

8-9-2018

It Takes a Village: The Role of Emic and Etic Adaptive Strengths in the Persistence of Black Men in Engineering Graduate Programs

Brian A. Burt
Iowa State University, burt@iastate.edu

Krystal L. Williams
University of Alabama

Gordon J. M. Palmer
University of Michigan

Follow this and additional works at: https://lib.dr.iastate.edu/edu_pubs

 Part of the [Educational Assessment, Evaluation, and Research Commons](#), [Educational Leadership Commons](#), [Education Economics Commons](#), and the [Engineering Education Commons](#)

Recommended Citation

Burt, Brian A.; Williams, Krystal L.; and Palmer, Gordon J. M., "It Takes a Village: The Role of Emic and Etic Adaptive Strengths in the Persistence of Black Men in Engineering Graduate Programs" (2018). *Education Publications*. 94.
https://lib.dr.iastate.edu/edu_pubs/94

This Article is brought to you for free and open access by the School of Education at Iowa State University Digital Repository. It has been accepted for inclusion in Education Publications by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

It Takes a Village: The Role of Emic and Etic Adaptive Strengths in the Persistence of Black Men in Engineering Graduate Programs

Abstract

Black men, underrepresented in engineering, constitute a missing segment of the population who could contribute to the global knowledge economy. To address this national concern, stakeholders need additional research on strategies that aid in Black men's persistence. This study explores the experiences of 30 Black men in engineering graduate programs. Three factors are identified as helping them persist from year to year, and in many cases through completion of the doctorate: the role of family, spirituality and faith-based community, and undergraduate mentors. The article concludes with implications for future research and professional practice that may improve the experiences of Black men in engineering graduate programs, which may also increase the chances that they will remain in the engineering workforce.

Keywords

Black men, broadening participation, graduate education, STEM, persistence

Disciplines

Educational Assessment, Evaluation, and Research | Educational Leadership | Education Economics | Engineering Education

Comments

This accepted article is published as Burt, B.A., Williams, K.L., Palmer, G.J.M., It Takes a Village: The Role of Emic and Etic Adaptive Strengths in the Persistence of Black Men in Engineering Graduate Programs. *American Educational Research Journal*. 2018. Doi: [10.3102/0002831218789595](https://doi.org/10.3102/0002831218789595). Posted with permission.

**It Takes a Village: The Role of Emic and Etic Adaptive Strengths in the Persistence of
Black Men in Engineering Graduate Programs**

Brian A. Burt, Ph.D. (*Corresponding Author*)

Iowa State University
2625 Lagomarcino Hall
Ames, Iowa 50011
(515) 294-4466
burt@iastate.edu

Krystal L. Williams, Ph.D.

University of Alabama
College of Education
520 Colonial Drive
Tuscaloosa, AL 35401
krystalwms@gmail.com

Gordon J. M. Palmer MS

Center for the Study of Higher and Postsecondary Education
University of Michigan
610 E. University Avenue
Ann Arbor, MI 48109-1259
734-647-1981
palmergj@umich.edu

Biographical Sketches

Brian A. Burt, Ph.D., Assistant Professor of Higher Education in the School of Education at Iowa State University, a National Academy of Education/Spencer Postdoctoral Fellow, and a National Science Foundation Early CAREER Award recipient. He studies the experiences of graduate students in STEM, and the institutional policies and practices that influence students' educational and workforce pathways. He also investigates participation in research experiences (i.e., the science of team science).

Krystal L. Williams, Ph.D., is Assistant Professor of Higher Education in the Educational Leadership, Policy and Technology Studies Department of The University of Alabama College of Education. Her research explores the use of public policies to promote college success for underrepresented students, with an emphasis on the interplay between policy initiatives and students' various psychosocial factors. Recently, her work has focused on these issues as they relate to (1) broadening participation in science, technology, engineering and mathematics for underrepresented groups, and (2) reducing students' role strain in college.

Gordon J. M. Palmer is a Ph.D. candidate in the Center for the Study of Higher and Postsecondary Education at the University of Michigan. His research centers on spirituality, sociopolitical and prosocial development, and critical consciousness among Black college students and emerging adults across the African diaspora.

Acknowledgment

We would like to thank the participants who courageously shared their stories with us, members of the Burt Research Group (BRG) who helped with peer review, and the reviewers for providing valuable feedback and helping to strengthen this work. This work was supported by the National Academy of Education/Spencer Postdoctoral Fellowship Program; the National Science Foundation-Iowa EPSCOR (under grant EPS-1101284).

Introduction

Chris (a pseudonym), a fourth-year doctoral candidate in mechanical engineering in one of the top engineering programs at a highly respected Midwestern university, was admitted into his graduate program because of his sustained record of academic achievement from elementary through undergraduate studies. Despite his advanced status as a fourth-year candidate, he is overwhelmed by the amount of research he has to complete for his advisor before he can begin to work on his dissertation. He is frustrated with himself because he feels it to be impossible to balance the ambiguous needs of his advisor, make progress on his own research, begin considering job opportunities, and maintain social relationships. In addition, he attempts to navigate an educational setting (and field of study) that makes him feel like an “outsider” because of his race. His racial and gendered experiences are representative of his Black men engineering peers in this study. They also describe routinely receiving harsh, racialized comments (i.e., racial microaggressions) about their lack of preparation for graduate level work or research performance from their professors, faculty advisors and research supervisors (Burt, McKen, Burkhardt, Hormell, & Knight, in press), and being overlooked to participate in study groups by their White and international Asian graduate peers (Burt, Williams, & Smith, 2018). Despite the turbulent experiences of graduate school, these Black men are resolute in their efforts to earn doctorates in engineering. Each participant describes intentional efforts to activate existing strengths to persevere. Specifically, they all explain how the support of their village (i.e., family, spirituality and faith-based community, and undergraduate mentors) helps to maintain their drive to persist during doctoral studies.

Ongoing structural racism in higher education keeps underrepresented students of color marginalized and feeling like outsiders at predominantly White institutions (PWIs) (Bonilla-

Silva, 1997; Burt, Williams, & Smith, 2018), making underrepresentation a common factor related to persistence for such students (Harper, 2010 & 2015; Howard-Hamilton, Morelon-Quainoo, Johnson, Winkle-Wagner, & Santiago, 2009; Ingram, 2007; Truong & Museus, 2012). National statistics highlight the limited representation of Black men in engineering graduate programs. According to Yoder (2015), in 2015, 156,857 students were enrolled in engineering master's and doctoral programs. Black men comprised only 1% (or 1,574) of these graduate students, across all graduate degree granting institutions in the United States (these data do not include international students). The consistently low proportions of Black men in STEM pathways will continue to make it difficult to meet repeated calls to action for broadening their participation in STEM (Brazziel & Brazziel, 2001; Chubin, May, & Babco, 2005; Herzig, 2004; Maton & Hrabowski, 2004; Moore, 2006; National Action Council for Minorities in Engineering (NACME), 2008; National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 1995). Institutions' failure to recruit and retain this population is a faculty accepted practice in the university power structure that devalues Black men as significant contributors in the field of engineering. When Black men hold STEM degrees, they not only contribute to the nation's technological advancements and infrastructure, they also serve as valuable thought-leaders, mentors and models for the next generation of those going into STEM. The lack of such mentors and models, however, is only one piece of the underrepresentation puzzle. Black men at PWIs and in top engineering graduate programs are consistently made to feel as if they do not belong and must prove that they have the talent and skills necessary to be in graduate school (Burt, Knight, & Roberson, 2017; Fries-Britt, 1998; Fries-Britt & Griffin, 2007).

A better understanding of what contributes to Black men's persistence through and completion of graduate school is crucial for developing strategies to help retain them. This article

examines the experiences of 30 Black men persisting in engineering graduate programs at three institutions. Chris and nearly half of the other students in this study persisted through degree completion; others are on their way to fulfilling their goal of obtaining a doctorate in engineering. Each participant's village – i.e., family, spirituality and faith-based community, and undergraduate mentors – has provided a support system to help him endure. We argue that part of improving STEM pathways is better understanding how to keep Black men in engineering, not only attract them into their respective graduate programs. The stories collected here illustrate how their perseverance and triumph are, at least in part, a result of the relationships they nurtured during graduate school. Exploring students' sources of support and what makes these significant will provide educational practitioners, families, and community members with better information to understand students and create promising practices that promote their persistence. We conclude with implications for improving future research, theory, and practice pertaining to Black men in engineering graduate programs.

Persistence and Black Students in Higher Education

Higher education scholars have been examining and theorizing about student persistence for decades (e.g., Adelman, 1999; Baker & Pifer, 2011; Bean & Metzner, 1985; Chemers, Hu, & Garcia, 2001; Permzadian & Credé, 2016, Tierney, 2000; Tinto, 1993; Wolf-Wendel, Ward, & Kinzie, 2009). Tinto's (1975) model of student departure, in particular, was used to describe predictors of persistence and attrition at the undergraduate level. Specifically, he asserted that to make progress, students needed to fully integrate themselves within the institution and its culture. Tinto's treatment of social and academic integration lent itself to "a theory of graduate communities and doctoral persistence" (1993, p. 231), with a similar premise to that of his theory about undergraduates. According to Tinto's (1993) theoretical addendum, the theory of doctoral

persistence suggested that students must connect with their institution via a strong relationship with their faculty advisor. From this perspective, Tinto suggested – just as in the theory geared towards undergraduates – that students should disconnect from previous relationships and completely integrate into the academic department. Of particular concern, the doctoral hypothesis – as well as the undergraduate theory – disregarded the necessity of maintaining prior networks that had previously promoted success. His theory was especially counterproductive for students of color, who need to maintain relationships with their home community and culture (Muñoz & Maldonado, 2011; Yao, 2015).

If Tinto's (1993) hypothesis – that the key to doctoral persistence resides in a student's deep connection to an advisor – were true, there would not be such a persistent quandary with regard to identifying why nearly 50% of doctoral students drop out (Gardner, 2008; Howard-Hamilton et al., 2009; Lovitts, 2008; Nettles & Millett, 2006). Instead, extant literature shows that the various requirements embedded in the doctoral process make completing the degree a challenge for many students (Gardner, 2008). For example, financial aid and length of time to complete one's degree have been reported to contribute to students' interest in persisting in graduate studies (Nettles & Millett, 2006; St. John, Cabrera, Nora, & Asker, 2000). In addition, there is agreement that the relationship between the advisor and advisee is important in students' socialization during graduate school (Barker, 2011; Felder, Stevenson, & Gasman, 2014; Gardner, 2007; Graham, 2013). However, researchers have also found the advising relationship to be a challenge for some students to navigate (Burt et al., in press). In their study of 11 Black men in engineering doctoral programs, Burt et al. (in press) illuminated how students perceive racial microaggressions within the advisor-advisee relationship along with the damaging effects they have on graduate students' mental health and persistence.

