Engaging Black Families to Enhance Recruitment and Retention Efforts for Engineering Undergraduates: Insights from a Counternarrative Study

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Abstract

There is a lack of research investigating Black male academic achievement, Black male educational experiences in STEM, and Black male intersectionality. As an effort to fill these gaps, this study employed a qualitative, counternarrative approach to understand the experiences of eight high-achieving Black male undergraduates in engineering majors at a southeastern predominately white institution. Using Critical Race Theory and the Anti-Deficit Achievement Framework as theoretical lenses, data were collected from four sources: an online demographic survey, an online narrative exercise, individual semi-structured interviews, and a semi-structured focus group. This paper discusses one of the overall study's findings, namely, the Black family as a protective factor that enabled academic success in racist environments. In addition to sharing insights from study participants, this manuscript offers recommendations for parents, higher education professionals, and policymakers.

Keywords

Black, Family, Intersectionality, Counternarrative

Introduction

Research affirms that the United States of America (U.S.) must augment its production of science, technology, engineering, and mathematics (STEM) degree earners in order to remain globally competitive [1,2]. Educational researchers have coined the metaphor "the STEM pipeline" to illustrate a linear pathway of individuals establishing a career in STEM beginning as early as middle school, and persisting through a career in industry or academia [3]. A major problem with the STEM pipeline is that leaks occur along the trajectory marked by students losing interest in math and science, dropping out of STEM majors, and not selecting STEM careers post baccalaureate. Further, the problem is persistent, in that leaks have occurred over many decades, and progressive, indicated by more and more students deciding to leave STEM fields at later junctures along the pipeline[1,2, 4]. Moreover, the leaky pipeline problem in STEM is most pervasive for women and underrepresented people of color.

In the U.S., STEM fields remain largely dominated by non-Hispanic White males as they have for nearly thirty years[5]. Concurrently, the literature documents how historically underrepresented groups, such as women and people of color, tend to exit STEM fields at higher

rates than their majority peers[5]. For example, Black first-year undergraduates – while equally as interested in STEM majors as their White counterparts – are less likely to earn a STEM bachelor's degree[6]. Diversifying America's STEM talent pool will not only bolster equitable representation of all groups, but also provide one avenue for enlarging the cadre of U.S. STEM professionals, thus augmenting the country's international competitiveness. As such, educational researchers have a vested interest in understanding how minoritized populations navigate STEM climates, and the factors necessary for these groups to obtain success.

The myriad of different cultures and experiences within aggregate groups are lost when umbrella terms such as "historically underrepresented populations" and "STEM" are used. It is important to disaggregate populations that are often lumped together to better understand the specific and nuanced particularities within racial, gender, and field groups. For example, in 2017, Black undergraduates earned approximately four percent of all engineering Bachelor's degrees, which was one percent less than they earned twenty years earlier in 1997[7]. Additionally, the percentage of Bachelor's degrees earned by domestic (i.e., U.S. born) Black undergraduates remains the lowest percentage of engineering Bachelor's degrees awarded to a racial group[8]. Moreover, Black male undergraduates continue to earn a lower percentage of STEM bachelor's degrees than their Black female peers[9]. When studying groups in the aggregate, these trends and this level of nuanced information is often lost in analyses and illustrates why it is imperative that researchers explore within-group differences in STEM at large. Doing so provides a level of knowledge and understanding that can help shape policies and practices that can create conditions necessary for marginalized groups, such as Black males, to obtain success in science and engineering.

