, and he continues to work hard, and contribute to the community. Then I guess that would be my definition of success.

When the researcher asked, “What advice would you share with the next group of Black males pursuing an engineering major?”, Imari expressed that the degree means more than they think. His advice was to change the perception of how TV portrays Black males and that they can go anywhere and do anything they want with an engineering degree. It is these types of discussions the researcher had with participants. Discussions that often centered around helping others, changing negative perceptions, and working together to accomplish their goals.

In theme two, the researcher discussed three categories that helped participants establish a social identity and persist in engineering. Participants shared information about their sense of self regarding themselves as individuals and in relation to others. A sense of community also contributed to normalizing the major as they saw other students

that looked like them. Last, shared responsibility indicated that their success in the major yielded an obligation to inspire and serve others.

Summary

The purpose of this chapter was to present the findings of the data collected from participants' interviews. The results highlighted two themes: Overcoming challenges and social identity. Several categories were also identified from data collected to support the researcher's thematic analysis. These categories were: resiliency, social support, and prior educational challenges for overcoming challenges in the engineering major. Categories that supported social identity were sense of self, sense of community, and shared responsibility. The eight participants interviewed for this study shared their stories about how they have matriculated as an engineering major and providing insight about issues encountered during their journey. Engineering is not an easy major to navigate yet these students have had success through support, motivation, and knowledge learned along the way. Chapter five will discuss the researcher's conclusions and recommendations resulting from this study.

CHAPTER 5: CONCLUSIONS & RECOMMENDATIONS

Black males who start out in engineering often do not persist in the major. However, there is a small percentage who successfully persist to graduation. This study used qualitative case study to understand factors that impact successful persistence of African American male engineering majors at a predominantly White institution. The findings in this study indicated that the themes of overcoming challenges and social identity assisted them with persistence in engineering. This final chapter will draw conclusions from the results and make recommendations for future studies. The following research questions framed the development of themes:

1. How do self-efficacy beliefs impact successful persistence?
2. How does racial identity impact successful persistence?
3. What contributes to the development of positive self-efficacy of African American males pursuing an engineering major?

Discussion

The self-efficacy beliefs of participants in this study positively impacted their persistence in engineering. Additionally overcoming challenges and establishing a social identity as a black male in engineering provided confidence and motivation to succeed in their programs of study. Participants provided valuable information about their lived experiences and provided context that sheds light on the struggles and accomplishments they endured to successfully persist. Engineering programs should continue to explore ways to promote a welcoming and safe environment for Black males pursuing engineering degrees.

Overcoming Challenges

Participants were able to overcome the challenges they faced through resiliency, a strong support system, and prior educational experiences. Participants attributed their unique schooling experience to their ability to persist which connects with Harper and Griffin's (2001) research on students' attribution of college readiness and access to unique K-12 experiences. Similar to their research, participants in this study attributed academic success to K-12 curriculum, which incorporated critical thinking and rigorous coursework. These findings also validate previous research that pre-college exposure to engineering coursework and co-curricular subjects, such as math and science, are critical to the persistence of Black males in engineering (Bonous Hammarth, 2000). The findings from this study are also consistent with Palmer, Miramba, and Dancy's (2011) findings on pre-college programs increasing persistence and retention of students of color which coincides with Harper's (2012) and the National Science Board's (2012) research on the significance of earlier academic preparation and the opportunity to experience programs promoting life after high school. These types of experiences also offered participants the opportunity for hands-on learning that further enlightened their minds to choose engineering as a career option. Rigorous coursework in K-12 and hands on learning resulted in making inquiry and design more concrete and relevant, promoting increasing success on tasks performed in school and yielding a positive belief in ability to succeed.

