

## **”Studies in the Strategies of Overcomers”: Literature Review of the Experiences of High-achieving Black Male Undergraduate Engineering Students**

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## **Abstract**

Many investigators have focused on the experiences of Black and African-American students, but these explorations often do not focus on either Black or African-American men or the experiences of high-achieving Black or African-American male students. The objective of this literature review is to explore the ways the experiences of high-achieving Black and African-American male students have been constructed in the literature. The purpose for this exploration is to identify the strategies these students use to successfully create positive professional identities and construct a trajectory towards the mainstream of their chosen professional communities. Several inter-related lines of inquiry are explored. Some example questions guiding our reading of the literature include: How do black men perceive or experience academic socialization? What funds of knowledge, community assets, or counter-perspectives do they create? What obstacles must they overcome? How have they created communities of belonging that exist within and transcend their institutional contexts? How can we best serve these students as engineering educators? This paper presents a selective literature review guided by these questions, and concludes with a brief discussion of potential implications for engineering educators.

## **Introduction**

The objective of this paper is to explore the ways literature describes the strategies high-achieving black men in engineering use to navigate the social, institutional, and cultural context of their undergraduate engineering programs. We take a particular interest in the experiences of these men on undergraduate engineering project teams. Not only is successful performance on student teams indispensable to the undergraduate experience, but demonstration of the ability to work effectively in teams is essential to entering the engineering profession.

Unfortunately, researchers in this space acknowledge that the exploration of the black male experience in undergraduate engineering contexts is still rare (Henderson et al., 2022c). So much has been written and/or said about the negative plight of black men that makes our understanding of their journeys urgent and critical. However, the vast majority of these rationales take a deficit perspective of the issue. This piece takes a different approach to the question, in the words of Milner IV et al. (2007), disrupting what is considered normal in order to more concretely understand both the uniqueness of the black male experience and also the conceptual or practical lessons we can draw from the experiences of high achieving black men in STEM.

Our paper proceeds as follows. First, we present our research questions. Next, we present three key themes emerging from our review of the literature related to black men in undergraduate engineering programs. While we are focused on undergraduates, we review elements of the broader literature including important relevant themes into which the black male undergraduate experience can be situated and more richly understood. For example, several studies of black male engineering faculty describe the criticality of bi-directional mentorship and relational resources that empower black male faculty to persist (e.g., Burt (2020) and McGee (2015; 2022)). We note that while we primarily review the engineering education literature, some

selected references from STEM education more broadly are included to contextualize our understanding of the ways other researchers have constructed the black male experience. We conclude this review with a brief discussion of research needs and potential implications for undergraduate engineering education practice.

### **Guiding Questions**

Our review of the literature is guided by the following related questions:

- 1) How do black men perceive or experience academic socialization?
- 2) What funds of knowledge, community assets, or counter-perspectives do they create?
- 3) What strategies do high-achieving black men use to overcome perceived barriers or obstacles to their academic socialization? What obstacles must they overcome?
- 4) How have they created communities of belonging that exist within and transcend their institutional contexts?

Our review of the literature is selective, not systematic, and is guided by an asset-based perspective. Our efforts focus attention on the experiences of high-achieving black men in the literature. We believe this approach honors the efforts of the many researchers who have focused on countering the deficit narrative (Tolbert Smith, 2022) associated with black men over the last 15 years of work and we rely on this research extensively in the present review. However, we will demonstrate that more research is needed to better understand the range of experiences of black men in general, and high-achieving black men in particular, in undergraduate engineering programs.

### **Positionality**

We are both professors at the same institution, although in two different departments: Engineering Management and Systems Engineering and Chemistry. The lead author is an African-American male, tenured associate professor in the Department of Engineering Management and Systems Engineering, while the co-author is an African-American female, assistant professor in the Department of Chemistry. Both co-authors are interested in learning from the experiences of successful African-American males. The goal is to better support members of their own communities utilizing strategies and lessons learned from the experiences of successful students who have overcome common obstacles faced by Black and African-American scholars. Furthermore, our goal is to contribute to the growing base of scholarship that counters the deficit narrative dominating the descriptions of the experiences of African-American males in academic work and elsewhere. Several exemplar studies in this regard have been referenced above in the introduction section. We both have gained awareness for the need of this type of scholarship from our experiences as faculty mentors for merit-based scholarship programs at our home institution, and direct observation of, and conversations with, Black and African-American students enrolled in our courses.

## Key Themes

Our review of the literature uncovers three primary themes related to the ways high-achieving black men in engineering navigate the social, institutional, and cultural context of their undergraduate engineering programs: leveraging community cultural wealth, development of robust or fragile identities, and constructing their roles as student leaders or members of student teams.

