# It's a Vibe: understanding the graduate school experiences of Black male engineering faculty

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## Abstract

**Purpose** – In spite of ongoing and recent initiatives aimed at broadening participation in engineering, the representation of diverse groups of learners in engineering graduate programs in the USA remains a challenge. Foregrounding the voices of 26 Black male engineering faculty, this study aims to investigate how institutions might recruit and retain more Black men in engineering graduate programs.

**Design/methodology/approach** – For this study, inductive thematic analysis was used.



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**Findings** – The authors show that three themes, namely, representation as an asset, invested mentors and faculty, and supportive peer networks described as the "Vibe" manifest as crucial elements for successful recruitment and retention of Black men in engineering graduate programs.

**Originality/value** – These findings are meant to augment the conversation around diversity, equity and inclusion in engineering graduate programs and to address a dearth of published research on the Black male engineering population. This work is also meant to help institutions conceptualize ways to create a "Vibe" that might be transferable to their institution's sociocultural context.

**Keywords** Black men, Community cultural wealth, Broadening participation, Graduate school

**Paper type** Research paper

## Introduction

Despite numerous calls for and tremendous investments in diversity, equity, and inclusion (DEI) efforts in engineering in the USA, evidence suggests they have not taken hold (Jones *et al.*, 2018; National Academies of Sciences, Engineering, and Medicine, 2018). Unfortunately, DEI initiatives in engineering have not resulted in significant gains in racial and gender representation in engineering, specifically among Black males (Figure 1). Among males who earn engineering degrees, each year, about 66% of engineering bachelor's degrees are earned by White males, compared to only 4% earned by Black males (National Science Foundation, 2017). The outlook is bleaker among Black men who obtain graduate degrees. They only account for 4.8% and 3.5% of engineering master's and doctoral degrees, respectively (National Science Foundation, 2017).

In spite of current conversations centered around diversifying engineering programs in general, the lack of diversity and specific conversations centered on diversifying engineering *graduate programs* remains a concern (Little, 2014; Posselt and Garces, 2014). Beyond the typical economic framing of the current lack of diversity at all segments of the engineering pathway, lack of representation is also an issue of social justice and equity (Lightner *et al.*, 2021). Our current contribution foregrounds from an insider perspective the voices of Black male engineering faculty by asking them to reflect upon their own lived engineering graduate school experiences and their experiences as faculty. This study is part of ongoing research about Black maleness in engineering spaces. The guiding research question for this portion of the study is:

- In what ways do Black male engineering faculty believe that institutions can recruit and retain more Black male engineering graduate students?

For this study, we define the following terms:

- Black/African American is a person having origins in any of the Black racial groups of Africa (United States Census Bureau, 2022).

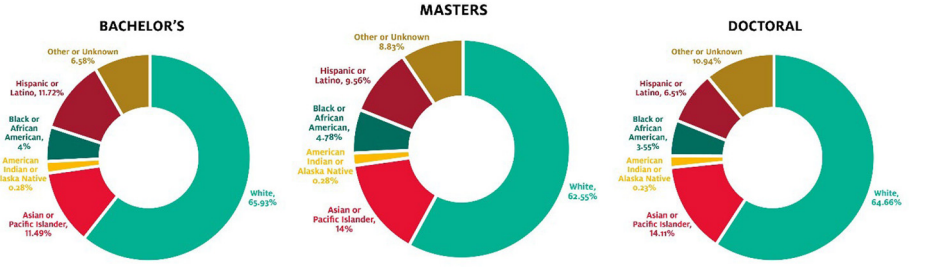


**Figure 1.** Representation among male engineering degree earners at the bachelor's, master's and doctoral level

- Vibe: colloquially, a vibe is described as a harmonious state of atmosphere and/or feeling (Merriam-Webster, 2022).

Through this investigation, we hope to provide institutions with guidance based upon the voices of "double-insiders" in the engineering field (i.e. Black men who have lived engineering experiences as students and who are now engineering faculty within institutions) about ways to broaden participation in engineering.

