

“Getting Into Academia Can Be Tough”: The Mentoring Needs Of Black And Latinx Engineering Postdoctoral Scholars

Sylvia L. Mendez, Sarah E. Cooksey, Kathryn Watson
University of Colorado Colorado Springs

Canek Phillips, C. Fred Higgs III, Illya V. Hicks
Rice University

Comas Haynes, Tammy M. McCoy
Georgia Institute of Technology

Natalie Arnett
Florida A&M University

Abstract

This phenomenological study explores the mentoring needs of 13 Black and Latinx engineering postdoctoral scholars who aspire to the professoriate. An adaptation of the ideal mentoring model (Zambrana et al., 2015) is employed as the conceptual framework. Moustakas' (1994) four-stage process of phenomenological data analysis was utilized to examine the interview data: epoché, horizontalization, imaginative variation, and synthesis. The phenomenon's essence is: Black and Latinx engineering postdoctoral scholars have primary and secondary mentoring needs pertaining to their immediate career acquisition of a tenure-track faculty position. Primary mentoring needs include expanding their professional network and receiving support in being a competitive faculty applicant, as well as coaching on work-life balance. Secondary needs consist of enhancing and promoting their technical skills and acquiring political guidance on racial/ethnic bias in academia. The findings of this study reveal the importance of higher education institutions and postdoctoral advisors assuming greater responsibility for ensuring postdoctoral scholars receive the mentorship and career support they desire, which may require a systematic change in the postdoctoral training environment.

Keywords: engineering postdoctoral scholars, mentoring, phenomenology

While an academic career is the single most desired career option for engineering postdoctoral scholars, only 16% secure a tenure-track faculty position (Andalib et al., 2018). The reason many fail to rise to the professoriate may lie in their mentoring needs being unmet during their postdoctoral appointment (Scaffidi & Berman, 2011; Yadav et al., 2020). To explore this supposition, a phenomenological study (Moustakas, 1994) is employed on the mentoring needs of Black and Latinx engineering postdoctoral scholars who aspire to the professoriate. An adaptation of the ideal mentoring model (Zambrana et al., 2015) is utilized as the conceptual framework. Awareness of the mentoring needs of postdoctoral scholars may be instructive to postdoctoral advisors and postdoctoral offices and can aid in diversifying engineering academia. Pres-

ently, just under 10% of engineering postdoctoral scholars identify as racial/ethnic minorities (Yadav et al., 2020), which is a cause for concern because future faculty are derived mainly from this career group. This research is sponsored by the National Science Foundation (NSF) Alliances for Graduate Education and the Professoriate (AGEP; award numbers 1821008, 1821019, 1821052, and 1821298). The research question that guides this study is: What are the ways in which Black and Latinx engineering postdoctoral scholars describe their mentoring needs, particularly as they relate to their desire to enter the professoriate?

Literature Review

In recent decades, numerous efforts to diversify the science, technology, engineering, and math (STEM) professoriate have been employed (Allen-Ramdiel & Campbell, 2014; Javier et al., 2021; Rybarczyk et al., 2016). Despite these endeavors, the demographic makeup remains relatively unchanged (National Science Board & NSF, 2020). Presently, only 2.6% of engineering tenured/tenure-track faculty identify as Black, and only 3.9% as Latinx (American Society for Engineering Education [ASEE], 2022). Postdoctoral scholars are the greatest source of future faculty and, subsequently, are a significant factor in the diversification of the STEM workforce and professoriate (Andalib et al., 2018; Wilson, 2020). Yadav and Seals (2019) argued that institutions must provide social and structural support, including mentoring, if postdoctoral scholars of color are to successfully transition to faculty positions. Mentoring continues to be heralded as crucial in the support and retention of STEM postdoctoral scholars of color and is considered a critical factor in their career progression and success (Faupel-Badger et al., 2015; Karalis Noel et al., 2021, 2022; Pyhältö, 2018; Rybarczyk et al., 2016; Scaffidi & Berman, 2011; Van Benthem et al., 2020; Yadav & Seals, 2019; Yadav et al., 2020).