In conjunction with pre-college experiences in engineering, this study also supports the notion that early academic success during the first semesters of college is particularly important for engineering students (Palmer, Miramba, & Dancy,

2011). Early academic success built confidence for participants and resilience when encountering difficulties later in their programs. What surprised the researcher is that most participants failed a course early in their academic career but all persevered in their programs. This validates Calhoun's (2013) study on self-efficacy beliefs and how early interactions influenced the choices made by Black male freshmen pursuing a STEM degree. While past success is a predictor of positive self-efficacy beliefs, the researcher also believes that setbacks and disappointments may also lead to positive self-efficacy beliefs as long as there are options and encouragement for getting back on track in the early stages of their engineering program. For example, several participants in the study failed a course early in their academic programs and also experienced some hardships before encountering the course they failed but they did not quit the program. Instead they decided to take the course over again.

This may be the result of informal cognitive restructuring. Cognitive restructuring is a technique commonly used in mental health to treat intrusive, irrational, automatic thoughts such as negative thinking (Carey & Mullan, 2004). This technique is also useful for mentally healthy individuals and has been applied to assist students in STEM. For example, Bodner and McMillen (1986) predicted that cognitive restructuring could help chemistry students perform well on solving chemistry problems. Students were given an activity that listed spatial shapes along with questions helping them to identify each shape. This Socratic questioning activity increased their understanding and confidence once they were given chemistry problems to solve. The results conferred that students with this early intervention performed well on chemistry problems. Once

students learned how to get to the point where they were confident about what steps to take to finish the assignment, negative thoughts subsided, and they solved the problem.

Like Bodner and McMillen's example (1986), participants in this study employed cognitive restructuring experienced through a plethora of actions which in turn influenced their decision-making process.. In this study, irrational thoughts and visualizing the "big picture" regarding their education were demonstrated. They did this through seeking out help from a professor or mentor early, who helped them think through the thought process and explore options for recovery. This study suggests that some early negative experiences along with positive reinforcement to build resilience towards challenges encountered later during college years build confidence and develop positive self-efficacy beliefs.

Family support also helped in overcoming challenges and is consistent with Flowers' (2015) research on factors contributing to persistence of African American males in engineering programs. Parents had high expectations of participants which influenced them to continue pursuing their engineering degree. Even for one participant who did not have his father involved in his life, his mother and sister made him aware that his father was an engineer. Therefore, he could be an engineer as well. These expectations encouraged the development of positive self-efficacy and encouraged persistence through the major.

Resilience through supportive mentoring is an important aspect to students adjusting to college and persisting to graduation. This finding is consistent with Pope's (2002) and other's research (Astin, 1993; Cujet, 2006; Flowers 2004, Harper, 2012; Santos & Reigadas, 2004; Strayhorn, 2013). Research shows that mentoring positively

impacts African American male persistence. Each participant had at least one professor within his major from which he sought out advice and all had a person of color who served as a mentor. Participants also had a mentor outside of their major who offered advice. This leads the researcher to believe that mentoring from someone outside of the major can be just as helpful as having a mentor within the major as long as the mentor has availability for students, provides guidance as students adjust to the changing demands of college life, and an understanding of what it means to be a Black male.

Strayhorn (2010) identified African American students who were academically resilient and had high academic self-efficacy as "buoyant believers" (p.50) who are more likely to achieve academic success. Participants in this study exhibited the same characteristics and often mentioned their belief of being capable of doing the work and succeeding in their respective engineering programs. Their ability to "bounce back" from adversity and take ownership of the challenges encountered set them up for success in their programs.

Social Identity

In the movie, *Higher Learning* (Singleton, Hall, & Singleton, 1995), there is a scene where Deja (Tyra Banks), a college freshman and African American female track athlete, asks Malik (Omar Epps), an African American male college freshman track athlete, "Who you think they (referring to her White roommates) looking at when something comes up missing in the room?" She puts her fists up and lets him know that she does not fight with her fists, instead she points to her to head and says, "I fight with this!" Deja indicates that she fights with her mind, encouraging him to do the same. It is a powerful scene because both were dealing with microaggressions while adjusting to

college at a predominantly White institution. Deja is essentially telling Malik to prove them wrong by using his brain. To Deja, fighting only reinforces stereotypes their White counterparts have about Black people. Several participants acknowledged that they, like Deja, had made a conscious effort to debunk stereotypes held about their academic ability in the engineering program, acknowledging negative perceptions perceived about their culture. The research of Moore et al. (2003) found that African Americans find themselves working hard to prove to Whites that they have earned their admission to the institution outright.