Theoretical Perspectives

Critical Race Theory (CRT) and the Anti-Deficit Achievement Framework (ADAF) were used to ground our study of Black males in STEM. CRT is an interdisciplinary perspective that underscores the permanence of racism in American society and centers the experiences of people of color[10]. By promoting the voices of marginalized people, CRT seeks to establish social justice. One central tenet of CRT was especially important in the development of this study: intersectionality. The construct of intersectionality, first coined by Kimberlé Crenshaw, expresses how social identities and societal structures of inequality converge and create discrimination and systematic oppression for individuals who hold marginalized identities[11]. Historically, intersectionality has been used as a lens to frame the lived experiences of those with two or more subordinate identities within the context of systems of oppression that operate within society. For instance, Black women experience systematic oppression that stems from racism because of their subordinate racial identity (i.e., Black) and sexism because of their subordinate gender identity (i.e., female). However, intersectionality contends that the unique experience of being both Black and female is not the additive effect of racism added to sexism, but rather, the multiplicative effect of racism compounded by sexism, and vice versa. This study extended the application of intersectionality to understand the experiences of a population with both dominant and subordinate identities, namely Black males. The second theoretical perspective that informed this work was the ADAF, which encourages researchers to examine the factors and conditions that promote success for students of color in STEM as opposed to focusing their academic failures[12]. This study intentionally focused on high-achieving Black males to understand what led to their success. High-achieving Black males are seldom studied in

educational literature. As such, this study utilized a counternarrative approach, in which it sought to collect the stories of how this population has achieved academic success in spite of the structural forms of oppression they face. Counternarratives are reports that tell the stories of people whose experiences are habitually excluded[13].

Study Purpose

Guided by CRT and the ADAF, the goal of this study was to understand how having a subordinate racial identity (i.e., being Black) and a dominant gender identity (i.e., being male) impacted high-achieving Black male undergraduates as they successfully navigated engineering majors. One central research question undergirded data collection and analysis: How does Black male intersectionality (i.e., being both Black and male) shape the lived experiences and academic success of high-achieving Black male undergraduates in engineering majors at a predominantly white institution (PWI)? Scholars have argued that "[Black male] intersectionality is rarely examined, and as a result, opportunities to authentically capture the breadth and depth of Black males are missed, and efforts to capture their stories and reform schools are misinformed and misguided" [14]. Additionally, aligned with existing research, high-achieving was defined as having earned a cumulative grade point average (GPA) at or above 3.0[15].

Participants

The study took place at Southeastern University (SU, pseudonym), a large, public PWI located in an urban city within the Southeastern region of the U.S., known for its competitive undergraduate engineering programs. SU was the ideal site for the study because of its consistent national ranking as a top producer of engineering bachelor's degrees awarded to underrepresented racial and ethnic minority students, particularly Black students.

To select participants, two types of purposeful sampling techniques were employed: criterion and snowball sampling. Criterion sampling required that participants (1) identify as a Black male, (2) have a 3.0 cumulative GPA or higher, and (3) have a junior or senior engineering undergraduate standing at SU. Current participants and academic and student affairs administrators at SU were also asked to "snowball" or refer potential participants. The sampling procedures yielded eight participants.

All participants were between the ages of 20 – 22 and were full time undergraduate students at their university. There was a good diversity of engineering majors represented, which is demonstrated in table 1 (see appendix). Inclusion criteria required that participants earn a 3.0 cumulative GPA, and participants' cumulative GPAs ranged from 3.2 to 4.0. Five participants were affiliated with scholar programs, such as honor societies and scholarships. Not only did participants excel in the classroom, but they were also highly involved in student life, creating and leading student organizations. Half (n=4) of the participants were employed between 8-20 hours a week, and one participant was also a football player at SU. It is important to note that no participant was a first generation college student; instead, for all participants, both their mother and their father earned at least a Bachelor's degree at minimum. For many participants, both their mother and their father earned advanced degrees. While not a criteria in the study, this idea of having college educated parents maps on well to the study's findings. Please refer to the appendix for a concise overview of the participants.

Methodology

Qualitative methods were appropriate to answer the research question because they understand reality as a social construction, and acknowledge that multiple realities exist[16]. Narrative inquiry was selected as the approach to data collection because it allowed for a deep dive into the participants' backgrounds and perceptions. Narrative inquiry implores participants to share stories from their lives[17]. Data were collected through four sources. First, participants completed an online demographic survey that asked them questions about their background. Next, participants completed an online narrative exercise adapted from Dr. Beverly Tatum's "Who Am I" Poem, which asked them to respond to seven prompts about their self-perception, upbringing, and family. Both the demographic survey and the narrative exercise were administered via Qualtrics. After participants completed the survey and exercise, they engaged in a 60-minute semi-structured individual interview. Following the completion of all the interviews, all participants also engaged in one 60-minute semi-structured focus group. The theoretical frameworks informed the interview and focus group questions. Sample questions are provided in the appendix. The interviews and focus groups were also voice recorded and transcribed by a third party.