Parental and Familial Support

Parental and familial involvement have been shown to contribute to the persistence and success of college students (e.g., Nichols, Kotchick, McNamara Barry, & Haskins, 2010), but literature on the ways in which family and parental involvement in college specifically affect underrepresented minority students, and Black students in particular, is comparatively quite slim (e.g., Guiffrida, 2005; Love, 2008; Love et al., 2009; Mandara, 2006; McCallum, 2016; Nora & Cabrera, 1996). Guiffrida (2005) found that high-achieving Black undergraduate students indicated that parental support was among the most important factors in their persistence and success in college. Parents provided a variety of support, from emotional support in moments of academic strife to financial support. Conversely, Black undergraduates with lower levels of support often experienced lower academic achievement and persistence. Love (2008) examined the ways in which attachments to parental care might act as a buffer against psychological distress for African American undergraduates and determined that that parental care served as a significant buffer against psychological stressors that contribute to dropping out among African American students. Love et al., (2009) found that the relationships students had with their parents were reflected in their relationships with other undergraduate students. These peer relationships (and the corresponding parental relationships) were important because African American students who did not build peer attachments experienced greater academic and psychological difficulties and less attachment to their institution.

Spirituality and Religion

Spirituality and religion are separate, but interrelated, concepts. Various definitions of these concepts have been discussed in the literature. Mattis (2002) defines spirituality as “an individual’s belief in the sacred and transcendent nature of life, and the manifestation of these

beliefs in a sense of connectedness with others” (p. 310), whereas religiosity is “the degree to which individuals adhere to the prescribed beliefs and practices of an organized religion” (p. 310). For Black Americans, spirituality and religion are communal pillars because they have influenced virtually all parts of the American Black experience (Herndon, 2003; Mattis, 2000). Religion and spirituality have been explored as sources of hope, purpose, coping, resilience, resistance, and positive identity development in the face of systematic oppression (Dancy, 2010; Herndon, 2003; Mattis, 2000; McGuire, 2017; Patton & McGuire, 2009; Stewart, 2002; Watson, 2006; Watt, 2003). Watt (2003) found that spirituality helped Black undergraduate women survive in college through resisting negative messages and using spirituality to form and shape positive identities. This understanding of spirituality was also a theme in Watson’s (2006) study of identity and coping in African American college men in which spirituality helped Black men to cope with and navigate life on campus while being a key contributor to their development and in Stewart’s (2002) findings that spirituality is a key component of Black student identity that contributes to an idea of an integrated self. Dancy (2010) found that when African American men’s college persistence was threatened, spirituality was a source of support, a central part of identity and connection to community, and a source of guidance and calm. Spirituality and religion serve as buffers in times of stress and help Black men in college to resist, cope, and persist.

Undergraduate Mentorship

Mentorship is vital to the persistence of undergraduate students of color and to efforts aimed at remedying their underrepresentation (Brown II, Davis, & McClendon, 1999; Padilla, 1994). It is also argued to be the one of the most important factors in the success of graduate students (Barnes & Austin, 2009; Hoyte & Collett, 1993; LaVant, Anderson, & Tiggs, 1997;

Palmer & Gasman, 2008; Palmer & Young, 2009). Hoyte and Collett (1993) found that in the biomedical sciences, certain mentoring programs provided students of color, and in particular Black men Ph.D. students, with positive models for success. Palmer and Gasman (2008) found that mentoring was directly linked to the persistence of Black men in college. In their study, mentors provided support and guidance in times of need, and served as role models for participants. Mentors also functioned as experienced counselors who dispensed insider knowledge that assisted Black men in navigating their campus. Palmer and Young (2009) also indicate that mentors and structured mentoring programs can help to increase retention of Black men in college. Finally, LaVant, Anderson, and Tiggs (1997) state that African American men who experience mentoring in college are often especially satisfied by their college experiences. Although there is a generally positive trend, more empirical investigation into the mentoring of Black men is needed.

While there is a growing body of literature on the experiences of Black collegians, there remains a dearth of literature on the experiences of Black students at the graduate level. Further, when looking at intersections of race, gender, and ethnicity, understanding persistence at the graduate level becomes even more confounded. The present study attempts to expand current understandings of students' support systems. In doing so, it highlights the roles of parents/families, spirituality and religion, and undergraduate mentors in the persistence of Black men in engineering graduate programs.

Theoretical Framework

To bring more Black men into and successfully through advanced STEM training, it is important to closely examine these students' experiences in graduate school with an eye towards the factors that help to promote their success. Such an investigation should employ a holistic

approach that acknowledges the barriers to success that Black men often encounter, but also explores factors that help students succeed despite those challenges. While other research has focused on ecological and social factors that threaten the success of resilient Black men in graduate engineering programs (Burt, Williams, & Smith, 2018), this study examines the strengths that Black men employ at the personal and social levels that help them successfully navigate the graduate student experience.

The Bowman Role Strain and Adaption Model (BRSAM) (2006) provides a guiding framework for understanding how Black men's strengths help them to overcome their challenges or "strains" as students in graduate engineering programs (Williams, 2014a; Bowman 2006). While the Bowman (2006) model was initially crafted to better understand role strain and adaptation in relation to counseling interventions and health and behavioral outcomes, it has since been adapted to address outcomes in education (Williams, 2014a; Williams, 2014b; Williams, Burt, & Hilton, 2016). Such an adapted model is needed to better articulate the experiences of Black men in engineering (Burt, Williams, & Smith, 2018). Figure 1 illustrates the adapted model used in this study.

The adapted BRSAM illustrates how various social and psychological factors influence Black men's success in graduate engineering programs. The model notes that while some factors have the potential to deter successful outcomes (e.g. race-based or class-based inequalities; institutional barriers; familial stressors; risky coping strategies, etc.), others can help foster student success (e.g. positive social-cognitive orientations; community support; adaptive coping behaviors, etc.). Although the model provides insight about the strains or challenges that Black men may encounter in graduate engineering programs, it does so from an anti-deficit perspective

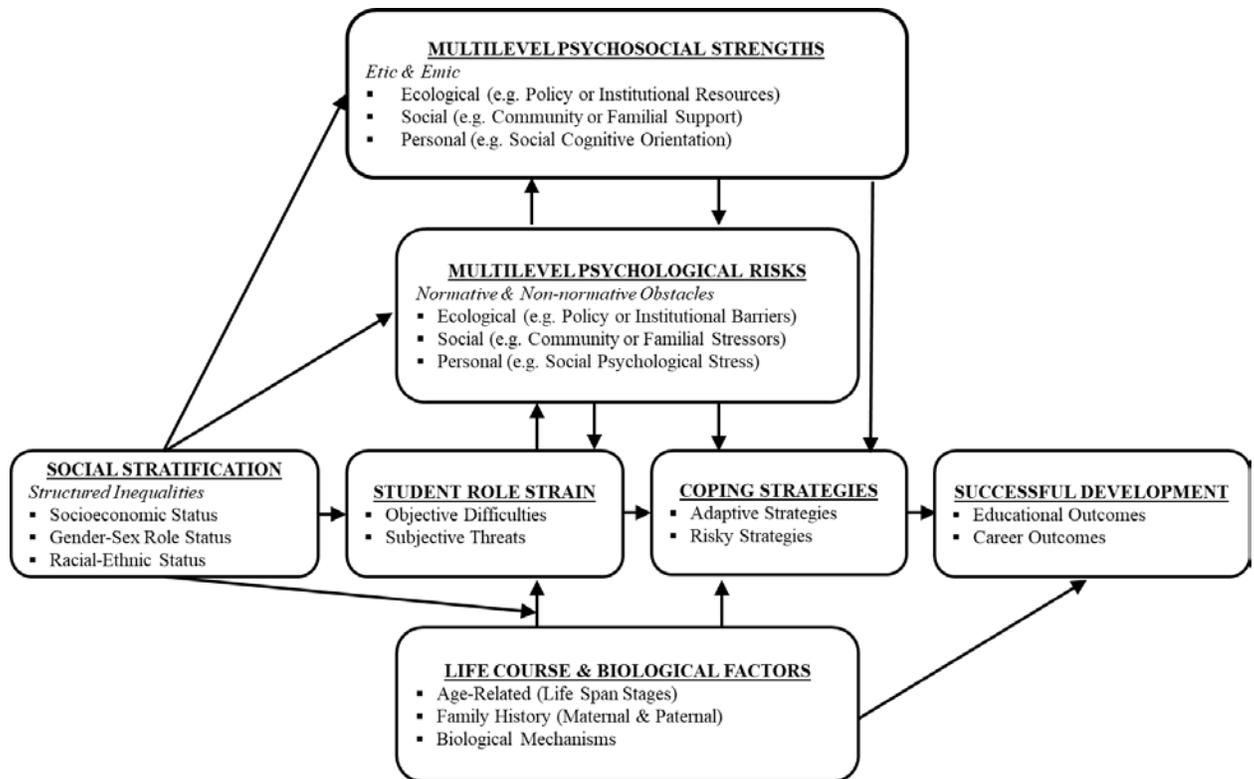


Figure 1: Adapted Bowman Role Strain and Adaptation Model

that: 1) situates or contextualizes these challenges by noting how they may manifest because of broader structural inequalities; and, 2) emphasizes how Black men’s multilevel strengths can help to buffer or reduce their strains as students. The strength-based aspects of the adapted BRSAM are particularly germane to this study given our interest in better understanding the factors that promote the success of Black men in graduate engineering programs, as a complement to existing research that discusses these students’ challenges (Burt et al., in press).

The BRSAM notes that students’ strengths can manifest at multiple levels, including the ecological, social, and personal domains. These strengths include elements such as institutionalized support systems within the academic environment, family support, and personal self-efficacy. Furthermore, students’ multilevel strengths can come from both etic and emic

resources. While *etic strengths* are those that are universal and generally beneficial to all students, *emic strengths* are group-specific or relevant to a particular community (Bowman, 2006). Given our interest in Black men, the emic strengths of note in this study are those which have historically assisted with the advancement of the Black community. Other studies have noted the importance of both etic and emic resources in understanding STEM outcomes for students from marginalized groups (Williams, 2014a; Williams, 2014b). Each of these strengths can reduce the strains that students experience in the academic environment. Furthermore, they can foster behaviors that help students respond to difficult circumstances in productive or adaptive ways. Such adaptation facilitates positive student outcomes.

The BRSAM has been employed to better understand the experiences of marginalized populations in various fields, including education (Burt, Williams, & Smith, 2018; Rowley & Bowman, 2009; Williams, 2014a; Williams, 2014b; Williams, Burt, & Hilton, 2016), psychology (Bowman, 2006, 2013) and health (Griffith, Gunter, & Allen, 2011). For example, Burt, Williams, and Smith (2018) utilized the model's detailed articulation of role strain and adaptation to examine the experiences of resilient Black men in doctoral engineering programs, and the type of racialized multilevel obstacles these students must overcome to be successful. As a complement to that research, this study employs the BRSAM to emphasize the etic and emic multilevel strengths that Black men in doctoral engineering programs employ, which promote their persistence despite strains caused by negative racialized experiences. Accordingly, this study adds to the lineage of existing anti-deficit research on marginalized groups (Bowman, 2013; Burt, Williams, & Smith, 2018; Harper, 2010; Williams, 2014a; Williams, 2014b; Williams, Burt, & Hilton, 2016), with an emphasis on the experiences of Black men in doctoral engineering programs.