One's self-conception is based on personal identity (what I think about myself) and collective identity (qualities we think we have from being a part of a group) in relation to a social group is defined as social identity (Abrams & Hogg, 1990). There are a number of variables that play a role in establishing our social identity such as race and racial identity. In the United States, race and racial identity are social constructs often used to distinguish people's value based on the color of their skin. When the researcher asked participants to indicate their racial identity, some were confused by the question. It was not how the researcher posed the question but the fact it was asked as if they could deny their racial identity. To them, based on the color of their skin, they are automatically presumed to be Black. When they walk into the classroom, they cannot hide their racial identity or pretend that they are something other than Black. It is already perceived by others in the classroom that they identify as Black based on the color of their skin. For these Black males, racial identity is very much a part of their social identity. The two are interconnected because of the visual identification and the power

structure within the construct of race. Racial identity and social identity are therefore difficult to disconnect if you are person of color in America.

The researcher is a member of Brothers Unified and Achieving, a service organization of Black males who serve the needs of their community. Its motto is "giving back what we have taken and more". Members of this group recognize their responsibility to share what was given to them, whether it is from volunteering time to tutor young males or cleaning up trash in a local neighborhood, there is a sense of pride knowing that you are giving back to your community. It connects them in a unique way to the community as they are serving a purpose larger than themselves. In this study, participants felt a sense of purpose to share their time, talents, or treasures with the community at large. It was a way to pay it forward that validated their larger purpose in pursuing a degree. It was a way to affirm their social identity. In this study social identity was cultivated by participants through service to the community.

Colin's refers to self-ethnic reflectors as images, pictures, and ideas centered around African values (as cited in Brookfield, 2010). These reflectors emphasize the nature of collectivism within African culture, including cooperative economics or Ujaama. The participants in this study understood that while there is an identity that establishes who they are individually, they also have a racial identity which connects them to the interests of a wider group. It is this connection that compels them to serve or give back in a way that preserves and honors the social values of the larger community. The community had consistently served their needs therefore they wanted to give back. Thus, continuing the practice of shared responsibility within their culture. Their racial identity and subsequent responsibility to the cultural group which with they identified

racially drove them to finish their programs because they knew the group was counting on them to do so. Such responsibilities while motivating can be a source of stress but in the case of this study, this type of stressor was perceived as positive reinforcement.

Harper and Quaye's (2007) research on Black male leaders found student organization membership helped enhance development of their racial identities and created a space to express issues dealing with White people. It also created a shared responsibility to take collective action towards improving the status and conditions of Black students on campus. Participants' desire for a sense of community was also met by joining student organizations. These organizations helped them develop and refine their understanding of their racialized social identity through service, organization, and positive self-ethnic reflectors. These organizations also created a safe environment and feeling of belongingness for participants.

Student organizations like the National Society of Black Engineers (NSBE) allow Black males in engineering to connect with other Black males who may be in the same track or another engineering track. This helps normalize the experience of being a Black male in engineering. Through NSBE, Black males have the opportunity to meet upperclassmen who provide guidance on how to successfully navigate their engineering program. For participants, this organization helped develop positive self-efficacy because they were exposed to and interacted with others who were experiencing what they were experiencing. This encouraged persistence. Furthermore, NSBE provided professional development opportunities in the field, and created a safe space to air out issues related to race.

This study offered findings that were useful to understanding the experience of successful Black male engineering majors. Early exposure to engineering through engaged learning built confidence in participants. These early experiences to engineering exposed participants to the rigors of an engineering curriculum. Most participants worked hard to establish academic credibility and an engineering identity within their programs. At the same time, they desired to find a connection to a group that could relate to the issues and experiences they encountered as a Black male in engineering. Participants also desired to serve others as a commitment and connection to a wider group.