## Literature review

The team found the systematic literature review on Black graduate students in engineering and computer science by Holloman and researchers a valuable starting point (Holloman *et al.*, 2021). The most salient publications were those addressing the experiences of students of color and/or underrepresented minority graduate students in Science, Technology, Engineering and Mathematics (STEM) (Figueroa, 2015; Rincon and Yates, 2018; Squires, 2015; Tran, 2011). Few articles addressed both engineering education at the graduate level, the experiences of Black males and the experiences of those who persist (Holloman *et al.*, 2021) leading us to see the need for our study (London *et al.*, 2019; Burt *et al.*, 2018). In the following sections, we share relevant, recent, exemplar studies that helped frame our work.

### *Recruiting and retaining Black males into engineering graduate programs*

McGee *et al.* (2016), investigating the intrinsic and extrinsic motivations of 44 Black PhD students in engineering (28 men and 16 women), provide insight into what is needed for the recruitment of Black engineering PhD students. Findings indicated that Black engineering PhD students were motivated by their love of the discipline along with more altruistic motives such as a desire to give back to their own communities through service informed by their expertise. Additionally, key extrinsic motivations included the personal and financial benefits of pursuing and obtaining an advanced degree. For example, the early research experiences afforded doctoral students could provide a pathway to degree completion and career advancement. Similarly, participants described positive social relationships (i.e. family and mentors) that motivated them toward success.

Henderson *et al.* (2022) also found that potential career/professional benefits and love of the discipline were key motivators for Black males to pursue advanced degrees. The study, aimed at understanding the factors that influenced 15 Black males to pursue engineering graduate degrees, found that supportive peers, mentors, and family were sources of academic, social, and emotional support for advanced degree attainment (Henderson *et al.*, 2022). These authors also highlighted potential barriers to degree attainment such as unsupportive advisors, noninclusive campus/college cultures and negative racialized experiences. Considering these key motivators and barriers should inform institutions' recruiting plans for attracting more Black male engineering doctoral students and retention plans for supporting them once they arrive on campus.

Further, environmental challenges exist for Black male engineering graduate students within prestigious, research-intensive colleges of engineering (Burt *et al.*, 2018). Such challenges were reported as including negatively racialized and gendered interactions with peers and advisors and problematic policies within the engineering college that were perceived to be as racialized. One such example included modifications and abandonment of diversity recruitment goals to avoid affirmative action attacks, which then served as an impediment to students causing further underrepresentation and feelings of isolation among Black males. This work also highlighted that participants experienced instances where

peers and faculty were not supportive and/or were biased or prejudiced toward them. These cues challenged students' persistence to degree completion.

An additional study around Black male PhD students' experiences, Burt *et al.* (2019) learned that racial microaggressions enacted by graduate advisors are an obstacle to retention. When graduate students experienced racial microaggressions in what should have been an affirming mentor/mentee relationship, the results were consequential. The impacts ranged from hindering professional identity development to internalizing deficit, racialized perspectives. In other words, there is a danger that graduate students will believe *this* racialized version of self and decide to exit their programs thinking they inherently do not belong (Burt *et al.*, 2019). In addition to these alarmingly negative findings, Burt *et al.* (2019) also pointed to the importance of networks of support. For example, familial support and faith-based communities were named as key networks of support. Mentors, in addition to the graduate advisor, were also key to the students' success (Burt *et al.*, 2019).

The literature presented in this section centralizes work reporting the lived experiences of graduate students. We used the trends described as a building block for our study aimed at understanding the experiences of current Black male engineering faculty. The shift in focus adds a unique perspective to the knowledge base on Black male engineering advanced degree seekers because the participants are uniquely positioned to act upon recommendations that may have improved their own graduate education experiences. In the next section, we describe the theoretical perspective that informed the study design and analysis to enable us to achieve this goal.

## Theoretical framework

### *Community cultural wealth*

Yosso (2005) defined Community Cultural Wealth (CCW) as "an array of knowledges, skills, abilities, and contacts used by Communities of Color to survive and resist racism and other forms of oppression" (p. 154). The framework has been applied in the field of education broadly to identify and share ways that students and educators of color tap into these forms of cultural wealth to achieve academic and career success. CCW as a theoretical framework extends Bourdieu's notion of social reproduction via various forms of *capital* (Bourdieu, 1986) to move beyond the focus on dominant group values (Yosso, 2005). The CCW framework draws from critical race theory to demonstrate the need to understand and articulate cultural attributes as assets that students build upon (Yosso, 2005; Villalpando and Solórzano, 2005). CCW posits that People of Color bring "cultural wealth" to educational environments, in this case, engineering education in a variety of higher education settings. Yosso puts forward six forms of capital that Communities of Color engage to navigate and succeed in educational settings. They are aspirational, linguistic, familial, navigational, social and resistant capitals.