### *Community Cultural Wealth.*

The predominant theoretical perspective used to explore the experiences of African American men has been the community cultural wealth (CCW) theoretical framework (e.g., Burt and Johnson (2018), Tolbert Smith (2022), Henderson et al. (2022a; 2022b; 2022c), Burrell et al. (2015), Brooms and Davis (2017)). The goal of this framework is to determine what types of social, cultural, personal, and institutional assets individuals are able to accrue in order to navigate their professional situations. The CCW framework was developed by Yosso (2005) and used by researchers such as Ladson-Billings (1995) and Tolbert Smith (2022) in order to provide a deeper understanding of how African American students leverage their community, cultural, and personal assets to navigate their academic and professional trajectories. This approach has been productive in understanding how black men experience their engineering programs, from pre-college through faculty levels (e.g., Burt et al. (2019), Henderson et al. (2022b)).

Consequently, the CCW framework provides useful insight into the strategies these men have used to successfully persist in the engineering profession. In this category, we will also include studies that develop strengths and assets of black men in engineering using other research frameworks such as the Bowman role strain and adaptation model (Bowman, 2006, 2013).

Burt et al. (2019) studied the experiences of 30 black men in engineering graduate programs using a grounded theory approach to argue for the criticality of keeping black men in engineering, not just attracting them to it. Their investigation employed the Bowman role strain and adaptation model to guide their assessment of how black men's strengths helped them to navigate graduate school employing an anti-deficit perspective. They demonstrate how black men employed multi-level strengths rooted in family, spirituality and faith-based communities, and undergraduate mentors to mitigate or buffer structural or contextual strains of their contexts and persist. Social support from these assets increased the participants' likelihood of success by fostering development of personal or individual adaptive strengths. Building on this, Burt et al. (2021) propose a new model of wholeness in graduate advising based on an ethic of care. The focus on wholeness directs attention to the need to recognize black male students as whole persons, including the influence of family (Brooms & Davis, 2017; Tolbert Smith, 2022). For example, Tolbert Smith (2022) shows that black families and extended family members provided black men's primary sources of support, although black men also benefited from bi-directional exchange of cultural capital when navigating non-inclusive environments. In the same vein, Burrell et al. (2015) suggest that while teacher expectations are a "self-fulfilling prophecy", growth mindset, peer support, and social capital can overcome negative influences of peer pressure or stereotypes.

Henderson et al. (2022a) explored factors influencing advanced degree pursuit and attainment among black males using cultural capital theory. Using interpretive phenomenological analysis, they analyze the experiences of 15 black male engineers. Positive factors influencing advanced

degree attainment include social supports and the benefits of advanced degrees as motivation. One potential barrier identified was hurdles and obstacles experienced, including two types of lesser negative themes noted by the researchers--advisor/mentor challenges and negative racial experiences. When Henderson et al. (2022b) utilized inductive thematic analysis to better understand the experiences of 26 black male engineering faculty, three positive themes were uncovered: Black male representation of role models as an asset; invested mentors and faculty as a source of inspiration, engagement, and encouragement; and supportive gender-specific peer networks. These themes indicate the persistence of the cultural capital needs of successful and high-achieving black men as they persist from undergraduate studies through to their faculty roles.

In summary, African-American men who are successful in engineering have accrued substantial community and cultural wealth that they can bring to bear on their pursuit of engineering degrees and advancement within the field. Studies in this category illustrate how cultural wealth, relationships, and wholeness yield assets necessary for persistence and academic success. The principal source of community wealth in the studies included in our review is family. However, other friendships and mentoring relationships have also been influential, especially where bidirectional exchange of CCW capital is concerned. The development of the personal or individual assets implied by CCW studies is crucial, as there is evidence that the absence of such assets could impose a psychological cost on black men that might deter them from persistence in engineering or pursuit of engineering advanced degrees (Henderson et al., 2022c).

#### *Robust, and Fragile Identity Development.*

Several of the reviewed sources could be classified as exploring the development of identity in spite of microaggression (True-Funk et al., 2021). In this category, researchers have investigated how high-achieving individuals have developed either reactive or intrinsic motivations for performing engineering selves in their context. Although many of these types of works are neither engineering-specific, nor black male-specific, they provide important lenses for understanding the experiences of black men in engineering. The key exemplar of these types of studies is McGee (2015) where she describes how high-achieving African-American mathematicians have developed either a robust or fragile mathematics identity. Her work frames an individual operating from a fragile math identity as one motivated to either attain the affirmative expectations of others or to disprove the false expectations of others. On the other hand, an individual operating with a robust mathematics identity is one who has an evolving sense of self-efficacy and discovery, growing affinity and passion for mathematics, and a desire to become a math role model. We view her framework—the robust mathematical identities framework—as presenting a continuum from fragile to robust math identities, with individuals occupying a range of positions along that continuum throughout their development.

A related type of investigation is the work of Hines et al (2020; 2021) exploring the precollege experiences of black males in higher education and the role of small group counseling in improving college readiness for black men. Although this work is not engineering-specific, many of the findings echo those of studies that focus on identity development. Their thematic analysis yielded three themes that linked pre-college experiences to the early undergraduate experiences of their participants: external influences of college expectations, precollege primers, and educational and social empowerment. This study suggests that external factors are important to helping students embark on a trajectory towards the engineering community, but McGee's

(2015; 2014) work indicates that even a positive trajectory motivated by such external factors must at some point be converted into a primarily internal motivation. In summary, black male success in engineering may often involve acts of identity production (Tonso, 2006) proceeding forth from either robust or fragile identities. Fragile identities are constructed in response to others' perceptions of these men, while robust identities proceed from intrinsic motivation internal to the men themselves.