Implications

There is a hip-hop song by rapper, Jay-Z, called *The Story of OJ*. In this song, Jay-Z sings about the different types of Black people perceived by mainstream society since the arrival of Black people in the United States (light-skinned, dark-skinned, fake, real, rich, poor, house, field). At the end of the stanza, he indicates that it does not matter what type of Black person they think they are, mainstream America still views them as "an ignorant Black person", devaluing their personhood, individually and culturally. Race continues to play an active role in the mistreatment of Black people in America. Notwithstanding class or gender, race often creates a misconception about individuals based on the color of their skin. For this reason, engineering programs have a responsibility to not only focus on engineering content but to also incorporate learning that is culturally relevant.

Findings from this study should encourage program administrators to develop culturally relevant engineering programs that respect the personhood of all students. They

can do this in a myriad of ways. Ladson-Billings (1995) identifies three criteria that must be met to provide culturally relevant pedagogy (CRP): 1) ability to develop students academically, 2) willingness to nurture and support cultural competence, and 3) development of a critical consciousness. CRP intentionally connects the life experiences of students with classroom instruction, building on their strengths through cultural practices. Professors should invite students to question and challenge social and racial inequalities that exist within the confines of the institution and society at large. In the classroom, culturally relevant engineering education practice can take place through conversations about the effect of engineering solutions and the intersections of race, prejudice, and oppression (Castaneda & Mejia, 2018). Conversations about significant contributors to engineering that include African and other minoritized groups' standpoints can lead to a more critical and robust understanding of engineering. This validates the voice of African American males and further validates their identity as an engineer. It also normalizes the experience for such students who can now see themselves within the curriculum. Culturally relevant engineering education practice therefore would create a welcoming environment for Black males as majority students begin to understand how the culture of African American people contributes to engineering and appreciate that Black males earned the right to be there just as they did.

Jay-Z's video to *The Story of OJ* displays the results of the injustices Black people have endured. Referring to Jay-Z's hook, Black men are often perceived as dumb or deviant, stereotypes popularized by members of the media. For some Black males in education, stereotype threat leads them to the fear that they will let down their race if they fail (Steele & Aronson, 1995). So much pressure is put on them that when they do fail,

they internalize this feeling of being intellectually inadequate. Thus, proving the stereotype to be true. Most participants found themselves drawn into the "prove them wrong syndrome". The adage often articulated in the Black community that you have to work twice as hard to get half as far. They did not internalize feelings of inadequacies but understood how race influences outcomes. It is the permanence of racism and bias towards Black males, who are often vilified in the media and throughout the history of America, that contribute to this mentality that these participants must work harder to prove that are just as smart as their White counterparts. Culturally relevant engineering programs could address issues that result in students feeling stereotype threat. These programs should examine how they can proactively debunk stereotypes about Black males within engineering to create a more hospitable environment for learning.

Another way to promote culturally relevant engineering education practice is through project based learning. Castaneda and Mejia (2018) found that CRP in civil engineering through project based learning in the local community challenged students to seek out and learn new perspectives from their peers who come from those communities, the community stakeholders, and the practice of engineering. For African American males, cultural relevant engineering education practice might involve project based learning in the community to help make the connection between home and school and allow them to take personal ownership of solving problems facing their community. For their White peers, it may challenge preconceived biases and stereotypes about African American males and their community as they learn from the community narratives (Gay, 2013).

Departments could also find out professors' perceptions of Black males and identify what other engineering programs are doing to create a safe and welcoming environment for Black males entering engineering and what are they doing to help Black males in their programs to graduate. The researcher suggests using the unique experiences of African American males to inform the development of culturally relevant engineering education strategies to increase enrollment and persistence in the programs. This should include partnering with schools in secondary education that promote STEM education and engineering companies that promote diversity within field. In addition to this, it is equally important to find ways to implement a culturally relevant engineering education curriculum that incorporates multiple teaching methods and provides a platform for the voices of Black males. An increase in the number of Black males in the program may change perceptions about them, helping to reduce stereotypes regarding their academic ability in engineering.