### *Role of community cultural wealth in this study*

We "use" Yosso's (2005) CCW framework in the study for three reasons. First, it provided a vocabulary for articulating *cultural* assets that communities of color often use to navigate sociopolitical spaces, such as education. In this way, the framework served as an anchoring point for communicative validation between research team members who conducted data analysis (Walther *et al.*, 2013). For example, the CCW framing helped researchers articulate their meaning-making during team meetings.

Second, Yosso's framework provided a way to expand our understanding beyond traditional notions of support for academic and career success. For example, traditional support for students in higher education is academic tutoring. However, emphasis solely on

academic support neglects the larger sociopolitical landscape of schooling that students of color often experience at all educational levels. Finally, because we used an inductive thematic analysis approach (Braun and Clarke, 2006; Nowell *et al.*, 2017), CCW was used as a sensitizing concept (Huff *et al.*, 2021). A *sensitizing concept* helps raise research awareness to become *sensitive* to participant responses. Thus, the CCW concept informed how we approached the study, in particular data analysis and dissemination.

## Methodology

An inductive thematic approach proved to be the most useful method given our aim to understand the lived experiences of study participants and consequently make sense of how they use these experiences to advise others (Braun and Clarke, 2006; Nowell *et al.*, 2017). In our case, researchers spent considerable time "living with" the data by conducting single and cross-case analyses. This sequence ensured that we understood experiences individually but could also describe them within the larger context of the study (Creswell and Creswell, 2017). A detailed account of the data collection and analysis processes is provided in the following sections.

### *Protocol development*

Protocol development involved a series of collaborative and iterative steps the first of which required leading authors to produce an initial protocol draft for critique. All authors then contributed to the refinement of each item by providing suggestions for language, sequence and conceptual changes. The final version of the protocol consisted of 15 open-ended questions. Protocol development was informed by current literature on CCW, underrepresentation, broadening participation and Black males in engineering. As a part of a larger ongoing study, interview questions were categorized as follows:

- reasons for attaining advanced degrees;
- relevant undergraduate experiences;
- challenges faced while in graduate school;
- career aspirations; and
- support structures necessary for degree attainment.

Data for this study were primarily situated within participant responses to questions from the last category (i.e. support structures required for degree attainment).

### *Participants*

Twenty-six Black male engineering faculty who were at varying career stages participated in this study. Table 1 provides participants' pseudonyms used throughout the paper along with their engineering disciplines, PhD and career institution type.

Two of the 26 participants earned their doctoral degrees from Historically Black College and Universities (HBCUs), while the majority ($n = 24$) had Predominantly White Institutions (PWIs) doctoral degree affiliations. Sixteen participants are currently faculty members at a PWI, five at Historically Black Colleges and Universities and five are at Hispanic-Serving Institutions (HSIs).

### *Data collection procedure*

Participants were purposefully recruited using an Institutional Review Board-approved e-mail and were invited to complete a demographic survey. This was a two-part process, first,

| Pseudonym | Engineering discipline | PhD institution type | Career institution type |
|---|---|---|---|
| Barry | Electrical | PWI | HSI |
| Bobby | Mechanical | PWI | PWI |
| Bruce | Industrial | HBCU | PWI |
| Bryant | Bioengineering | PWI | HBCU |
| Bucky | Civil and Environmental | PWI | PWI |
| Christian | Management and Systems | PWI | PWI |
| Damian | Computer | PWI | HBCU |
| Dean | Environmental | PWI | HBCU |
| Eren | Management Science | PWI | PWI |
| Hank | Aeronautics and Astronautics | PWI | PWI |
| James | Mechanical and Industrial | PWI | HSI |
| Jean | Mechanical | PWI | PWI |
| Jerry | Electrical | PWI | HSI |
| Kevin | Industrial | PWI | HSI |
| Levi | Systems | PWI | PWI |
| Nick | Industrial and Systems | HBCU | PWI |
| Nico | Biomedical | PWI | PWI |
| Peter | Electrical | PWI | PWI |
| Riley | Chemical | PWI | PWI |
| Sam | Chemical | PWI | PWI |
| Scott | Computer | PWI | HBCU |
| Seth | Electrical | PWI | HSI |
| Stephen | Industrial | PWI | PWI |
| Steve | Computer | PWI | PWI |
| Tom | Chemical | PWI | HBCU |
| Tony | Agricultural and Biological | PWI | PWI |