Using the strength-based BRSAM as a guiding framework, this study explores the following research question:

What etic and emic adaptive strengths do Black men in graduate engineering programs employ at PWIs to promote persistence?

Methods of Data Collection and Data Analysis

Data Collection Procedures

This qualitative study, based on grounded theory techniques, features the experiences of 30 Black men in engineering graduate programs (master's and doctoral) at three predominantly White institutions. Each institution is a member of the Association of American Universities (AAU), an organization representing the leading research universities in North America. The institutions are also similar in that they enroll a small number of Black students (Black students comprised less than 5% of the graduate student population at each institution). The engineering colleges represented here house the leading engineering graduate programs in the U.S. (U.S. News and World Report, 2012). It is important to note that because the number of Black graduate students at each institution is so small, the percentage of Black men in engineering at each institution is miniscule. The men in this study represent the critical mass of Black men in their respective graduate programs. Specific percentages of Black men per engineering college are not included to help maintain institutional and participant anonymity.

Participants were recommended by peers, administrators, or students who had already agreed to participate (i.e., snowball sampling) (Merriam & Tisdell, 2016). Each participant completed an eight-item demographic form before responding to semi-structured one-on-one interviews conducted by the principal investigator (i.e., lead author). Questions surrounding students' pre-graduate school background and experiences, and reasons for pursuing and staying

in graduate school guided the study. Examples of select interview questions included: “What influenced your decision to go to graduate school?” “Can you describe your graduate school transition?” “Did you ever consider leaving [your institution] (dropping out or transferring)?” “What keeps you from dropping out?” “Black men are underrepresented at all levels in the academy, especially in STEM fields. How have you been able to defy the odds?” “What have been your sources of support during graduate school?” “Who has been influential in your decision to stay in graduate school?” “How did those individuals specifically support you?” Although these questions were asked of all participants, the semi-structured nature of the data collection allowed for probing into participants’ unique lived experiences (Merriam & Tisdell). Interviews ranged from one hour to more than two hours. All interviews were audio recorded and transcribed verbatim to capture participants’ vernacular.

Meet the Participants

Composite data from participants’ profiles show that these students are among the most likely to succeed academically. Further, their profiles provide an indication of the types of support available to them prior to graduate school matriculation. For example, participants ranged in class level (i.e., their year in school during the time of data collection). Their engineering specializations varied: electrical (8), mechanical (6), chemical (3), civil (3), industrial (3), material (3), aerospace (1), agricultural (1), biomedical (1), and design (1). The number of students born in the United States (i.e., native born) totaled 22, and those born outside of the United States (i.e., foreign born) totaled 8. Important to note, all participants considered themselves to be “Black” but not all necessarily considered themselves “African American” (some students self-identified as Caribbean, Jamaican, Ethiopian, Ghanaian, Nigerian, Togolese, and West African). Thus, in this article, “Black” is not synonymous with “African American.”

Most participants (25) had attended predominantly White institutions as undergraduates; four attended a Historically Black College or university (HBCU) and one attended an international institution. Finally, at the time of data collection, 11 students were interested in obtaining industry positions upon graduating, seven were interested in a faculty career, one was interested in a policy career, and 11 were unsure of their post-graduate plans. Table 1 captures some of the

Table 1: Demographic Data for Study Participants

Pseudonym*	Class Level	Engineering Specialization	Household	SES	Mother Education	Father Education
Alphonso*	5 th	Electrical	2-parent	Middle	Bachelor	Some College
Ben	2 nd	Mechanical	2-parent	Low	Bachelor	High School
Chris*	5 th	Chemical	2-parent	Middle	Bachelor	Master's
Christian	3 rd	Civil	Mother	Middle	Some College	Some College
Daniel	1 st	Industrial	2-parent	Middle	Vocational	Graduate
David	1 st	Design	2-parent	Middle	High School	Community College
Dean	1 st	Electrical	Mother	Low	High School	High School
Isaac*	4 th	Agricultural	Single	Middle	Master's	High School
Jackson*	3 rd	Mechanical	2-parent	Middle	Some College	Bachelor's
Jacob	3 rd	Chemical	2-parent	Middle	Doctorate	Bachelor's
Jaden*	2 nd	Electrical	2-parent	Middle	Doctorate	Doctorate
Jalen	1 st	Mechanical	Single	Middle	Vocational	Vocational
James*	4 th	Biomedical	2-parent	Middle	Master's	Master's
Jesse*	5 th	Electrical	2-parent	Middle	Bachelor	Bachelor's
Joseph*	4 th	Material	2-parent	Middle	Doctorate	Doctorate
Logan*	5 th	Electrical	2-parent	Middle	Master's	Master's
Lucas	1 st	Electrical	2-parent	L-M	Master's	Some College
Marcus*	3 rd	Mechanical	2-parent	L-M	Doctorate	Master's
Martin	2 nd	Industrial	2-parent	Middle	Master's	Master's
Paul*	4 th	Electrical	2-parent	Low	Elementary	Elementary
Quentin*	5 th	Electrical	2-parent	Middle	Some College	Bachelor's
Robert	2 nd	Industrial	2-parent	Middle	Master's	Bachelor's
Samuel	5 th	Civil	2-parent	Low	Middle School	Middle School
Shawn	4 th	Material	Mother	Middle	High School	High School
Terrence*	2 nd	Material	Mother	Middle	Bachelor	Doctorate
Thomas	3 rd	Mechanical	2-parent	Low	High School	N/A
Titus	2 nd	Civil	2-parent	Middle	Master's	Master's
Trai*	4 th	Mechanical	2-parent	Middle	Bachelor	Master's
Tristan	1 st	Aerospace	2-parent	Middle	Master's	Bachelor's
Victor*	5 th	Chemical	2-parent	Middle	Master's	Bachelor's

* Denotes that a student has graduated since data collection.

“Class Level” refers to the number of years a student has been in graduate school.

“L-M” socioeconomic status indicates that a participant marked in between “low” and “middle” on the demographic form

participants' demographic and educational information (*all participants have been assigned pseudonyms to maintain confidentiality*).

A majority of the participants self-reported growing up in middle-income households (seven participants described themselves as low-income) and coming from two-parent homes (six participants described being raised primarily by their mothers). Of the 30 participants, 21 had mothers with postsecondary education, including four who held doctorates. Similarly, 18 had fathers with post-secondary education, including three who held doctorates.

Collecting students' demographic information was valuable for gaining information that might not have been acquired through interviews alone. The demographic information provided clues about the types of familial and educational support students had. Based on students' information regarding their parents' educational and occupational backgrounds, high school and collegiate grades, and campus involvement during undergraduate studies, there is evidence that the students in our sample had a solid foundation from which to succeed in top engineering graduate programs. Finally, the demographic data illustrate the diversity present within the participants in this study. Their within-group diversity clarifies the need for more literature and policy that does not treat all Black men as if they are the same (Burt, forthcoming).

Data Analysis

Techniques from grounded theory were utilized to analyze the data. Analysis was completed in two waves by the principal investigator (this study's first author). The first wave was inductive; the principal investigator identified small chunks of text that offered explanations of the experiences of Black men in engineering graduate programs (Corbin & Strauss, 2008; Merriam & Tisdell, 2016). This wave of analysis was iterative and ongoing. The goal was to be open to all possible accounts. To ensure that codes were distinct, they were constantly

scrutinized (i.e., constant comparison) (Corbin & Strauss, 2008). When one code could not be easily distinguished from another, it was re-analyzed and assigned a more appropriate label and definition. Confidence that saturation had been reached occurred when no new codes were identified. After the coding process, axial coding took place, where like codes were combined into categories. Examples of categories and their codes include: journey to the Ph.D. (influence of others, personal aspirations, family expectations and encouragement, cultural pressure); pushing past obstacles (transitioning to graduate school, advisor relationships, experiences with qualifying exams, research experiences); and sources of support (family, peers, undergraduate advisor/mentors, campus student organization, university).

Most germane to this article is the final category above, “sources of support.” Therefore, a second round of data analysis specifically focused on students’ sources of support was conducted. Transcripts were reread with this category and its codes in mind (i.e., selective coding) (Strauss & Corbin, 1990). Because existing codes had been previously identified, this wave of analysis was more deductive in nature. The goal of this wave was to focus on the codes within the “sources of support” category to gain a deeper understanding of how students utilized these sources in their efforts to persist in graduate school. However, along with the intentional focus on this category, the researcher remained open to new codes, and/or more nuanced definitions of codes, that helped to better explain students’ adaptive strengths as graduate students. Because of our use of grounded theory techniques (Corbin & Strauss, 2008), the BRSAM was not used to guide our analyses. Instead, we drew upon the adapted BRSAM to offer a theoretically based interpretation of participants’ experiences, and how those experiences were influenced by emic and etic strengths, after data were collected and analyzed.

Several steps were taken to ensure the trustworthiness of the findings (Creswell, 2013; Merriam & Tisdell, 2016). First, the same interview protocol was used across participants and institutions throughout data collection. Second, to establish rapport, the interview protocol was intentionally designed to be general at first before probing into more sensitive questions. This strategy allowed participants to view the exchange as a *conversation* (rather than an *interview*), which resulted in interviews that were longer and produced thick rich descriptions (Merriam & Tisdell). Third, a team of researchers (including the second and third authors) engaged in ongoing discussions of the data. These researchers iteratively returned to the audio recordings and transcripts to verify the essence of students' meanings. Discussions among the researchers were ongoing until consensus was reached. This crucial peer review process (Merriam & Tisdell) helped with the negotiation of codes and themes. In particular, it provided confidence that the codes and themes held up to scrutiny among participants, across institutional contexts and engineering specializations. Fourth, throughout the research process, memoing allowed for the tracking of procedural decisions, potential relationships between interviews, research questions, and prior research (Corbin & Strauss, 2008). Finally, the researchers were reflexive with regard to how potential biases may have affected their interpretations of the data (Cooper, Jackson, Azmita, & Lopez, 1998; Milner, 2007; Peshkin, 1988). For example, all of the authors of this study are Black, but not all identify as African American; two are male and one is female; each author has an advanced degree in a social science field, yet one also holds a STEM undergraduate degree. Additionally, we individually study the experiences of students in the African diaspora, and we collectively believe that Black students hold unique and nuanced strengths. While we remained cautious not to assume that being Black (and/or male) and studying Black students made us experts on our participants' experiences, the authors' collective

identities may be viewed as assets to this study. Our shared identities of race, ethnicity, and shared culture allowed for rapport-building and interpretation of data in ways that might be missed by researchers of other racial and ethnic identities (Bernal, 1998; Green, Creswell, Shope, & Clark, 2007; Warren & Vincent, 2001).