Recommendations for Practice

The researcher suggests engineering programs and universities offer mentoring program opportunities for Black males in engineering. Getting them connected to these programs early is ideal so they establish a connection to the engineering program or university before a major issue occurs. Just as participants indicated, it is ideal to find faculty of color to serve as mentors. However, sometimes the number of faculty of color is small and program chairs cannot send every Black male to them. Therefore, it is also suggested that programs explore ways to increase the number of faculty of color in their department and provide diversity training for all engineering faculty on the specific needs of Black males entering their programs and how they can assist with persistence.

Engineering programs could explore opportunities for Black males to serve in their community. This could be in the form of an engineering service learning project where Black males have an opportunity to apply skills learned in the classroom to their local community or serve as a mentor/tutor to other Black male students at a middle school or high school. Farinde, Tempest, and Merriweather's (2014) research on service learning to motivate underrepresented high school students to consider STEM majors found that service learning intentionally purposed to meet needs within their communities broaden students' perspectives of engineering promoted a greater sense of self-efficacy and confidence, and gave them a voice as they became the experts of the projects. The same can be true for African American males who have opportunities for service learning projects. It would give an opportunity to serve their community, providing hands on learning toward understanding engineering concepts, and providing an opportunity to demonstrate that they are sufficiently competent with the engineering subject. This further establishes their engineering identity. If they are working with local students from underrepresented populations, this could be an opportunity to increase interest in engineering as local students see images of themselves and influence their perception of what an engineer look likes. These opportunities positively impact the local community while also aiding in Black males establishing a connection to their program.

Recommendations for Future Research

The following are suggestions for future directions in research. In investigating the experiences of Black males in engineering who have successfully persisted at a predominantly White institution (PWI), persistence was found to be a continuing issue. As college becomes more accessible, more first-generation college students will

enter higher education with many being students of color. An extension of this research would be to conduct a case study on first-generation Black male engineering majors who have successfully persisted at a PWI. This research could provide insight into how engineering programs can prepare future first-generation Black male students for success and create a supportive environment that promotes persistence throughout the entire program. An additional case study on first-generation students of color could also provide insight about how to prepare for an increase in this particular group of students in engineering. More women, particularly Black females, have intentions of pursing an engineering degree but a small percentage obtain this degree. A qualitative study on Black females who have successfully persisted in engineering programs could also provide insight about factors that contribute to their success.

The researcher wishes he had the time and resources to have interviewed other Black males in science, technology and math majors. Qualitative research conducted to hear the voices of Black males in other STEM majors could give rich information about factors contributing to their success and determine if these majors are providing a supportive environment that keeps them connected to STEM. It may also provide additional information about the impact mentoring has on Black males in STEM and what mentoring opportunities are provided within the program and the institution.
A large portion of Black male engineering graduates come from historical Black colleges and universities (HBCU). However, most Black males intending to major in engineering attend PWIs. Conducting a case study on successful persistence of Black male engineering students at HBCUs could provide insight about support structures needed to yield comparable results at PWIs. This research might also examine professors'

perception of Black males in engineering and how these perceptions impact Black males' self-efficacy.

These research findings can be transferred to other settings. Efforts can be duplicated to better understand how to serve similar student populations in engineering at their institutions. Insights learned through this study could also be applicable to the larger population of African American males pursuing a degree in STEM.

Conclusion

The purpose of this study was to understand factors that impact successful persistence of African American male engineering majors at a predominantly White institution. The stories of eight Black males who were majoring in engineering were shared to shed light on the challenges they overcame to persist in engineering. These males climbed to the mountain top called success. They found professors, family members, and classmates to serve as guides, determined the route they wanted to take, and discovered the detours necessary to stay on the route to success. The students located and used the right equipment for navigating the rough side of the mountain. The goal of increasing African American male persistence in engineering hinges on administrators and faculty learning from students who have successfully performed well in the major and implementing changes that will foster self-efficacy and culturally situated social identity development within a safe learning environment with opportunities to build confidence and sense of belonging. In doing so, as African American males climb towards the mountain peak where the air is purer, institutions will reach a higher place of awareness and give these men a perfect view of the horizon.