**Table 1.** Participant pseudonyms, engineering disciplines, PhD and career institution type

**Notes:** Institution type: Predominately White Institution (PWI); Historically Black College and University (HBCU); Hispanic-Serving Institution (HSI)

faculty at Minority-Serving Institutions were contacted which led to 10 interviews. Next, faculty at PWIs were contacted, leading to 16 additional interviews. Black male engineering faculty participated in semistructured, audio-only interviews via Zoom. On average, each lasted between 60 and 90 mins. Interview participants selected their own pseudonyms, and all conversations were recorded. Interviewers posed follow-up questions, where necessary, to obtain thorough, thoughtful responses as recommended by Breakwell and Rose (1995).

*Data analysis procedure*

Once interviews were completed, recordings were transcribed by a professional transcription service. As the first stage of reliability, transcripts were reviewed to ensure that mistakes made during transcription were corrected (Creswell and Creswell, 2017).

Then, using a multistep, thematic analysis approach, independent transcript reviews were conducted by two separate team members (first and third author). Both members then reviewed transcripts several times to highlight significant words and phrases, developing and documenting initial codes and themes (Nowell *et al.*, 2017). The authors convened "calibration meetings" to discuss the themes they had individually developed (Hines *et al.*, 2015; Henderson *et al.*, 2022). These calibration meetings provided an opportunity to gain consensus on the definitions of the themes developed (Moore *et al.*, 2003). Next, the two members continued independent review of transcripts, entering themes into an excel spreadsheet. Following that, an auditor (second author, not involved in data collection)

conducted an independent review of the data to ensure the trustworthiness of the data analysis and developed a summary of themes (Smith and Osborn, 2008). Research team members reached a consensus as to the final themes as suggested by the auditor. All other authors contributed significantly to manuscript preparation.

## Positionality

Each authors' unique perspective have allowed for rich and thorough data collection and analysis. Additionally, all authors possess multiple intersecting identities that shaped how and in what ways they have contributed to this project.

For example, the first two authors initiated this study due to their interest in the topic. They are both Black men who have pursued and earned advanced degrees (engineering and counseling). The third author is an advanced-level Black male undergraduate engineering research assistant who is undergoing his own lived engineering experience. He assisted with data collection and led team discussions aimed at scrutinizing findings. The fourth author is a Black woman of Afro-Caribbean heritage. Her research studies issues related to quality in doctoral programs and the experiences of minoritized learners.

During team project discussions and calibration meetings, authors were careful to account for their similarities and differences with participants and how their experiences impacted data analysis and interpretation of participants' experiences. Team conversations or as we call them, "times of calibration," were used to help mitigate the authors' excitement and influence on the data analysis. The authors were also careful to spend extended amounts of time "living with data" (Creswell and Creswell, 2017) for a more refined analysis.

Finally, the authors also viewed their "insider status" (Smith and Osborn, 2008) and comparable lived experiences to participants as an asset. During interviews, the team was able to develop a rapport which led to participants' willingness to share their experiences and, likely, more in-depth discussions (Prosek and Gibson, 2021). For example, during interviews when the third author (an engineering undergraduate student) was present, participants often offered "on the job" mentoring by offering to help him build his network and encouraging him to apply to a graduate engineering program.

## Limitations

First, in this study, we did not explore the full gamut of intersectional identities among participants. Second, this study was conducted as a retrospective. For example, though participants provided advice and recounted their own lived experiences, data were not collected *in the moment*. Finally, while participants were at various stages in their careers and studied and work at different institution types, we did not analyze data at those levels. Our claims are in aggregate and not distinguished based on the time period in which participants were in graduate school or the type of institution they attended or are currently affiliated with. Future research might take into consideration generational and institutional nuances. Accounting for these differences may yield more thick and rich perspectives.

## Findings

Results suggest that the "Vibe" includes the presence of three conditions: *representation as an asset, invested mentors and faculty, supportive peer networks*. In turn, we used these to name the themes we found during data analysis. Table 2 summarizes and provides a definition for these themes.