Effective mentoring holds specific postdoctoral career benefits in terms of increasing scholarly performance and productivity, bolstering one's science identity, broadening one's network, and improving STEM career trajectories (Faupel-Badger et al., 2015; Karalis Noel et al., 2022; Mendez et al., 2022; Pyhältö, 2018; Scaffidi & Berman, 2011). Additionally, mentoring influences post-

doctoral scholars' satisfaction with the work environment and deepens feelings of resiliency at work (Burt, 2019; Pyhältö, 2018; Scaffidi & Berman, 2011; Van Benthem et al., 2020). Relatedly, leadership, teamwork, and creativity skills are enhanced through mentoring, as well as a commitment to diversity, equity, and inclusion (Hund et al., 2018; Yadav et al., 2020). Recently, greater attention has been focused on the notion that mentoring also results in positive mental health outcomes, such as reducing stress, anxiety, and depression (Karalis Noel et al., 2022; Muñoz & Villanueva, 2022; Van Benthem et al., 2020; Yadav et al., 2020). Most notably, specific mentorship in the teaching and research arenas of the professoriate leads to more postdoctoral scholars transitioning into the tenure-track faculty ranks (Burt, 2019; Rybarczyk et al., 2016). These benefits are realized when postdoctoral scholar mentoring occurs regularly with short- and long-term career goals in mind (Karalis Noel et al., 2021).

The benefits of mentoring postdoctoral scholars of color are evident for current and future career success, although they receive substantially less mentoring than their White counterparts (Javier et al., 2021; Yadav et al., 2020). The lack of mentorship is particularly critical, as scholars of color must contend with marginalization, microaggressions, and blatant bias in the academy (Eaton et al., 2020; McGee & Bentley, 2017; Mendez et al., 2022; Robinson et al., 2016; Yadav et al., 2020). Yadav et al. (2020) noted that postdoctoral scholars of color often feel isolated within STEM and express a yearning for belonging, social identity, and professional growth during their postdoctoral appointment. If efforts to diversify the STEM professoriate are to be achieved, higher education institutions must train faculty and advisors on best practices in mentoring to meet the unique mentoring needs of this population (Faupel-Badger et al., 2015; Karalis Noel et al., 2021, 2022; Pyhältö, 2018; Yadav et al., 2020).

Conceptual Framework

Upon a thorough investigation of mentoring frameworks, the ideal mentoring model for underrepresented minority faculty from the research of Zambrana et al. (2015) was chosen and adapted for this study, as it pro-

vided a comprehensive picture of the mentoring needs and activities known to benefit faculty of color. The results led to the development of the ideal mentoring model comprising four discrete domains: forging connections, encouraging scholarly opportunities, using a hands-on approach, and providing political guidance. Shifting the focus was a logical adaptation, as frameworks build upon foundations of established knowledge and reveal new understandings of a phenomenon—in this case, the mentoring needs of Black and Latinx engineering postdoctoral scholars aspiring to the professoriate.

The adapted ideal mentoring model for postdoctoral scholars of color encompassed the same four domains but was tied to specific needs and activities to those of postdoctoral scholars endeavoring to transition into tenure-track faculty positions (see Figure 1). Forging connections involves a mentor providing access and networking opportunities for their mentee. Activities in the domain of encouraging scholarly opportunities comprise a mentor promoting their mentee's research expertise and offering advice on potential research collaborations. A hands-on approach includes a mentor strengthening their mentee's scholarly products and offering strategic coaching on time management and priority identification. The final domain, providing political guidance, relates to a mentor explaining institutional norms, power relations, and the political climate in higher education to their mentee. The adapted ideal mentoring model provided the conceptual propositions of the mentoring needs of postdoctoral scholars and was used to guide the interview protocol, data analysis process, and implications of this study.

Methodology

Research Design

A phenomenological research design (Moustakas, 1994) was employed to explore the mentoring needs of Black and Latinx engineering postdoctoral scholars who aspire to the professoriate. The ideal mentoring model for postdoctoral scholars adapted from the research of Zambrana et al. (2015) served as the conceptual framework. The goal of phenomenological inquiry is to capture and

convey the experiences and stories of participants around specific interactions and events to stimulate the transferability of findings to others in similar circumstances (Creswell & Poth, 2017). The research question guiding this study was: What are the ways in which Black and Latinx engineering postdoctoral scholars describe their mentoring needs, particularly as they relate to their desire to enter the professoriate?