Data Analysis

This study used analysis of narratives to construct the primary data into themes[18]. Three themes and six subthemes emerged using a priori coding, informed by CRT and the ADAF constructs, and open coding. This study also used narrative analysis to organize these themes into a sequential order[18]. For the purposes of this manuscript, one major finding and its implications will be discussed.

Findings

One major finding that emerged from this study was that the Black family served as a protective factor that enabled participants to achieve academic success in racist educational environments. The literature characterizes PWIs as spaces that are racially offensive, hostile, and even outright racist to Black students overall, and particularly in STEM[19]. Moreover, notions of the "chilly climate" hypothesis, the idea that STEM fields are uninviting, cold, and intimidating, permeate STEM cultures and often lead to Black student attrition[20]. Participants' stories echoed these sentiments describing at length their experiences with covert and overt racism at the hands of their fellow peers, faculty, and academic advisors at their university. Participants described the various micro and macro assaults they faced maneuvering their PWI from being routinely mislabeled as student athletes to being consistently perceived as academically inferior in comparison with their White peers. In short, participant stories of enduring bias and angst resonated heavily with what is prevalent in the literature.

Although they dealt with analogous challenges to other Black students in STEM, what was unique about the participants was how their families prepared and shielded them from adverse outcomes. In other words, the Black family was an asset that enhanced Black engineering undergraduate persistence. Because participants originated from families that were rich in knowledge, affirmation, and resources, they had built-in support networks and arrived at college with experiences that offered them access to three primary privileges not afforded to their

first generation peers: (1) academic achiever identity, (2) engineering interest and self-efficacy, and (3) racial insight. These privileges mitigated the impact of the risk factors they encountered in higher education and the workplace.

Academic Achiever Identity: The first privilege that participants gained from their families was their academic achiever identity. From an early age, participants' families reiterated to them that they were high academic achievers. As a result, participants adopted a high academic achiever self-identity. Thus, when participants encountered negative stereotypes that Whites held against them, such as being criminals or academic deficit, they were frustrated, but their frustration did not cause them to doubt their identity or abilities. Participants were confident in their identity as an academic achiever, so they did not internalize negative stereotypes, or leave their engineering major as other less privileged peers might have.

Engineering Interest and Self-Efficacy: The second privilege that participants gained from their families was their engineering interest and self-efficacy. Participants were required to enroll in what the literature coins as "weed out classes", or rigorous introductory STEM classes that are known for prompting STEM-aspirant underclassman to change their majors[21]. However, even after enduring "weed out classes", participants still choose to stay in their engineering major because of their family-inspired engineering interest and self-efficacy. In their youth, participants' families helped them visualize their future as an engineer. Family members encouraged participants to engage in STEM enrichment programs and reminded them of their STEM skills and expertise often. In doing so, families nurtured participants' confidence in themselves and their STEM abilities, which was able to withstand challenging coursework. It was also interesting that throughout the data collection process, participants did not refer to themselves as engineering students, but rather engineers. By adopting that professional label as a part of their self-concept, participants demonstrated their self-assurance and commitment in their field, further elucidating how participants' families helped them believe they could become engineers.

Racial Insight: The third privilege that participants gained from their families was their racial insight. Like nearly all Black undergraduates on PWIs, and especially in STEM majors, participants experienced some degree of race-related challenges such as underrepresentation, discrimination, and racism[22]. In spite of these trials, participants chose to persist in their major because they had an advanced sociopolitical cognizance that was established by their families. In their earlier lives, participants' families communicated candidly with them about issues of race and racism. As such, participants developed a mature understanding of what it meant to be Black in American society. When participants arrived on their college campuses, they anticipated the race-related challenges they would face. They expected being one of the only Black students in their STEM classes and being negatively stereotyped. Thus, while they were frustrated when challenges occurred, they were also prepared and able to react in strategic ways. For example, participants did not internalize their frustrations but rather sought refuge in culturally affirming groups such as minority student services offices or minority student organizations. Developing community in those safe spaces fostered a sense of belonging that alleviated the urge to leave the major.