In this section, we present findings that demonstrate the ways that Black male engineering faculty described best practices for broadening participation in engineering among Black male graduate students.

*Representation as an asset*

Findings suggest that one of the most essential components of a "Vibe" is representation. Christian's experience embodies just that:

> You can't have, like my institution for example, which is a Predominantly White Institution [PWI]. You can't have a single underrepresented minority in a class of 25 students and expect that single minority to ever consider pursuing an advanced degree. That's not going to happen because it's going to feel like, you know what? I'm in a cultural space that does not belong to me.

Christian notes that in environments lacking apparent representation, Black males find fewer opportunities to lean on culturally familiar communities for motivation to persist and perhaps do not develop a sense of belonging.

Other participants extend this idea by suggesting that Black men must also see aspirant models of themselves in leadership positions within university environments. Levi says:

> [. . .] we need more of me and others. People that look like me that are mentors and professors, and folks that are sitting on the various defense boards and the advisors in there as well. Right now, it seems like – and I guess it may be more because I was at a PWI, but there was very low interaction with anyone that looked like me that was higher than where I was.

Levi associates the lack of representation and interaction with people that look like him as something inherent to PWIs as if to say *that is the way it is supposed to be*, and perhaps he does not expect that it should have been different. Levi suggests that seeing Black males across faculty ranks may serve as a potential source of encouragement and show Black males what it looks like to persist.

In addition, participants indicated that universities (e.g. through departments) should make greater efforts to spread awareness of how graduate programs work and how they lead to various opportunities. Steve reveals what little he knew about the PhD process:

> [. . .] one thing that universities can do is each department can have talks from faculty to the undergrads really just to explain how advanced degrees work because when I was a senior in undergrad, I didn't actually fully understand how the Ph.D. worked. What exactly does a Ph.D. student do? How exactly does the Ph.D. admission, application, and admissions process work? I didn't realize when I was a senior in undergrad that Ph.D. was free.

This desire for more awareness about graduate programs and how they operate was common among participants. This represents an opportunity for institutions to develop simple interventions/strategies to help their students understand the benefits and processes involved in obtaining an engineering graduate degree.

**Table 2.**
Summary of themes and descriptions of those themes

| Theme | Description |
|---|---|
| Representation as an asset | Participants' beliefs that Black male engineering graduate students must-see examples of themselves among their peers, faculty, and engineering college leadership |
| Invested mentors and faculty | Faculty who commit time to students' academic, personal, and professional success |
| Supportive peer networks | Institutional support of and providing infrastructure for student group/ organizational support |

*Invested mentors and faculty*

Coupled with representation, participants also shared that an important aspect of the "Vibe" that fosters the success of Black men pursuing advanced engineering degrees is what we describe as an invested mentor. The invested mentor may prove to be an unparalleled source of academic and social support for Black male engineering graduate students. James describes it as such:

> [. . .] but we need to find ways to inspire them to believe that they can be at the top of our graduating classes. All too often, I run into students who just have no relationship with any faculty [. . .] whereas if we find a way to really engage their minds to circumstances where they can believe that they can do the work, that they can build confidence in their understanding of the work, that they'll find the beauty in being able to continue that work.

James unpacks what it might take to be an invested mentor – inspiration, engagement, and encouragement.

Participants such as Seth further define and highlight the benefits of an invested mentor.

> I believe faculty members who understand, you know, the nonacademic challenges that one might be experiencing. For example, you know, feeling like you're alone or – or all your classmates just don't look like you. Uhm, having faculty members, who understand that and take that into account in the interactions they have with, you know, Black male students would be helpful

Here Seth highlights how having faculty who understand and support students through nonacademic challenges is crucial for the success of Black males in engineering. This does not suggest that faculty be mentoring experts, but rather understanding and considerate of students' experiences.

Further unpacking the role of invested mentors, participants discuss how these mentors must commit time to the academic development of Black men as well, especially those who might not be as prepared or who might be perceived as not being prepared. Bruce shares:

> So, that's where I think we have failed our Black male students is that we don't take the time to develop them. It takes time and effort and patience to develop a good graduate student from a student that's maybe not as academically gifted because of their circumstances, right? It doesn't mean they're less intelligent, but they've had less exposure and so yes, they're going to start behind.