Limitations

This study has some limitations related to the sample that should be considered. First, this study's sample of 30 Black men in engineering, and their stories, are not representative of all Black men in engineering graduate programs. Therefore, it is necessary to acknowledge that rather than one singular "truth," there are multiple realities based on one's lived experiences (Creswell, 2013; Merriam & Tisdell, 2016). Second, this study's findings may be related to the types of students who attend top-ranked engineering colleges and institutions. That is, there might be unexplored relationships between students' family and educational backgrounds (e.g., parental education and occupations, family socioeconomic status) that offer clues to students' sources of social support and early socialization for academic success. Finally, students experience graduate education differently based on their year in school and their engineering specialization. However, the purpose of this study was not to investigate students' experiences in engineering, as much as to better understand the sources of support they access to persist in engineering.

Findings

As participants discussed their expectations of graduate school, then shared descriptions of their actual transitions into and experiences through graduate school, many described feeling isolated and alone as detailed in other research. They also expressed a need for affirmation that they had selected the right field of study; made the right choice to pursue graduate studies; and

could overcome the challenges faced during graduate school. Before graduate school, they received encouragement from previous experiences with teachers (kindergarten-college), faculty, and staff mentors, many of who encouraged them to pursue STEM and graduate degrees. They found it jarring not to receive similar forms of support from their doctoral advisors and peers, while simultaneously experiencing messages that made them feel like they did not belong on campus (Burt, Williams, & Smith, 2018; Burt et al., in press). Despite these challenging circumstances, the Black men in this study noted a number of things that helped them to succeed in academically and socially hostile environments. Three themes emerged that best illuminate the etic strengths (i.e., strengths that are universally and generally beneficial to all students), as well as emic strengths (i.e., strengths that are group-specific or relevant for a particular community) that students activated to negotiate their graduate school challenges and adapt in ways that fostered persistence: social support from parents; encouragement resulting from their personal spirituality and faith-based community; and social support from undergraduate faculty mentors.

Social Support from Parents: An Etic Adaptive Resource

Research commonly substantiates the ways in which familial social support operates as an etic adaptive resource that helps to foster student success (Guiffrida, 2005; Love, 2008; Nora & Cabrera, 1996). Specifically, it is well documented that support from parents helps to promote successful educational outcomes at various points along the educational continuum, and for students from various backgrounds (Guiffrida, 2005). Similarly, in this study, each of the participants noted how their relationships with their parents helped them to remain encouraged despite the challenges that they encountered as graduate students. A clear message from participants' parents was that they were capable of successfully pursuing a career in engineering.

Furthermore, parents suggested that a bachelor's degree is no longer enough for professional and personal advancement; terminal degrees, then, solidify job security and upward mobility.

Students understood their family members' rationales for encouraging graduate school completion. Many participants described receiving regular encouragement from their family members that helped them overcome the day-to-day challenges of being underrepresented in engineering at a predominantly White institution. Terrence, a second-year doctoral student in material engineering, mentioned: "I think I have a very good support structure, but it sucks that the family part is not here. So I just talk to them on the phone and feel that they are giving support." As a foreign-born student from Ghana, Terrence found it vital to stay connected with his family members via telephone. Similarly, Chris, a fifth-year doctoral candidate in chemical engineering, explained his deep connection to family and the importance of maintaining that connection for social support during trying circumstances:

My parents have told me, especially my mom, she knows me like a book of course (laughter), she just told me that a lot of times I put undue expectations on myself. I really put high expectations on myself. And even if I do decently well, I see all the negative things like "oh, I should have gotten an A+ in this class but I let other problems that I put on myself cause me to do these things wrong." She says, "Maybe, you're in nth degree, [but] you're still here, you're going through it, you're a year away, your advisor is still working with you I mean, look at the positives, you're not on the street yet, you haven't failed yet, the university is still keeping you, they're still paying you to do your degree, your advisor is still supporting you. Look at that, and then let all that stuff in the past go, and then move forward. All that stuff about your advisor, let it go. If it wasn't your fault, it wasn't. If it was it was, you can't dwell on it anymore. You've got to move beyond that.

Chris' example was echoed by other Black men in the study. In fact, most participants shared examples of how parents regularly provided words of encouragement, specifically tailored to students' situations. In Chris's example, his mother often coached him about feeling discouraged by his grades (the difference between an A+ and something slightly lower), maintaining sanity in

midst of advising troubles, and resisting the recurring temptation to drop out. More broadly, in both Terrence's and Chris's examples, illustrative of those of the larger pool of study participants, family members served as listeners and providers of information. Participants described their regular communication with family as one of the only consistent motivators they had on a weekly basis. Understandably, when students do not regularly share their daily or weekly challenges with faculty advisors or peers on campus, and do not have mentors to consult, family members may be their only source of affirmation of their sacrifices and motivation to continue in graduate school (McCallum, 2016). Plainly put by Paul, a fourth-year doctoral candidate in electrical engineering: "When your family is very supportive, when they tell you they understand and they tell you they want you to be successful, that helps a lot, you know?" This regular contact was especially important in students' ongoing battles with feeling like they did not belong in graduate school.

Participants' parents' educational background and socioeconomic status provide additional context for thinking about the support parents provide. A majority of participants' parents had postsecondary degrees, and several had advanced degrees. A few participants echoed sentiments similar to Chris's when he proudly stated, "I was raised in a family of achievers...I think a lot of my influences [have] been within the family, being expected to be successful, being expected to defy the odds." Participants also benefitted from their parents' educational attainment. As Trai, a mechanical engineering student, suggested, "[Both my parents] went through it," and as a result, he felt comfortable taking their advice on how to navigate graduate school. Trai and Chris acknowledged their fathers' occupations as reasons they persisted. Both of their fathers were engineers, providing them up-close examples of what an engineer does and what it looks like to be Black, male, and in engineering.

Parents who had attended college and/or held advanced degrees were consistent models of success that served to motivate students during difficult times in graduate school. As noted in the “Meet the Participants” section, however, not all students shared the same circumstances regarding their parents’ education. Nonetheless, students who self-reported coming from less advantaged backgrounds still drew on their families in similar ways. Marcus, a third-year doctoral student in mechanical engineering, for example, shared how his earliest upbringing informed his motivation to persist:

I grew up in...I wouldn't say, that we were emotionally poor, but we were definitely financially poor and I've seen where my mom, has, has definitely...I see where her going to school and making sure that no matter what she gets her education and imparting that on me and my sister.

It is important to note that Marcus has highly educated parents (i.e., his mother holds a doctorate and his father holds a master's degree). However, based on Marcus's demographic form, he indicated a socioeconomic status somewhere between low and middle-income. Upon further analysis, it became clearer that on the demographic form Marcus was conflicted in choosing between low and middle-income statuses because of his changing social status. Although immediately prior to graduate school he was middle SES, he grew up in a lower SES home (as reflected in the quotation above: single-parent household, mother who was working on her education). Insights from Marcus provide a powerful counterexample of the role of socioeconomic status in students' persistence and degree attainment. It might be assumed that because he was raised in a single parent, lower SES household during his formative years that he would be characterized as “at-risk” or assigned other deficit-laden labels. His statement tells a different story: a household full of love, and a mother modeling the importance of academic attainment. The lessons that he witnessed growing up had lasting effects that helped him to

remember where he came from, envision the possibilities that awaited him, and establish a blueprint for thriving despite adversity.

It is possible that higher parental SES and educational background could have provided some students with greater access to resources (for example, other family members and friends who also attended college and held advanced degrees, increasing students' social capital, and knowledge of navigating academia). To be clear, we are not arguing that there is a causal relationship between family SES, number of parents in a household, and students' persistence in graduate school. In fact, our findings suggest that parents across SES levels were able to support their students in meaningful ways that aided in students' persistence. However, from participants' voices, we see that parents' who attended college and/or held advanced degrees may have been able to help their students in different ways because they had a better understanding of the college-going and graduate school process.

Spirituality and Faith-Based Community: Emic Personal and Social Adaptive Strengths

Spirituality and faith-based communities have historically been emic sources of strength, encouragement and support for individuals from marginalized groups (Herndon, 2003; Mattis, 2002; Stewart, 2002; Watt 2003). For example, in a qualitative study of African American women, Mattis (2002) illustrates how these individuals use their religion and spirituality to cope with adverse situations. The experiences shared by the Black men in this study further underscore the importance of their personal religious development and the social relationships that manifested in spiritual and faith-based communities as sources of encouragement, purpose, and perseverance during their graduate studies. It is necessary to acknowledge, however, that the noted benefits of spirituality and faith-based community to these students' persistence emerged organically during the study. The larger study did not seek to investigate students' religious

affiliations. Participants did not necessarily refer to the same spiritual *beings*, nor did all participants self-identify with a particular faith. Nonetheless, they shared similar ideas about the instrumental role of spirituality and faith-based community in helping them to remain committed to finishing their graduate studies.

Several participants indicated that being in graduate school was part of a greater spiritual purpose. Their spiritual purposes appeared to have been instilled by their parents, as illustrated by Martin, a second-year master's student in industrial engineering: "I talk to my mom every Tuesday... ever since I left to go to college. She keeps telling me to pray and have faith and keep doing things. That's helpful to constantly have positive feedback from her." Martin's words highlight sentiments expressed by several participants. A number of the Black men in the study noted the importance of their family upbringing in relation to their spirituality, and how their familial and spiritual connections needed to be maintained, if not further developed, in efforts to persist in graduate school.

For some, staying rooted in their spiritual faith contributed to their capacity to endure challenging times during graduate school. Recall, these men regularly described tumultuous experiences with their advisors, peers, and broader campus communities. With this in mind, it is not hard to imagine how some students believed at times that there was no one to turn to but their faith in god. Daniel, a first-year doctoral student in industrial engineering, bluntly proclaimed: "You know man...I'm like 'Yo, God I need your help.'" Marcus, a third-year doctoral student in mechanical engineering, elaborated:

It's been tough psycho—it's been tough emotionally. It's been tough mentally. It's been tough spiritually. But I've grown into my faith over the last two years and I feel like the thoughts that were trying to convince me to leave were negative thoughts. They weren't—there were things creeping into my heart that weren't necessarily of my faith or they weren't necessarily—umm, let's just say they were coming from a bad source trying to force me to detach myself from my faith. So, if I leave [my graduate school

institution], I feel like I would have squandered a golden opportunity to continue to grow in faith. I don't have anyone here. I don't have that support system. So I need to lean on my faith a whole lot more than I did when I was [at my undergraduate institution in the south].

Marcus's words are particularly powerful. When he shared his feelings of isolation ("I don't have anyone here"), he was referring to the lack of support at both the institutional and community levels. He alluded to the loaded turmoil of being a Black man in a top engineering college at a leading institution. It was evident that Marcus had considered dropping out. However, as he connected his thoughts of dropping out to his spirituality, it was apparent that for Marcus, leaving without his doctorate was not an option. Further, most germane to this theme, when Marcus mentioned "squandering a golden opportunity to grow in faith," he was relating remaining (i.e., persisting) in graduate school to his religious faith. Marcus's words are illustrative of experiences of other study participants who, on several occasions, described their use of spirituality as an adaptive strength. In most occurrences, their persistence in graduate school was described as being related to their spiritual "purpose," or "witness." This suggests that they viewed earning a doctorate as being not only about skill and job acquisition, but also part of their life's purpose to symbolically model what a Black man holding a doctorate in engineering could look like for future generations of students.