Participants

A total of 13 Black and Latinx postdoctoral scholars were recruited and interviewed for the study. Each participant was selected given their involvement in the AGEP Engineering Alliance, which addresses the career development needs of engineering postdoctoral scholars of color who intend to transition into tenure-track faculty positions. All participants hail from one of three institutions in the southern region of the United States. One institution is classified as a doctoral university with high research activity (R2) and is a Historically Black College or University (HBCU). Another is a public doctoral university with very high research activity (R1) and is a predominately White institution (PWI). The final institution is a private R1 as well as a PWI. The sample comprised six women and seven men, and each self-identified as either Black or Latinx. All are from various engineering disciplines, such as aerospace, agricultural, biomedical, chemical, and mechanical. The 13 participants are affiliated with the AGEP Engineering Alliance; therefore, pseudonyms are used which are not linked to a higher education institution, gender, race/ethnicity, or engineering sub-discipline to limit identification because only a few Black and Latinx engineering postdoctoral scholars are employed at these institutions.

Data Collection

Upon completing the Institutional Review Board approval process, each postdoctoral scholar was contacted via email and provided with an informed consent form detailing the study and interview procedures. The postdoctoral scholars were informed that their participation in the interview process would be used to identify their mentoring needs and to guide successful mentoring

matches. Interviews were conducted by phone and web conferencing and averaged 45 minutes. Data were collected one-on-one utilizing an interview protocol based on the conceptual framework. Sample questions included:

1. What motivated you to participate in the AGEP Engineering Alliance?
2. What components are needed in a successful mentoring relationship?
3. What areas of support are you looking for from a mentor?
4. Do you have preferences on the demographic characteristics of your mentor?
5. What type of feedback and critiquing do you best respond to?

Adherence to the interview protocol ensured questions were carefully worded and asked in a specific order; additionally, probing questions were included to seek clarification and meaning (Creswell & Poth, 2017). Upon completion of the interviews, a third-party service transcribed the recordings. The transcriptions were reviewed and cleaned for errors, after which the digital recordings were permanently deleted.

Data Analysis

The interview data were analyzed using Moustakas' (1994) four-stage process of phenomenological data analysis: epoché, horizontalization, imaginative variation, and synthesis. In the first stage, epoché, the research team engaged in bracketing their individual and collective beliefs and experiences regarding the mentoring needs of hopeful academics to examine openly and honestly that which the participants brought to the study. Bracketing accounts for and mitigates potential researcher bias through analytical memoing and dialogue (Moustakas, 1994). Epoché requires researchers to refrain from considering their lived experiences as absolute and, instead, to critically examine how their unique experiences influence their interpretations of the world, specifically the phenomenon at hand (Husserl, 1913/2014). The researchers associated with this study hold positions in academia as professors, administrators, research affiliates, or graduate students with disciplinary homes in educational leader-