Bruce suggests that even if students are not (perceived as being) as prepared as faculty may like, it does not mean that they are unfit to participate in engineering graduate programs. Faculty who are willing to commit time to the academic development of students are essential for building the "Vibe" culture.

As an example, James describes his experience with his invested mentors, "[. . .] they had an open-door policy. Countless times, they stopped what they were doing to just hear me, deal with it, and I didn't have to make an appointment. There was no door shut for me." Having the ears of his advisors at any moment was important and was a clear sign that his advisors were there to support and contribute to his success. The authors understand this type of investment costs – perhaps time and resources, but it might be necessary for further supporting students.

Another participant, Riley, describes a mentorship framework that he believes to be helpful: "we start to mentor directly students from undergrad [. . .] The faculty mentor the PhDs [. . .] The Black PhDs mentor the Black master's; Black master's mentor the Black undergrads; and it's like a cycle, a continuum." Mentorship beginning in undergrad from graduate students might allow Black males a greater understanding of what they are committing to and how to navigate graduate programs effectively. This form of

interconnected mentorship could contribute toward Black males' preparation and success in graduate programs. Access to the community that one may have an interest in or is actively trying to join enables first-hand accounts of what could be expected.

*Supportive peer networks*

Finally, in concert with invested mentors, peer networks were also perceived to have a large influence on the success of Black men in engineering programs. Bruce emphasizes gender-specific networks as a strategy for success:

> But as Black male students, there's a unique set of circumstances that come with that and it's been difficult to find community or for me to see where our Black male students have been able to find community [. . .]. When I was a graduate student, I primarily worked with Black women. I was just blessed enough that they would allow me in their circle and become successful, but I do think there needs to be a space for Black male students [. . .] There needs to be some facilitated effort to develop these communities and networks for Black male students as there has been for Black female students.

Bruce highlights the potential positive impact of gender-specific mentoring for Black men. Though men generally are not underrepresented in engineering, as described above, Black men are. Bruce suggests that Black women have found these supportive spaces and they may be beneficial for Black men as well.

Also, peers in structured networks were a source of encouragement. For example, Jerry shared, "That was my experience as a grad student. Uh, mentoring those NSBE students kept me motivated and helped me see the big picture, especially in those bad days in the lab [Laughter]." He found that interacting with peers, and serving as a mentor himself, helped him stay grounded and motivated to continue. Often students can find these peers in student organizations. Jean points out, "[institution] had several student organizations like [org, *pseudonym*]. Those were kind of culturally supportive so that you had Black graduate students sharing their experiences and basically peer mentoring." These groups provided spaces for Black males to feel supported.

## Discussion and recommendations

We start with a brief discussion of how our work aligns with the work of other researchers followed by highlighting the more original aspects of our findings.

*Alignment with previous work*

Our work supports previous claims that suggest that supportive cultures are especially important when attempting to recruit and retain marginalized groups in STEM (Klenk *et al.*, 2015). Like other researchers, our work emphasizes that supportive cultures must be created and nurtured by people in positions of power (e.g. faculty and mentors), and the onus should not be solely upon the shoulders of individuals from marginalized communities to create and maintain these supportive cultures (Burt *et al.*, 2019; McGee, 2016; Henderson *et al.*, 2022; Burt *et al.*, 2018).

Other researchers have also highlighted that attention from professors and mentors may be contributors to student motivation to pursue and persist in graduate programs (Maton and Hrabowski, 2004; McGee, 2016). Our work also supports scholarship that highlights the importance of representation to the success of Black male engineering students and extends this idea to consider the meaningfulness of representation at the *graduate* level (Tuladhar *et al.*, 2021).

Like others, and our previous work, we find that engaging Black males in the ideas and processes involved in earning an advanced degree well before it is time for them to apply for graduate school is also crucial (Burt and Johnson, 2018; Henderson *et al.*, 2022).

*Extensions of previous work*

While this work further confirms and augments the rich conversations currently taking place, it is also unique.

First, we were intentional about including the voices of "double-insiders" (Black male engineering faculty). This was important for giving appropriate weight to their experiences as students alongside their perspectives as faculty enmeshed in educational systems serving Black male engineering graduate students.