For some participants, an added benefit of having a spiritual connection was the support of a faith-based community. For those who attended church, doing so not only provided the spiritual nourishment they sought, it also provided a supportive interpersonal connection that was missing from their graduate school and/or larger campus community experience. Ben, a first-year doctoral student in mechanical engineering, explained,

Church, that's a big...I wasn't going to church as much last year or when I first got here, but I've been more...What's the word—more involved at church lately. My fiancée and I,

we usually go every Sunday if we can, and we have a good relationship with the pastor and his wife, and we've been doing marriage counseling, stuff like that.

Others also described similar personal benefits from attending church. Daniel mentioned, “In relation to that, there is people...My support structure of the church I attended in [large urban city]. Just letting people know, ‘Hey, here's what I'm going through. I'm back in classes. This is tough. Pray for me.’” Marcus further contributed to this discourse when describing his participation in his Bible study group:

So, you know that organization [Bible study] has helped me to draw closer to my faith and as such I've been able to understand what different things are going on in my head. And you know, I have different sources of people praying for me and encouraging me. I think that's probably the reason why they have had the most impact because they've directly helped me with a need that I have right now in my life versus the other [university-wide, mainstream] organizations, you know. I'm passionate about the kind of stuff, the work that they're doing but it's not a need, it's not like I'm hungering or desiring to fill that void.

Marcus's words are poignant because while he describes his participation in his campus Bible study group, he also juxtaposes his involvement with other non-religious organizations on campus and within the engineering college. This finding is of particular importance because previous research indicates that when Black men are involved in campus organizations, they are more likely to persist (Harper, 2005; Strayhorn, 2011). Extant literature, however, is focused primarily on students in undergraduate studies. The present study suggests that even at the graduate level, some students' persistence is tied to their connection with spiritual and faith-based involvement in the campus community.

Ben and Marcus both described the relationships they built by attending church and Bible study. Jaden, a second-year doctoral student in electrical engineering, offered an important insight concerning students' church-going behavior:

And I'm around actually a few engineers [who] go there. I have had some questions about engineering and I can go to them for advice, and if I don't want to talk about it then nobody brings it up. I am probably the only person that brings it up 'cause every-

everyone is doing the same thing and want to step away from it. Um so yeah, that's nice. And it kind of like rejuvenates you.

While Jaden gained the personal spiritual enrichment needed to rejuvenate from the draining experiences of graduate school, he also described the social relationships he was able to build by attending church. He explained that some engineering peers attended the same church, which not only enhanced his faith-based community, but also gave him access to other students when he had academic questions. He and other Black men noted how their religion offered personal spiritual growth and a supportive community, which helped them to overcome the demands of graduate school.

Social Support from Undergraduate Faculty Mentors: An Etic Adaptive Strength During Graduate School

Mentorship is an etic resource that benefits students from various backgrounds and its importance with regard to student success has been thoroughly documented in the literature (Barnes & Austin, 2009; Cole & Griffin, 2013; Nettles & Millett, 2006; Williams, Burnett, Carroll, & Harris, 2016). In this study, mentors acquired during undergraduate years remained sources of motivation for students as they navigated graduate school. The strong relationships students built with undergraduate faculty members helped them perform well in college, and apply and gain acceptance to top graduate programs in engineering. Participants praised their undergraduate faculty mentors as being their shepherds through the application and transition process. Most germane to this study, participants evoked memories of interactions with undergraduate mentors to help them persist in graduate school. This type of support appeared to occur when students were not receiving similar mentorship from their current graduate advisors.

Having a mentor was significant for the majority of participants. For example, Paul, a fourth-year doctoral candidate in electrical engineering, explained that the supportive and “very encouraging” interactions he had with undergraduate mentors were monumental for his

persistence. The significance of undergraduate mentors was explained, at least in part, because since a young age, the Black men in this study had always felt different for being “the smart kid in class,” as explained by Alphonso, a fifth-year doctoral candidate in electrical engineering. Their awareness of being different increased as they aged; not only were they smart, they were Black, male, and interested in STEM. Alphonso discussed the significance of having a faculty mentor reach out to him about pursuing a Ph.D.:

[My undergraduate faculty mentor] thought I could do very well going forward because of what I’d been doing in undergrad...So being able to have those types of high grades, they felt that I could be successful in grad school. So I was like “That’s what I’m going to do.”

For some participants, like Alphonso, their undergraduate mentors were among the first to tell them that they should pursue graduate school. For others, receiving affirmation of their potential to succeed in graduate school led them to believe in their own abilities for the first time. For Alphonso, the extra push from his faculty mentor was the catalyst he needed to help him realize that he should apply to graduate school.

Dean, a first-year doctoral student in electrical engineering, shared that his faculty mentor – and the program staff – during his undergraduate summer research experience “said I did a good job with what I did and things of that nature, even maybe little compliments.” Receiving these regular moments of affirmation on his research performance “provided that mindset that I am capable of doing this [research at the graduate level].” Dean additionally described how two other professors further developed his thinking about graduate school:

One professor in particular, I feel like she held it over my head sometimes, as in she wouldn’t let me slack in certain areas. If I did [slack], she would basically say, “In graduate school, you won’t be able to do this or you won’t get away with that.” Although at times I did not like that, just leave me alone, kind of mindset, but it was good because she helped sculpt me into who I need to be and the mindset that I should be thinking of. Another professor...he pushed me as I would want and expect a professor to do if they see a pupil that has potential.

From Dean's quotation, it is apparent that his mentors held him accountable to performing at high levels. Dean's academic record (for example, graduating with a 3.5 grade point average from both high school and undergraduate studies) shows that he had the capacity to thrive academically. According to his words, it was supportive interactions from his mentor that provided the extra push he needed to stay focused and keep working hard. It also appears that his faculty mentors established a caring relationship with him where he did not perceive their constructive criticisms as attacks or microaggressions. To be clear, we are not suggesting that a caring relationship never includes microaggressions. In fact, microaggressions are sometimes masked in care, yet are still harmful, as has been the case with other students of color in STEM who report negative experiences with faculty advisors (Burt et al., in press; Fries-Britt, Burt, & Johnson, 2012). Rather, because of the nature of their relationship, he viewed their interactions as helping prepare him for the rigors to come in graduate school. Trai also explained how his faculty mentors motivated him towards graduate school, explaining that "some of the faculty that I was around in undergrad kind of encouraged me":

[He] just kind of appealed to the fact that...I guess he just felt that I was intelligent [and] smart; he just felt that I should just pursue this because, it would almost be, I guess maybe a waste, in a way. So, he just said—he was in the middle of class and was asking different people "what are you going to do when you graduate"? And a lot of people were just going to go, especially at the school I went to, just go get a job, and that's fine. But at the time I was thinking of getting a master's, but he specifically said [to me], "No no. You're going to get a Ph.D." I kind of flinched at that thought. He kind of used that as a tactic to kind of claim that I was going to do that.

Trai's conversation with his mentor provides an example of a faculty member who saw potential in a student and let the student know what he saw. The effort taken by Trai's faculty mentor did not go unnoticed. That Trai recounted this scenario when answering the question about his sources of support illustrates the lasting power that his undergraduate mentor had over him. The

scene Trai painted also illustrates how meaningful interactions within the classroom, especially in front of peers, may have significant and lasting impacts on students' sense of self and academic self-efficacy.

As evidenced by Trai, some of the mentoring experienced by students took place within the classroom. However, support from undergraduate mentors also took place through research experiences. Additionally, support from mentors was not exclusive to individuals at students' home institutions, especially for those who participated in undergraduate research experiences at different institutions. Dean shared that it was at his summer undergraduate research experience that he learned about graduate school from his mentor:

[During] my summer research experience is when graduate school was introduced [to me]. I had no plans of graduate school at all. I learned about graduate school and also research...I really found out that I enjoy research and that I possess some of the skills for that. The students in my lab, and also the mentor I was working with, I guess between all of them, kind of made me feel comfortable with saying, "I can do this." It [became] an option that was put on the table.

Not only did Dean did learn about graduate school by doing the work of his faculty mentor in the lab, his mentor took time to explain graduate school, as well as the application process. The lab context established by his mentor was also a supportive place of learning about graduate school, as Dean's lab mates were also influential in his growing understanding of graduate-level work. Two other students also described having positive learning experiences while participating in summer research. In fact, they both ended up choosing their graduate institution because of the mentoring relationships they formed during their summer experience. Jackson, a third-year doctoral candidate in mechanical engineering, explained the relationship between his summer experience, mentoring, and choice of graduate school:

Before I got my master's, I came up to [my current institution] and I did research with the professor I work for now. He was really supportive. He helped me narrow down different

schools, and gave me recommendations as to resources and as to things to think about as I looked at Ph.D. programs.

Ben, a second-year doctoral student in mechanical engineering, offered a similar example of how his undergraduate research mentor became his current graduate advisor:

Before graduation, one of my mentors [at my current institution]—he was actually a recruiter that came [to my undergraduate HBCU for a research symposium]. He was looking around and doing stuff like that. He was trying to recruit. He was basically there because he knew that I was there, and some other students from [my HBCU] had also participated in the program. [While] he was there, we talked, and we eventually caught up, touched base, and then he was telling me that I should go ahead and apply, so I applied.

In combination, Jackson and Ben's experiences indicate that mentoring can come from what appear to be small gestures of spending time with students to discuss their future plans, watching them discuss their research during symposia or presentations, and condensed summer research experiences. These examples illustrate how students chose long-term graduate advisors based on the personalized efforts of faculty members interested in getting to know them. Their interactions with these faculty mentors were also ongoing after their short interactions. The sustained availability – and care – of faculty mentors apparently helped students to realize what long-term mentorship and commitment might look like if they chose to continue working with those professors in graduate school.

There are persistent questions within the mentoring literature about whether or not mentors must hold the same social identities as mentees, and the empirical literature has produced mixed results, particularly concerning race and gender (see Blake-Beard, Bayne, Crosby & Mueller, 2011). In the current study, there was no discussion with regard to the characteristics that make a good mentor. In two instances, however, participants identified their mentors as sharing the same race. Isaac's faculty mentor was the first Black man to earn a Ph.D.

in agricultural engineering from a well-respected engineering school in the south. Now, as a fourth-year doctoral candidate in agricultural engineering, Isaac explained the positive effects of attending an HBCU for undergraduate studies, and having a mentor who was a part of Black history. It appeared that knowing his mentor's place in history served as a motivator to persist through his own challenges during graduate school. Similarly, Trai's confidence was increased due to another of his mentors, a Black woman:

An African American professor...made a point to actually call everyone in her class "Dr. so and so." When they would call our names...I think the whole point was to get us thinking in the mindset that a Ph.D. is attainable and something we should think about. It was kind of just claiming it almost right there that any of us was capable of doing that.