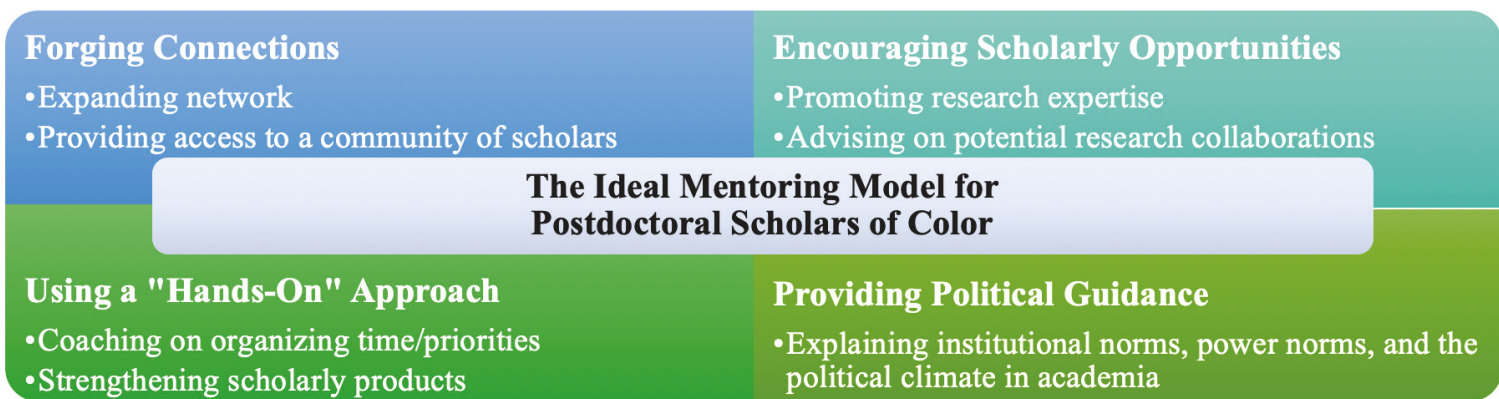


Figure 1. Ideal Mentoring Model for Postdoctoral Scholars of Color

ship or engineering. Thus, the data were approached from insider and outsider perspectives. Also, the team believes strongly in the benefits of mentoring and its vital role in career progression and success. All researchers have participated in formal and informal mentoring and attribute these opportunities to their own career advancement. Additionally, the researchers are involved in the AGEP Engineering Alliance, so their closeness to the project could have clouded their ability to be neutral on the mentoring views and needs shared by the project participants.

The second stage utilized inductive, open coding of significant statements through horizontalization, as all transcripts were read with equal value (Moustakas, 1994). The statements were parsimoniously reduced and clustered into initial patterns by successively combining similar statements. The initial patterns indicated the broad categories of mentoring needs described by participants, such as networking and managing microaggressions. In the third stage, imaginative variation was used to clarify the underlying structure of the phenomenon by addressing the contextual factors and conditions that determined the participants' mentoring needs (Moustakas, 1994), such as weak and strong postdoctoral advisor relationships. The ideal mentoring model provided a lens to consider the emerging themes determined during the horizontalization phase. Moustakas (1994) considered this process to be an analytical, mental experiment to explore a variety of perspectives.

The fourth and final stage involved the holistic synthesis of the phenomenon's essence (Moustakas, 1994), which was found to be: Black and Latinx engineering postdoctoral scholars have primary and secondary mentoring needs pertaining to their immediate career acquisition of a tenure-track faculty position. Primary mentoring needs included expanding their professional network and receiving support in being a competitive faculty applicant, as well as coaching on work-life balance. Secondary needs consisted of enhancing and promoting their technical skills and acquiring political guidance on racial/ethnic bias in academia. The essence is to be considered limitless, universal, transferable, and formulated in the context of the participants and mediated by the researchers.

Trustworthiness

The trustworthiness of the findings was established by using multiple verification strategies (Lincoln & Guba, 1985). Thick, rich descriptions and the inclusion of participant quotations were utilized to foster transferability (Creswell & Poth, 2017). Credibility was achieved through interview triangulation and identifying the occurrence of saturation before the conclusion of the interviews, as no additional significant statements were gleaned after the sixth interview (Creswell & Poth, 2017). Employing Moustakas' (1994) phenomenological data analysis approach safeguarded the consistency of the process and product, which ensured credibility and dependability.

Bracketing during the epoché stage and the involvement of multiple researchers in the analysis process also bolstered the dependability of the findings.

Limitations

As in all research inquiries, this study has several limitations. First, the research team did not conduct member checks because arranging and conducting interviews was difficult due to participants' demanding schedules. Member checking could have provided more complex and nuanced depictions of the mentoring needs of the participants. While the study exposed researcher bias through the epoché stage of Moustakas' (1994) data analysis process, its potential to influence the findings and interpretations cannot be guaranteed. Last, all postdoctoral scholars participated in the AGEP Engineering Alliance, which may limit the transferability of their experiences to others in different programs and contexts.

Findings

Theme 1: Expanding Professional Network and Receiving Support in being a Competitive Faculty Applicant

Each postdoctoral scholar hopes the mentoring program offered by the AGEP Engineering Alliance will help them in their tenure-track faculty job search. Flexing their mentor's network and being recognized as a competitive applicant was noted as their most important mentoring need. Brian said:

I want to be a chemical engineering professor, I could definitely see myself in the chemical engineering department as a professor. . . to have someone on my side that can actually talk to people and mention my name sometimes or have me come to present in seminars and things like that, are pretty important.

Carlos and Hakim hope their potential mentors can connect them with higher education institutions and faculty who genuinely desire to diversify their departments. Carlos said, "Every university nowadays is looking to diversify. . . I'd like to know which ones are really lacking in diversity." Similarly, Hakim stated he desires a mentor who can "provide me more access to universities, especially with deficits in faculty and underrepresented minorities would be helpful." Each postdoctoral scholar identified extending their networks and receiving customized, personalized advice on institutions that may be a good fit for them as integral to continuing on the professoriate pathway.