Second, participants noted the need for representation (e.g. representation as an asset). To further unpack, Black males in engineering graduate programs should not only experience representation among peers but also among faculty, advisors and administrators. As for attending to representation, the argument is for a critical mass of Black men in student, faculty and leadership roles which may challenge institutions' approaches to recruiting faculty and students. Moreover, Black male representation requires meaningful interactions (i.e. mentorship, developing authentic relationships) to create a "Vibe."

Next, we further unpack the activities that supportive mentors and faculty members must be engaged in (e.g. encouragement, inspiration, academic support) for the success of Black male engineering graduate students. Participants provided nuanced insights about how mentors and peers should engage Black men within supportive environments.

Additionally, our participants shed light on the importance of support network structures such as student organizations and uniquely gender-specific networks. In the remainder of this section, we provide recommendations gleaned from the words of the participants. Table 3 gives a summary of those recommendations.

To enhance representation, institutions should explore targeted strategies to recruit both Black male graduate students and Black male faculty (Henderson *et al.*, 2022). Passive recruiting will no longer work. Just as the advising community has come to appreciate proactive or intrusive advising strategies (Varney, 2007; Glennen and Baxley, 1985), institutions ought to become committed to more proactive recruitment strategies. While there are a number of targeted recruiting interventions such as the Meyerhoff Scholars Program and others like it (Maton and Hrabowski, 2004), we encourage more research and scholarship related to the assessment, evaluation and success of these interventions.

In addition, establishing learning communities that mirror students' communities has been shown to be a critical and effective recruitment and retention strategy for Black males in higher education (Cintron *et al.*, 2020). The learning community model may help institutions further develop the "Vibe" culture within their institutions. Creating designated learning communities for Black male graduate students might also tremendously impact their sense of belonging and success.

**Table 3.** Strategies suggested by participants

| Theme | Participants' recommended strategies connected to each theme |
|---|---|
| Representation as an asset | Hiring a critical mass of Black male engineering faculty |
| | Admitting a critical mass of Black male engineering graduate students |
| | Developing targeted recruiting strategies |
| Invested mentors and faculty | Promoting and supporting faculty in the development of authentic relationships with students |
| | Sensitizing faculty to both academic and nonacademic challenges students may face |
| Supportive peer networks | Having the infrastructure in place for peer mentoring networks |
| | Providing gender and ethnic-specific mentor support and learning communities |

The labor of invested mentors and faculty requires a time commitment, understanding and effort. *Good* mentorship is not always valued within institutions (Diggs *et al.*, 2009). Authors assert that if departments and institutions are truly interested in diversifying their engineering colleges at the graduate level, they will have to consider their current systems for rewarding faculty for mentorship and make appropriate modifications based on the cultural wealth of their target audiences (e.g. Black males) and their institutional contexts. In addition, providing faculty with trainings to develop their mentoring and cultural competence skills are necessary.

Admittedly, to build a "Vibe" at institutions, such strategies inevitably require faculty awareness (Burt *et al.*, 2016) and faculty engagement/buy-in (Aparakakankanange and Tull, 2014; Tapia *et al.*, 2003).

## Implications for future research

Findings from this study situate the engineering community to further understand broadening participation in engineering and provide insights into future research. For example, we can stand to learn more about how and in what ways these findings are unique to Black males and what can be gleaned for understanding and supporting other underrepresented groups in engineering. The authors also suggest that future researchers continue this work, attempting to understand the discipline-specific differences (e.g. chemical, mechanical, etc.). For example, Holloman *et al.* (2021) also call for increased diversification of the disciplines studied in their article. Finally, there is significant potential in disaggregating these data. Compelling insight may be gained from conducting analyses across institution type and graduate enrollment decade. Analyses such as these are tantamount to understanding Black males in engineering as a nonmonolithic group (Henderson *et al.*, 2022).

## Conclusion

A "Vibe" is not necessarily discrete or tangible. The authors assert that this could be a reason it has been difficult for some institutions to define or actualize strategies for broadening participation in engineering. As institutions design interventions, they must understand the cultural wealth that their current and desired student populations have. Further, such understanding can be complicated among persistent cultural disconnects that exist between systems and individuals (i.e. the university and the student). However, as we move toward broadening participation in engineering, it is imperative that stakeholders who develop and implement interventions aimed at recruiting and retaining a diverse graduate student population address cultural gaps. Finally, results from intervention design evaluations should also be disseminated to the broader higher education community to help inform DEI advances.

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