Although there was no saturation of evidence suggesting that same race and gendered mentoring relationships were necessary, having faculty mentors who shared these identities was beneficial for Isaac and Trai. It is not clear from our data whether or not other students had experiences with Black faculty mentors. Thus, what appeared to be most salient for participants was to have a physical example of success (Palmer & Gasman, 2008), as candidly explained by Terrence, a second-year doctoral student in material science: "You know, you kind of like want to look up to other people to be able to believe that if other people have done it, I can also do it." In his concluding thoughts, Terrence ended by sharing his hypothesis about mentoring and the persistence of Black men in engineering graduate programs: "So I think maybe you know people like that [who] don't have mentors or don't have people to encourage them or people to look up to. So that would be, you know, my guess on why people would drop out."

Discussion and Implications

Previous theory suggests that students are successful in graduate school when they integrate into the social fabric of the department solely via their academic advisor (Tinto, 1993).

This study, however, considers the BRSAM to tell a different story about the factors that may have helped Black men to survive and thrive in top engineering graduate programs, emphasizing the role of their adaptive strengths at the personal and social levels. The BRSAM notes the key role of students' strengths in helping to foster successful outcomes in college despite the challenges that manifest in the academic environment. While other work highlights resources that serve as adaptive strengths (e.g. social support from parents and mentors), which are universally beneficial to students from various backgrounds (McCallum, 2016), the BRSAM also acknowledges the group-specific, culturally relevant or emic adaptive strengths that may have particular import for students from marginalized communities (e.g. spirituality and faith-based community). Both emic and etic strengths help these students to be resilient when faced with adversity. Building upon this conceptualization, this study highlights personal and social adaptive strengths of Black men that have both etic and emic origins.

Although the BRSAM was useful in illuminating the multilevel strengths that students employ to foster success, the model was less pronounced in its description of how these strengths influence persistence directly and indirectly. However, the findings from this study further extend the BRSAM framework by illustrating interconnected relationships between students' multilevel strengths and persistence in engineering graduate programs.

As illustrated using the BRSAM, each of the participants indicated the ways in which etic and emic social support and personal strengths helped them to persist. In addition, the Black men in this study also noted how their social support not only helped to foster persistence, but also promoted the development of strengths at the personal level. For instance, support from students' undergraduate faculty mentors and family members increased students' personal evaluations of their ability to achieve. Likewise, the social support that students received from their faith-based

communities further reinforced the development of their individual spirituality in the context of challenges they confronted in graduate school. The findings from this study suggest that one of ways in which social support can help to foster successful student outcomes is by promoting the development of personal or individual attributes that also lead to student success. Accordingly, this study offers new insights about the interconnected aspects of the multilevel emic and etic strengths noted in the overall Bowman model, as well as additional nuance about their importance in relation to educational outcomes. Future research should further investigate students' multilevel strengths and their connection to persistence. In doing so, scholars may consider exploring the wide range of strengths students possess, as well as when and where they acquire these strengths. Identifying students' strengths and considering when and how they develop these strengths would provide further nuance about students' abilities to develop, activate, navigate, and thus, persist in STEM educational contexts.

Prior to matriculating into graduate school, participants were accustomed to receiving encouragement and reminders of their potential for academic success. It was in part these regular forms of encouragement from their support systems that helped them remain in STEM. In graduate school – and throughout their STEM pathways – they faced consistent opposition to their goals of completing an engineering degree. It can be imagined that an abrupt shift from receiving consistent support in working towards one's goals to receiving opposition (opposition in the form of racial microaggressions, being overlooked to participate in study groups by their graduate peers, and being underrepresented in the engineering college) (Burt, Williams, & Smith, 2018) could cause anxiety and doubt. The BRSAM helps underscore how, in response to their graduate school challenges, the Black men in this study drew upon emic and etic strengths to support their persistence. Specifically, the participants described how parents, spirituality and

faith-based community, and undergraduate mentors served as necessary sources of support to continue making progress towards their graduate degrees. The findings reported in this article provide counterexamples to previous theory (i.e., Tinto, 1993), illustrating that some Black men make progress when they maintain (and in some cases, develop) social networks – beyond their academic advisors – that promote their confidence. Our findings not only complicate existing theory and research on student persistence, they add to the growing corpus of literature refuting outdated and inaccurate research on persistence for students of color (Muñoz & Maldonado, 2011; Yao, 2015).

These findings offer important contributions to the growing literature on graduate education, STEM pathways, and Black men in academia. Namely, our findings expand understandings of the cadre of individuals and entities that may serve as systems of support for some Black men in engineering graduate programs. The individuals or groups identified in our study are often forgotten or overlooked in existing literature that generally focuses on students' advisors and peers. Rarely do scholars identify other important sources of social support and the roles that these relationships play in students' persistence. By considering the supportive relationships students develop and maintain, we emphasize students' agency in overcoming barriers to persist in academia. In this way, these findings also contribute to the growing research on the “array of knowledge, skills, abilities and contacts possessed and utilized by communities of color to survive and resist macro- and micro-forms of oppressions” (Yosso, 2005, p. 77). From this perspective, relationships with family, spirituality and faith-based community, and undergraduate mentors may be framed as forms of community cultural wealth (Yosso, 2005) at play in the graduate STEM experience of at least some Black men.

Implications for Practice and Research

While this article focuses on persistence at the graduate level, the findings address multiple communities and stakeholders inside and outside of the academy (e.g., families, churches, undergraduate faculty, administrators, staff, students), all equally invested in student success. Because of this, recommendations for research, and professional and personal practice, are offered, beginning with practical recommendations to students. Part of adjusting to graduate school includes a recalibration of one's previous experiences and access to supportive resources and socialization to the norms and expectations of the new educational community (Dortch, 2016; Felder, Stevenson, & Gasman, 2014). In the broader study from which this article derives, the Black men described experiencing cultural shock, isolation, and hostile environments at their predominantly White institutions (see for example Burt et al., in press; Burt, Williams, & Smith, 2018). During their transition to graduate school and throughout progress towards degree completion, they intentionally maintained supportive relationships with people, practices, and beliefs from their past. Others confronting similar experiences would likely also benefit from maintaining supportive relationships. Enacting this recommendation should not be considered a crutch or deficit. On the contrary, maintaining these supportive relationships is likely to promote progress towards degree completion. Similarly, those who are part of students' villages (e.g., family members, church members, spiritual advisors, undergraduate mentors) should neither expect nor encourage students to distance themselves upon graduation and matriculation to graduate school. Rather, students may need to stay connected. This might be especially true during students' transitions while they try to find new mentors and sources of support within their new academic departments, institutions, and communities. Students would benefit from their sources of support also reaching out to them so that the responsibility for staying connected does not solely fall on their own shoulders.

It is clear from this study that the social support provided by parents – and more broadly, family members – plays a significant role in many students’ STEM pathways. While parents were found to be the sources of students’ earliest interests in science and engineering, most germane to this study were the ways that parents continued to nurture students’ interests through consistent encouragement in graduate school. Future research could deepen this area of inquiry by further investigating the wide range of ways that parents support students. All parents might not be able to support students through financial means, but there may be other equally critical ways that parents help their children through graduate school. More research is needed to uncover these forms of support. Additionally, as alluded to throughout this article, students often used “parents” (i.e., mother, father, parents) and “family [members]” interchangeably. Future research should take a more expansive approach to investigating the variety of ways in which family members (e.g., immediate and extended family) support students.

The theme of “spirituality and faith-based community” was admittedly more challenging to succinctly capture because students described these adaptive strengths in varied ways. While some talked about going to a physical location (i.e., church) and participating in regular services, others appeared to reference practices of organized religion (e.g., praying, attending Bible study) and/or discussed more broadly holding a spiritual connection to a higher being. Existing research on Black college students’ religion affirms our own difficulty in categorizing students’ religious and spiritual perspectives (McGuire, 2017). For example, McGuire (2017) highlights the increase in spiritual belief yet declining rate of religious affiliation of today’s college students. The implications of his work suggest that retention efforts – traditionally aimed towards communal practices – may need to be reconsidered if college students are instead drawing on individual-centered practices of spirituality (e.g., meditation). In the current study, students experienced

religion and spirituality as a means of coping and resilience. Existing literature speaks to these means more broadly (Patton & McClure, 2009; Stewart, 2002; Watson, 2006; Watt 2003), but the current study provides a more nuanced picture of the ways that religion and spirituality served as individual (e.g., a relationship with a higher being) and communal (e.g., belonging to a church body) means of supporting Black men's persistence. These findings offer no basis for recommending the usefulness of one strategy over another, but do provide evidence of the nuanced ways that some students engage practices around spirituality, religion, and faith. This evidence may be even more significant for those in charge of student success in STEM, where spirituality and religion may not always be acknowledged as appropriate ways of surviving.

There are many reasons individuals attend church that cannot be fully captured in one study. The findings from this study revealed that church was a social location where students could have interpersonal connections with others without the high-stakes pressure that they tend to face on a daily basis in their departments, research groups, and engineering college. In addition, church provided students with a social outlet, not exclusively comprised of those from engineering or STEM backgrounds, and for those who attended predominantly Black churches, with an opportunity to interact with people who looked like them. Such opportunities to temporarily escape their STEM world were rejuvenating. Based on this finding, it seems likely that finding additional opportunities to create such circumstances for students could be beneficial, and that administrators within the graduate college or other support services on campus will be helping students when they intentionally provide opportunities for students to interact with others from fields other than their own. This may provide them with momentary relief from their academic silos, not to mention possibly increasing their on-campus support systems beyond their field of study.

Although church appears to be a safe haven for some students, not all students will attend church. As an additional note of caution, encouragement to pray may or may not be well received by all students. In fact, encouraging some students to attend church or pray – particularly if this advice comes from someone holding a different belief system or religion from the student – may be perceived as disrespectful. It is possible that students could feel judged for not practicing a particular religion or engaging in a set of religious practices, further exacerbating their feelings of otherness within their educational community. Similar to the arguments made by McGuire (2017), we also recommend that further research be conducted on student uses of religious and spiritual activity (including but not limited to church attendance, prayer, etc.) to develop a more granular understanding of the ties between religion, spirituality, and faith-based community and persistence. More specifically, research on both the communal nature of religious practice and the developmentally complex internal nature of spirituality is needed to understand how these factors affect persistence. A communal versus individual framing of these phenomena is only one way of pursuing this research, but it is one based in the data from this study. And while specifically tied to religion in this study, this research would add to existing literature on the ways that students seek out communities of support and how communities of support (e.g., faith-based communities) offer developmentally complex understandings of the world, yet affect graduate student persistence.

The findings from this study also indicate the lasting effects of undergraduate mentoring on students' graduate persistence, and offer implications for sustaining undergraduate mentoring relationships throughout graduate school. These findings extend previous conceptions of undergraduate mentoring (that tend to be space and time-bound). For example, as found in existing research, undergraduate mentors often push students to see their potential and help guide

them through preparation for graduate school (Cole & Griffin, 2013; Palmer & Gasman, 2008). Hands-on encouragement from undergraduate mentors helps inform how students view their own potential to pursue graduate studies and do graduate-level work. Furthermore, interactions with undergraduate mentors can boost participants' confidence in their ability to do well in graduate school. It comes as no surprise, then, that the men in this study named undergraduate faculty mentors as important sources of motivation who impacted their persistence. Participants in this study were not only positively impacted by mentoring during undergraduate studies (space-bound), but the mentoring they received affected their graduate experiences (time-bound). However, rarely are undergraduate mentors considered to be later sources of support during students' graduate studies. Future research that explores graduate student mentoring – by extending time and space-bound parameters – may better capture which mentors are part of students' networks of support, and the longitudinal effects of mentoring.