Conclusions and Future Work

This manuscript presents the Black family as a protective factor that enabled high-achieving Black males to achieve academic success in racist educational environments. For the eight participants selected for this narrative study, their families granted them access to three distinct yet interrelated privileges, (1) academic achiever identity, (2) engineering interest and self-efficacy, and (3) racial insight, of which lessened the impact of the risk factors documented in STEM education literature. The paper will conclude with recommendations for three main stakeholder groups can benefit from the study findings: parents, higher education professionals, and policymakers.

Parents: The first and most evident stakeholder group that can learn from this study is parents. This study points to countless ways in which parents can have a direct impact on the possibilities for their children. Parents can take the examples shared by study participants to imagine ways to create similar conditions in their own child's life. For example, parents can ask themselves: What am I doing to strengthen my child's academic achiever identity? How am I encouraging my child's interest in engineering? How often am I affirming to my child that they can become an engineer? What racial realities am I sharing with my child to prepare them for life as a Black American? Such questions can help parents identify and operationalize tangible ways they can increase protective factors in their child's life.

Higher Education Professionals: The second stakeholder group that may change their practice as a result of this study is higher education professionals. Acknowledging the pertinence of the Black family, administrators may consider partnering with families more to recruit and retain Black students. For example, institutions may augment their family outreach services to provide more opportunities for pre-college students and their families to visit their colleges, particularly their engineering programs. Also, while the Black family emerged as a protective factor, it is also vital to dismantle and reassemble the higher education institutions that initiated participants need for safeguarding. The PWI that participants attended incubated a lack of sense of belonging. Administrators who desire to reorient their institutions may consider developing anti-racist trainings, counterpaces, and other specialized services to promote belonging among their Black students. Faculty can be an important partner in this work as they can research the perceptions of Black students on campus and the effectiveness of potential initiatives.

Policymakers: The third and arguably least obvious stakeholder group that should consider the study findings is policymakers. It is important to note that the privileges experienced by the participants were a direct result of their highly resourced families. However, all students do not have access to such communities. In particular, low-income and first generation students are at a considerable disadvantage. To provide equitable opportunities for educational success, policymakers should institutionalize K-12 programming that helps students of all socioeconomic backgrounds develop their academic achiever identities and engineering interest and self-efficacy, as well as communicate racial realities with them. Examples of potential programs might be workshops, camps, and mentorship programs that are economically accessible.

Appendix
Table 1: Overview of Participants

Participant Pseudonym	Major	Minor	Undergraduate Classification	Cumulative GPA	Socioeconomic Status***
Marcos*	Chemical Engineering	Spanish	Senior	4.0	Middle Class
Isaiah*	Biomedical Engineering	No minor	Senior	3.6	Working Class
Lamar*	Electrical Engineering	Music Performance	Senior	3.2	Middle Class
James*	Chemical Engineering	Environmental Science	Senior	3.3	Middle Class
Saadiq*	Textile Engineering and International Studies (double major)	No minor	Junior	3.8	Working Class
Jermaine*	Industrial & Systems Engineering	No minor	Senior	3.6	Wealthy/ Affluent
Anthony**	Material Science and Engineering	No minor	Junior	3.9	Middle Class
Carter**	Civil Engineering	No minor	Senior	3.4	Middle Class

Key
*Participant-selected pseudonym
**Participant did not indicate a pseudonym preference, so pseudonym was selected for participant.
***Participant-selected socioeconomic status

Appendix
Table 2: Sample Interview and Focus Group Questions

Data Source	Question	Theory and Construct
Interview	When did you know you were academically successful or a high-achieving student?	ADAF – Pre-college socialization and readiness
Focus Group	Can anyone recall a specific instance in which both your race and gender influenced your academic success? Tell us about that experience.	CRT – Intersectionality

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