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APPENDIX A: RECRUITMENT EMAIL

Hello,

My name is Marquis McGee and I am a doctoral student in the Educational Leadership department here at the University of North Carolina at Charlotte. I am conducting a study to fulfill the requirements of Doctor of Education. The study concerns the progress of African American males majoring in engineering. This study will benefit those who work directly with African American engineering majors and are interested in their success.

I am looking for participants who are willing to complete a short questionnaire and be interviewed for about 60-90 minutes to share their experience as an engineering major and a possible follow-up interview lasting no longer than 30 minutes additional time. Eligibility is based on the following criteria:

- Self-identified as Black or African American male
- At least sophomore standing (30 or more earned credit hours)
- Have a minimum grade point average of 2.75
- Have declared major in Engineering

I would be grateful if you would be willing to take part in my study. If you are interested, you will have the opportunity to find out more information about the study before making a decision. You are under no obligation to take part. Eligible participants will receive a $25 gift card upon completion of the interview.

This study is supervised by Dr. Lisa R. Merriweather, associate professor in Educational Leadership department. She can be contacted through email at lmerriwe@uncc.edu.

Marquis McGee
mcmcgee@uncc.edu

APPENDIX B: CONSENT FORM

Informed Consent for
FROM ROOTS TO STAR TREK: A CASE STUDY ON SUCCESSFUL PERSISTENCE OF AFRICAN AMERICAN MALE ENGINEERING MAJORS

Project Purpose

You are invited to participate in a research study entitled "From Roots to Star Trek: A case study on successful persistence of African American male engineering majors." This is a study to understand factors that impact successful persistence of African American male engineering majors at a predominantly White institution.

Investigator(*s*)
This study is being conducted by Marquis McGee, a Doctoral Candidate in the Department of Educational Leadership, College of Education under the supervising faculty advisor and dissertation chair, Dr. Lisa R. Merriweather.

Eligibility
You are invited to participate in this study if you are…

- Self-identified as Black or African American male
- At least sophomore standing (30 or more earned credit hours)
- Have a minimum grade point average of 2.75
- Have declared major in Engineering

Overall Description of Participation
If you volunteer to participate in this study, you will be asked to participate in one interview which will last no more than 90 minutes. If necessary, a follow up interview will take no more than 30 minutes. Interviews will take place on campus at an agreed upon location and can be face-to-face or over the telephone. The interviews will be audio recorded and then transcribed verbatim for use in the data analysis process. The data collected is for research purpose only

Length of Participation
Your participation will take approximately 120 minutes. Reviewing the consent form and interview will be approximately 90 minutes. If necessary, a follow up interview to verify your statements will take approximately 30 minutes.

Risks and Benefits of Participation
There are no known risks to participation in this study. However, there may be risks which are currently unforeseeable. There are no direct benefits to participants in this study. Benefits to society may include information that can be transferable to any university interested in engineering persistence of African American males. Moreover, rethinking how we interact with members from this group could encourage additional

members to pursue an engineering degree in the future, advancing STEM diversity, persistence, and success.

Compensation/Payment/Incentives
You will be given a $25 gift card from Walmart for competing the interview

Volunteer Statement

You are a volunteer. The decision to participate in this study is completely up to you. If you decide to be in the study, you may stop at any time. You will not be treated any differently if you decide not to participate or if you stop once you have started. Participation is completely voluntary and a $25 gift card from Walmart will be given to those who complete interviews.