It is important to note that the broader study was not focused on undergraduate mentors and their sustained roles in students' graduate persistence. Rather, this theme emerged during participants' discussions of those who helped them to persist from year to year. The data show that most students talked about faculty members as their undergraduate mentors. In some instances, students also mentioned staff members and administrators. To avoid leading participants to mention particular people (or choose between faculty, administrators, or staff) probing questions remained broad to allow students to identify the people who were supportive in their experiences.

Within the undergraduate mentoring theme it may appear that students were reflecting on their rationales for going to graduate school. However, it was in these reflections that they shared how undergraduate mentors influenced their determination to persist. As an example, several

students described sentiments about staying in graduate school because the end pay-off would be greater. By probing, it was learned that students heard these messages from their undergraduate faculty mentors. In efforts to persist, the graduate students in this study apparently revisited lessons imparted to them by their undergraduate mentors, particularly because it was the lessons from these individuals that helped them gain admission to graduate school. These findings suggest that maintaining strong relationships with undergraduate mentors had lasting impacts beyond the undergraduate experience. Additionally, undergraduate mentors should not expect that once students graduate they find it easy to separate from mentor support. Staying in touch with students might be a useful mentoring practice, especially for students who receive messages that they are supposed to detach or “move on” once they graduate from undergraduate studies.

It is important to note, however, that Black faculty representation in engineering is small. According to Yoder (2015), Black faculty (tenured and tenure-track eligible) faculty totaled 670 (or 2.5%). These statistics make it clear that not all Black students who may want a Black and male engineering professor as a mentor are likely to have one. Two recommendations are offered. First, there needs to be a relentless commitment to recruiting and retaining more Black faculty. Existing research shows that Black graduate students experience lower rates of socialization in science and engineering, in part, due to the lack of diversity in those settings (Charleston, Adserias, Lang, & Jackson, 2014; Charleston, Gilbert, Esobar, & Jackson, 2014; Nettles & Millett, 2006). This research suggests that hiring more Black engineering faculty may help redress inequities in the socialization experiences of Black students. Second, the presence of proportionally fewer Black men faculty members also means that Black students need to be supported through mentoring by non-Black faculty who comprise the faculty in greater numbers, as well as by staff members. Put differently, non-Black engineering faculty and staff members

should not assume that Black students have access to Black faculty mentors in engineering. They often do not. Given that mentorship in the success of undergraduate students of color is vital to their persistence (Brown II, Davis, & McClendon, 1999; Padilla, 1994; Palmer & Gasman, 2008; Palmer & Young, 2009), there needs to be a collective effort from faculty and staff to mentor Black men in engineering graduate programs.

Finally, although our study centered on the experiences of Black men in engineering graduate programs, it is clear that students' villages of support are comprised of those outside of the graduate institution. Further, our data indicate that students' sources of support may be formed prior to graduate school. These findings offer practical and scholarly implications beyond graduate school. It is possible that Black men at other educational levels (e.g., elementary, middle and high school, community college) draw on pre-existing support to survive and thrive academically. Thus, applying the findings from this study to a wider audience, by encouraging students – across educational levels – to draw on their villages of support, may be useful in strengthening educational pathways. Simultaneously, those within students' villages will need to play a more active and sustained role for students, especially during their progression through the educational pathways. From a scholarly perspective, more research is needed to understand how students' villages of support – across educational levels – aid students throughout critical educational transitions and influence persistence.

Conclusion

The Black men in this study have faced many hardships in their efforts to remain in engineering (Burt et al., in press; Burt, Williams, & Smith, 2018). The cumulative effects of a rocky advising relationship, troubles with research, and an isolating campus climate have prompted them to consider dropping out at several points throughout their doctoral programs. If

they do not feel like they belong to the field as graduate students, what motivations will they have to stay in the engineering workforce thereafter? As suggested by participants in this study, if it were not for their village of support, dropping out may have been their reality.

The traditional African proverb “it takes a village to raise a child” refers to the necessity of an entire community to help a child succeed. The proverb appears to be equally true with regard to the retention and persistence of Black men students striving to earn graduate degrees in engineering. With this proverb in mind, the findings from this study illustrate how retention at the graduate level should not be relegated solely as a function of the college or university, but rather, Black students often need their more expansive village of support to help survive the often-tumultuous experiences of graduate school. In fact, their lived experiences show how important sources of support are to their success. Their sources of support, however, may extend beyond the usual candidates. Instead, the stories of the participants in this study show that their persistence in graduate school is often linked to those who helped them to get to graduate school in the first place. Thus, faculty, staff, and administrators should cease practices that promote students’ disconnection from their families, spiritual and faith-based communities, and undergraduate mentors. Encouraging students to add distance from their sources of support and instead focus solely on their academic pursuits may promote additional barriers to transition and resistance to staying in STEM, and threaten student persistence. Rather, practitioners should consider students’ support systems as adaptive strengths and develop opportunities to build on these strengths. Encouraging students to have support both on campus (e.g., advisors, peers) and off campus (e.g., family, spiritual/church/religion, undergraduate mentors) expands students’ quantity of care. Having an expansive support system (i.e., village) may be an unexplored key to the retention and persistence puzzle in graduate school.

REFERENCES

- Adelman, C. (1999). *Answers in the Tool Box. Academic intensity, attendance patterns, and bachelor's degree attainment*. Washington, DC: U.S. Department of Education.
- Baker, V. L., & Pifer, M. J. (2011). The role of relationships in the transition from doctoral student to independent scholar. *Studies in Continuing Education, 33*(1), 5-17.
- Barker, M. J. (2011). Racial context, currency and connections: Black doctoral student and white advisor perspectives on cross-race advising. *Innovations in Education and Teaching International, 48*(4), 387-400.
- Barnes, B. J., & Austin, A. E. (2009). The role of doctoral advisors: A look at advising from the advisor's perspective. *Innovative Higher Education, 33*(5), 297-315.
- Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of educational Research, 55*(4), 485-540.
- Bernal, D. D. (1998). Using a Chicana feminist epistemology in educational research. *Harvard Educational Review, 68*(4), 555-583.
- Blake-Beard, S., Bayne, M. L., Crosby, F. J., & Muller, C. B. (2011). Matching by race and gender in mentoring relationships: Keeping our eyes on the prize. *Journal of Social issues, 67*(3), 622-643.
- Bonilla-Silva, E. (1997). Rethinking racism: Toward a structural interpretation. *American Sociological Review, 62*(3), 465-480.
- Bowman, P. J. (2006). Role Strain and adaptation issues in the strength-based model: Diversity, multilevel, and life span considerations. *The Counseling Psychologist, 34*(1), 118-133.
- Bowman, P. J. (2013). A strengths-based social psychological approach to resiliency: Cultural diversity, ecological, and life span issues. In S. Prince-Embury & D. H. Saklofske (Eds.), *Resilience in children, adolescents, and adults: Translating research into practice* (pp. 299-324). New York: Springer.
- Brazziel, M.E. & Brazziel, W.F. (2001). Factors in decisions of underrepresented minorities to forego science and engineering doctoral study: A pilot study. *Journal of Science Education and Technology, 10*(3), 272-281.
- Brown II, M. C., Davis, G. L., & McClendon, S. A. (1999). Mentoring graduate students of color: Myths, models, and modes. *Peabody Journal of Education, 74*(2), 105-118.
- Burt, B. A. (under review). Demystifying the monolithic Black male mystique: Advancing a research agenda on Black men in engineering graduate programs. In P. Felder, M. Barker, & M. Gasman (Eds.) *SANKOFA: Exploring the Racial and Cultural Implications for Doctoral Education from the African American Perspective*.
- Burt, B. A., Knight, A., & Roberson, J. (2017). Racializing experiences of foreign-born and ethnically diverse Black male engineering graduate students: Implications for student affairs practice, policy, and research. *Journal of International Students, 7*(4), 925-943.
- Burt, B. A., McKen, A., Burkhart, J., Hormell, J., & Knight, A. (in press). Black men in engineering graduate education: Experiencing and coping with racial microaggressions within the advisor-advisee relationship. *Journal of Negro Education*.

- Burt, B. A., Williams, K. L., & Smith, W. A. (2018). Into the Storm: Ecological and Sociological Impediments to Black Males' Persistence in Engineering Graduate Programs. *American Educational Research Journal*, DOI 0002831218763587.
- Charleston, L. J., Adserias, R. P., Lang, N. M., & Jackson, J. F. L. (2014). Intersectionality and STEM: The role of race and gender in the academic pursuits of African American women in STEM. *Journal of Progressive Policy & Practice*, 2(3), 273-293.
- Charleston, L. J., Gilbert, J. E., Esobar, B., & Jackson, J. F. L. (2014). Creating a pipeline for African American computing science faculty: An innovative faculty/research mentoring program model. *Journal of Faculty Development*, 28(1), 85-92.
- Chemers, M. M., Hu, L. T., & Garcia, B. F. (2001). Academic self-efficacy and first year college student performance and adjustment. *Journal of Educational Psychology*, 93(1), 55-64.
- Chubin, D.E., May, G.S., & Babco, E.L. (2005). Diversifying the engineering workforce. *Journal of Engineering Education*, 94(1), 73-86.
- Cole, D., & Griffin, K. A. (2013). Advancing the study of student-faculty interaction: A focus on diverse students and faculty. In M.B. Paulsen (Ed.), *Higher education: Handbook of theory and research* (Vol. 28)(pp. 561 – 611). Netherlands: Springer.
- Cooper, C. R., Jackson, J. F., Azmita, M., and Lopez, E. (1998). Multiple selves, multiple worlds: Three useful strategies for research with ethnic minority youth on identity, relationships, and opportunity structures. In V.C. McLoyd & L. Steinberg (Eds.), *Studying minority adolescents: Conceptual, methodological, and theoretical issues* (pp. 111-125). Mahwah, NJ: Lawrence Erlbaum Associates.
- Corbin, J. & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (4th ed.). Thousand Oaks, CA: Sage Publications.
- Creswell, J.W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.
- Dancy, T. E. (2010). Faith in the unseen: The intersection (s) of spirituality and identity among African American males in college. *The Journal of Negro Education*, 79(3), 416-432.
- Dortch, D. (2016). The strength from within: A phenomenological study examining the academic self-efficacy of African American women in doctoral studies. *Journal of Negro Education*, 85(3), 350-364.
- Felder, P. P., Stevenson, H. C., & Gasman, M. (2014). Understanding race in doctoral student socialization. *International Journal of Doctoral Studies*, 9, 21-42.
- Fries-Britt, S. L. (1998). Moving beyond Black achiever isolation: Experiences of gifted Black collegians. *Journal of Higher Education*, 69(5), 556-576.
- Fries-Britt, S. L. & Griffin, K. (2007). The black box: How high achieving Blacks resist stereotypes about Black Americans. *Journal of College Student Development*, 48(5) 509-524.
- Fries-Britt, S. R., Burt, B. A. & Franklin, K. (2012). Establishing critical relationships: How Black males persist in physics at HBCUs. In Palmer, R. T. and Wood, J. L. (Eds.), *Black Men in Black Colleges: Implications for Diversity, Recruitment, Support, and Retention* (pp. 71-88). Routledge, New York, NY.
- Gardner, S. K. (2007). "I heard it through the grapevine": Doctoral student socialization in chemistry and history. *Higher Education*, 54(5), 723-740.