### *Leadership, Citizenship, and Teamwork.*

A variation on this theme is the focus on leadership and participation in engineering teams. Very little work has been performed on African American men in engineering student teams; however, Cross and Paretto (2020) have demonstrated that while the black men they studied experienced positive personal interactions, they lacked opportunities for authentic friendships and sometimes were required to navigate conflict due to unmet expectations that may not have been held in common by their teammates. More research is needed to explore these themes because, as Fries-Britt (2011) has shown, the establishment of these relationships is an important link in the development of persistence and academic success. While very little research has been conducted exploring the experiences of black men on student teams, more research has been conducted on the experiences of African-American undergraduate student leaders and high-achieving students. Thus, for the purpose of discussion, we provide a bit of context related to student leadership and undergraduate activism.

Cross and Paretto (2020) investigated African-American males' experiences on multiracial student teams in engineering. Their study involved semi-structured interviews with 8 African American men. Using intergroup contact theory to sensitize their analysis, they identified three key themes: positive team experiences albeit including an awareness of negative stereotypes held by team members, lack of friendship opportunities and potential conflict associated with unmet expectations, and proactive efforts to dispel stereotypes. While most research exploring the experiences of black men focuses on the assets and individual characteristics required to navigate the contexts of engineering study for black men, Cross and Paretto (2020) put these characteristics into action through their analysis of experiences on teams. For example, while a key asset to black men is their ability to draw on same-gender support networks and friendships, a major observation of their experiences on student teams is limited opportunities to develop friendships among their peers. Additionally, while the positive expectations of mentors and professors could serve as a "self-fulfilling prophecy" (Burrell et al., 2015), students in Cross and Paretto's study used proactive efforts to dispel stereotypes among their peers. Although these strategies could be viewed as instances of their participants working from the position of a fragile engineering identity (see McGee (2015)), such positionality was seen to aid Cross and Paretto's participants in navigating conflict resolution and expectations of professional conduct.

To provide context to this theme, we include the work of Hotchkins (2017). Hotchkins shows how black student leaders and activists used face to face and digital modes of protest, resistance, and communication to conduct activism. This research shows how these student leaders were socialized to value Black culture, people, and traditions, and therefore to cultivate black communities on campus. Within these communities, these student leaders coordinated efforts to use the "digital underground" to employ technology in exposing racism or racist acts, to identify racially threatening sources, or to disseminate opportunities to participate in activism.

In summary, leadership, citizenship, and teamwork outcomes are the result of African-American male responses to racial microaggressions and stereotypes. Instead of surrendering to these images, they self-select patterns of personal conduct that directly contradict the unspoken assumptions behind these stereotypes or microaggressions. These leadership outcomes are a form of identity production (Tonso, 2006) that is intended to neutralize these assumptions.

## Conclusions and Research Needs

While the study of the experiences of African American men in undergraduate engineering programs is continuing to emerge in the literature, this critical area of scholarship is underexplored. Our review of the existing literature suggests several important lines of inquiry that have potential for strengthening engineering educators' ability to support black men in the pursuit of engineering degrees.

First, we note that the black men in these studies are overcomers precisely because their acts of identity production are enacted in order to overcome the negative stereotypes that are prevalent in the cultural context they are immersed in. Researchers studying black men have uncovered strategies explicitly designed to overcome these barriers and microaggression (Burt et al., 2021; Burt et al., 2019; Burt et al., 2018) but much more work is required in order to better characterize the strategies and personal assets that create resilience among black men in engineering.

Second, we note that although our investigation is motivated to understand the experiences of black men on undergraduate student teams, almost no researchers have explored these experiences. With the exception of Cross and Paretto (2020), our review did not uncover an investigation specifically focused on the experiences of black men in undergraduate student teams. Since working on multi-disciplinary teams is both a ubiquitous feature of the undergraduate experience and also a key learning outcome of ABET-accredited US programs at both undergraduate and graduate levels, more research is needed to characterize these experiences.

Finally, all of the research reviewed in this paper indicates the need for a focus on wholeness, that is, the needs of the whole person (Burt et al., 2021). This is analogous to findings of studies with black girls pre-college (King, 2017; King & Pringle, 2019) and others. Centering the need for wholeness can help foreground the confluence of race, gender, and role identities that produce resilient engineering identities (Ross et al., 2021). Not only this, but well-being and belonging improves confidence in the transition to college (Strayhorn et al., 2015). This is probably the most robust theme across these studies from those with a focus on pre-college populations (Hines et al., 2015; Kricorian et al., 2020; London et al., 2021) to those exploring successful leveraging of cultural capital in undergraduate studies and beyond (Fries-Britt et al., 2011; Tolbert Smith, 2022).

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