Confidentiality Statement
Any identifiable information collected as part of this study will remain confidential to the extent possible and will only be disclosed with your permission or as required by law. Because your voice will be potentially identifiable by anyone who hears the tape/digital recording, your confidentiality for things you say on the tape/digital recording cannot be guaranteed although the researcher will try to limit access to the tape/digital recording as described below:

The researcher will manage all student interview data. Any identifiable information will be removed from each interview transcript during the transcription process use pseudonyms (fictitious names) instead. No references will made in oral or written reports, which could link you to this study. Use of direct quotes from interviews will not include your identity. The expected number of student interviewees recruited for this research is sixteen.

Statement of Fair Treatment and Respect
UNC Charlotte wants to make sure that you are treated in a fair and respectful manner. Contact the Office of Research Compliance at 704.687.1871 or uncc-irb@uncc.edu if you have any questions about how you are treated as a study participant. If you have any questions about the project, please contact Marquis McGee, mcmcgee@uncc.edu or Dr. Lisa R. Merriweather, Dissertation Advisor, lmerriwe@uncc.edu.

Approval Date
This form was approved for use on <insert date> for a period of one (1) year.

Participant Consent
I have read the information in this consent form. I have had the chance to ask questions about this study, and those questions have been answered to my satisfaction. I am at least

18 years of age, and I agree to participate in this research project. I understand that I will receive a copy of this form after it has been signed by me and the Principal Investigator.

_____ _____

Participant Name (PRINT) DATE

_____

Participant Signature

_____ _____

Investigator Signature DATE

APPENDIX C: PARTICIPANT QUESTIONNAIRE

Name:_____ Email:_____

Date of Birth:_____ Classification_____

Hometown/State:_____ Major: _____

Cumulative GPA_____

Parent/Legal Guardian Highest Level of Education (Check the appropriate box)

Mother:	Father:
☐ Some High School	☐ Some High School
☐ High School Diploma	☐ High School Diploma
☐ Trade/Vocational School	☐ Trade/Vocational School
☐ 2 year college (Associate's Degree)	☐ 2 year college (Associate's Degree)
☐ 4 year college (Bachelor's Degree)	☐ 4 year college (Bachelor's Degree)
☐ Beyond 4 year college (Masters/Doctorate Degree)\	☐ Beyond 4 year college (Masters/Doctorate Degree)
☐ Not Applicable	☐ Not Applicable
☐ Other_____	☐ Other_____

Did you transfer to this university from another postsecondary institution? _____

How long have you attended this university? _____

APPENDIX D: INTERVIEW QUESTIONS

1. How did your experience in K-12 education prepare you for engineering program?
2. When did you decide that you wanted to major in engineering?
3. How did you decide to choose engineering as a major?
4. Describe what success looks like for an engineering student.
5. What challenges have you encountered in your engineering program?
6. What factors have contributed to your success in engineering?
7. How confident are you that you will succeed as an engineering major?
8. How do engineering professors influence your perception of yourself as an engineering student?
9. Tell me about your racial identity?
10. What positively impacts your racial identity? What negatively impacts your racial identity?
11. How has your professors' and peers' perception of your racial identity impacted progress in your major?

12. Tell me about a time your racial identity mattered in your major?

APPENDIX E: RECRUITMENT FLYER

[redacted]

African American Males Needed!!!

Share Your Story!!!

This is a study to understand factors that impact successful persistence of African American male **engineering majors** at a predominantly White institution.

Who's Eligible:

- Self-identified as Black or African American male
- At least sophomore standing (30 or more earned credit hours)
- Have a minimum grade point average of 2.75
- Have declared major in Engineering

What Will You Be Asked To Do:

- Take Brief Questionnaire
- Attend 60-90 minute interview
- Attend 30 minute follow-up interview (if necessary)

Compensation:

- You will receive a $25 gift card to Walmart after completing interview

If interested, please follow link <**insert link**> to see if you're eligible.

If you have any questions, please contact:

Marquis McGee at (704)-975-[redacted] mcmcgee@[redacted]

This study has been approved by UNCC IRB (uncc-irb@uncc.edu), IRB#17-0304