- Gardner, S. K. (2008). Fitting the mold of graduate school: A qualitative study of socialization in doctoral education. *Innovative Higher Education*, 33(2), 125-138.
- Graham, E. (2013). The experiences of minority doctoral students at elite research institutions. *New Directions for Higher Education*, 163, 77-87.
- Green, D. O., Creswell, J. W., Shope, R. J., & Clark, V. L. P. (2007). Grounded theory and racial/ethnic diversity. In A. Bryant & K. Charmaz, (Eds.), *The SAGE Handbook of Grounded Theory* (pp. 472-492). Thousand Oaks, CA: SAGE Publications.
- Griffith, D. M., Gunter, K., & Allen, J. O. (2011). Male gender role strain as a barrier to African American men's physical activity. *Health Education & Behavior*, 38(5), 482-491.
- Guiffrida, D. (2005). To break away or strengthen ties to home: A complex issue for African American college students attending a predominantly White institution. *Equity & Excellence in Education*, 38(1), 49-60.
- Harper, S. R. (2005). Leading the way: Inside the experiences of high-achieving African American male students. *About Campus*, 10(1), 8-15.
- Harper, S. R. (2010). An anti-deficit achievement framework for research on students of color in STEM. In S. R. Harper & C.B. Newman (Eds.), *Students of color in STEM* (pp. 63-74). San Francisco, CA: Jossey-Bass.
- Harper, S. R. (2015). Black male college achievers and resistant responses to racist stereotypes at predominantly White colleges and universities. *Harvard Educational Review*, 85(4), 646-674.
- Herndon, M. K. (2003). Expressions of spirituality among African-American college males. *Journal of Men's Studies*, 12(1), 75-84
- Herzig, A. H. (2004). Becoming mathematicians: Women and students of color choosing and Leaving doctoral mathematics. *Review of Educational Research*, 74(2), 171-214.
- Howard-Hamilton, M. F., Morelon-Quainoo, C. L., Johnson, S. D., Winkle-Wagner, R., & Santiago, L. (2009). *Standing on the outside looking in: Underrepresented students' experiences in advanced degree programs*. Sterling, VA: Stylus Publishing.
- Hoyte, R. M., & Collett, J. (1993). "I can do it": Minority undergraduate science experiences and the professional career choice. *New Directions for Teaching and Learning*, 1993(53), 81-90.
- Ingram, T. N. (2007). From challenged to triumphant: Factors contributing to African American male doctoral students' persistence at predominantly White institutions. Dissertation. Indiana University.
- LaVant, B. D., Anderson, J. L., & Tiggs, J. W. (1997). Retaining African American men through mentoring initiatives. *New Directions for Student Services*, 1997(80), 43-53.
- Love, K. M. (2008). Parental attachments and psychological distress among African American college students. *Journal of College Student Development*, 49(1), 31-40.
- Love, K., Tyler, K., Thomas, D., Garriott, P., Brown, C., & Roan-Belle, C. (2009). Influence of multiple attachments on well-being: A model for African Americans attending historically black colleges and universities. *Journal of Diversity in Higher Education*, 2(1), 35.
- Lovitts, B. E. (2008). The transition to independent research: Who makes it, who doesn't, and why. *The Journal of Higher Education*, 79(3), 296-325.

- Mandara, J. (2006). The impact of family functioning on African American males' academic achievement: A review and clarification of the empirical literature. *Teachers College Record*, 108(2), 206–233.
- Maton, K. I., & Hrabowski, F. A., III. (2004). Increasing the number of African American PhDs in the sciences and engineering: A strengths-based approach. *American Psychologist*, 59, 547–556.
- Mattis, J. S. (2000). African American women's definitions of spirituality and religiosity. *Journal of Black Psychology*, 26(1), 101-122.
- Mattis, J. S. (2002). Religion and spirituality in the meaning-making and coping experiences of African American women: A qualitative analysis. *Psychology of Women Quarterly*, 26(4), 309-321.
- McCallum, C. M. (2016). “Mom made me do it”: The role of family in African Americans' decisions to enroll in doctoral education. *Journal of Diversity in Higher Education*, 9(1), 50-63.
- McGuire, K. M. (2017). Religion's afterlife: The non-institutional residuals of religion in Black college students' lived experiences. *Journal of Diversity in Higher Education*. <http://dx.doi.org/10.1037/dhe0000058>
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative Research: A guide to design and implementation (4th edition)*. San Francisco: Jossey-Bass.
- Milner, H. R. (2007). Race, culture, and researcher positionality: Working through dangers seen, unseen, and unforeseen. *Educational Researcher*, 36(7), 388–400.
- Moore, J. L. (2006). A qualitative investigation of African American males' career trajectory in engineering: Implications for teachers, school counselors, and parents. *Teachers College Record*, 108(2), 246-266.
- Muñoz, S. M., & Maldonado, M. M. (2011). Counterstories of college persistence by undocumented Mexican student: Navigating race, class, gender, and legal status. *International Journal of Qualitative Studies in Education*, 25(3), 293-315.
- National Academy of Sciences, National Academy of Engineering, Institute of Medicine. (1995). *Reshaping the graduate education of scientists and engineers*. Washington, DC.: National Academy of Science.
- National Action Council for Minorities in Engineering. (2008). *Confronting the “new” American dilemma: Underrepresented minorities in engineering – A data based look at diversity*. White Plains, NY.
- Nettles, M. T., & Millett, C. M. (2006). *Three magic letters: Getting to Ph.D.* Baltimore, MD: The Johns Hopkins University Press.
- Nichols, T. M., Kotchick, B. A., McNamara Barry, C., & Haskins, D. G. (2010). Understanding the educational aspirations of African American adolescents: Child, family, and community factors. *Journal of Black Psychology*, 36(1), 25-48.
- Nora, A., & Cabrera, A. (1996). The Role of Perceptions of Prejudice and Discrimination on the Adjustment of Minority Students to College. *Journal of Higher Education* 67(2), 119-48.
- Padilla, A. M. (1994). Research news and Comment: Ethnic Minority Scholars; Research, and Mentoring: Current and Future Issues. *Educational Researcher*, 23(4), 24-27.

- Palmer, R., & Gasman, M. (2008). "It takes a village to raise a child": The role of social capital in promoting academic success for African American men at a Black college. *Journal of College Student Development*, 49(1), 52-70.
- Palmer, R. T., & Young, E. M. (2009). Determined to succeed: Salient factors that foster academic success for academically unprepared Black males at a Black college. *Journal of College Student Retention: Research, Theory & Practice*, 10(4), 465-482.
- Patton, L. D., & McClure, M. L. (2009). Strength in the spirit: A qualitative examination of African American college women and the role of spirituality during college. *The Journal of Negro Education*, 78(1), 42-54.
- Permzadian, V., & Credé, M. (2016). Do first-year seminars improve college grades and retention? A quantitative review of their overall effectiveness and an examination of moderators of effectiveness. *Review of Educational Research*, 86(1), 277-316.
- Peshkin, A. (1988). In search of subjectivity. One's own. *Educational Researcher*, 17(7), 17-21.
- Rowley, L. L., & Bowman, P. J. (2009). Risk, protection, and achievement disparities among African American males: Cross-generation theory, research, and comprehensive intervention. *The Journal of Negro Education*, 78(3), 305-320.
- Stewart, D. L. (2002). The role of faith in the development of an integrated identity: A qualitative study of Black students at a White college." *Journal of College Student Development*, 43(4), 579-596.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage Publications.
- Strayhorn, T. L. (2011). Singing in a foreign land: An exploratory study of gospel choir participation among African American undergraduates at a predominantly White institution. *Journal of College Student Development*, 52(2), 137-153.
- St. John, E. P., Cabrera, A. F., Nora, A., & Asker, E. H. (2000). Economic influences on persistence reconsidered. In J. M. Braxton (Ed.) *Reworking the Student Departure Puzzle* (pp. 29-47). Nashville, TN: Vanderbilt University Press.
- Tierney, W. (2000). Power, identity, and the dilemma of college student departure. In J. Braxton (Ed.), *Reworking the student departure puzzle* (pp. 213-234). Nashville: Vanderbilt University Press.
- Tinto, V. (1993) *Leaving college: Rethinking the causes and cures of student attrition*. (2nd ed.). Chicago: University of Chicago Press.
- Truong, K. A., & Museus, S. D. (2012). Responding to racism and racial trauma in doctoral study: An inventory for coping and mediating relationships. *Harvard Educational Review*, 82(2), 226-254.
- U.S. News and World Report. (2012). Best engineering graduate schools. Retrieved September 5, 2012 from <http://grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/top-engineering-schools/eng-rankings>
- Warren, S., & Vincent, C. (2001). "This won't take long...": Interviewing, ethics and diversity. *International Journal of Qualitative Studies in Education*, 14(1), 39-53.

- Watson, L. W. (2006). The role of spirituality and religion in the experiences of African American male college students. In M. Cuyjet (Ed.), *African American men in college* (pp. 112-127). San Francisco: Jossey-Bass.
- Watt, S. K. (2003). Come to the river: Using spirituality to cope, resist, and develop identity. *New directions for student services*, 2003(104), 29-40.
- Williams, K. L., (2014a) Financial impediments, academic challenges and pipeline intervention efficacy: A role strain and adaptation approach to successful STEM outcomes for underrepresented students. Dissertation, University of Michigan.
- Williams, K. L. (2014b). Strains, strengths, and intervention outcomes: A critical examination of intervention efficacy for underrepresented groups. *New Directions for Institutional Research*, 2013(158), 9-22.
- Williams, K., Burt, B. A., Hilton, A. (2016). Math achievement: A strain and adaptive strengths approach. *Journal for Multicultural Education*, 10(3), 368-383.
- Williams, S. W., Burnett, T. J. B., Carroll, T. K., & Harris, C. J. (2016). Mentoring, managing, and helping: A critical race analysis of socialization in doctoral education. *Journal of College Student Retention*. DOI: 10.1177/1521025116657834,
- Wolf-Wendel, L., Ward, K., & Kinzie, J. (2009). A tangled web of terms: The overlap and unique contribution of involvement, engagement, and integration to understanding college student success. *Journal of College Student Development*, 50(4), 407-428.
- Yao, C. W. (2015). Sense of belonging in international students: Making the case against integration to US institutions of higher education. *Comparative & International Higher Education*, 7, 6-10.
- Yoder, B. L. (2015). "Engineering by the numbers". Washington: American Society for Engineering Education. Retrieved from: <https://www.asee.org/papers-and-publications/publications/college-profiles>
- Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education*, 8(1), 69-91.