The postdoctoral scholars also would like their potential mentors to provide them with job-seeking advantages in the application process. Martin noted his awareness of needing support in "having an edge in the application process since the academic job market is so competitive." Joaquin desires insider knowledge on tailoring his application package to a variety of job postings: "What I've found out so far from applying to faculty po-

sitions is that different departments have slightly different requirements. . . and the only way I found that out is from actually talking to professors within these departments." Aisha noted wanting help in "putting together my faculty application package. . . basic advice for my CV would be great." Miranda also desires support in developing dynamic application materials personalized to her sub-discipline: "What matters most is someone that's in my field that understands the nuances of applying for a faculty position within biomed engineering because it's a little bit different from the other engineering fields." Similarly, Tamika shared the need for support in marketing her skillset: "My research is so interdisciplinary. . . I have a hard time telling people why I would be a good addition. . . I could fit in a lot of places." Gaining an "edge" was replete in the interviews, which participants hope to gain from their mentors reviewing their application materials and helping them consider the "right way" to position themselves for a faculty position.

Brian feels comfortable with the application materials he has created but is most interested in engaging in mock interviews with a mentor:

There are some general questions that they ask during the interview that anybody would ask. Like, "What are your research ideas?" . . . I think it would help a lot, as far as me being able to find the right words or saying things the way that it needs to be said.

Practicing for the interview sessions was deemed most critical, as Brian desires to appear technically competent, as well as personable and a team player. All participants felt unprepared to enter the job market without additional coaching and support. Many intimated anxiety about their ability to be competitive despite being on track to move into the professoriate successfully. Booker said, "Getting into academia can be tough. . . it's definitely stacked against you. . . so getting support is key." As noted by Evelyn, "It can't hurt to have a little bit of extra support."

Theme 2: Coaching on Work-Life Balance

Participants also strongly desire coaching on work-life balance. The postdoctoral scholars expressed concerns about the stress that developed during their doctoral studies as they struggled to find a proper work-life balance. The resulting burnout left them feeling somewhat despondent about the possibility that the balance may become even more unachievable in the future if they fail to address it now. Martin described this fear:

I need support with work-life balance because I see that's a big issue for me. Coming out of the PhD, I felt like I was to the point where I was burning out. And I don't want to repeat that in the long-term race, that is the tenure-track life.

They sought support on handling work-life balance in general, and specifically in a demanding career field. A few requested needing a greater awareness of the university structures in place when personal challenges or life

circumstances arise, such as illness or maternity leave.

Coaching on work-life balance was particularly poignant among those married with children. Nearly half of the participants hold this family structure, while the others are single. Hakim referenced the need to be present with his family:

My wife and I had a baby this fall. Prioritization and time management of my time, yes professionally, but also, by extension, personally, is quite important to me. It's really important for me to know that I can succeed and have a strong career and also be available for my family.

Similarly, Carlos shared, "I have a wife and two kids, and so life and time management is a bit different. It's more similar to what a professor has to manage because usually, professors have a wife and kids, usually, postdocs don't." The postdoctoral scholars do not believe they have seen "positive modeling" on effectively balancing a family and a career, so they specifically desire mentorship in this area. Participants stressed the importance of being attentive to their family needs while remaining productive and successful in their desired career path.

Relative to coaching on work-life balance, postdoctoral scholars intimated that this requires a level of trust, as most are uncomfortable sharing personal challenges they experienced with their postdoctoral advisors. Thus, they are seeking strong mentorship in this area. Saria noted that time management is her "Achilles heel at every stage of my career, from undergrad to today in my postdoc position." Similarly, Miranda shared, "It feels daunting to consider managing all that life throws at you and remaining productive... some tips for time management will be great." Interestingly, most of the postdoctoral scholars found their PhD advisors and postdoctoral advisors did not model work-life balance well, although they still believe it is achievable with focused counsel.

Theme 3: Enhancing and Promoting their Technical Skills

In addition to learning ways to achieve a sense of work-life balance, participants desire support in enhancing and promoting their technical skills. Savannah stated, "I need someone who would read my documents and try to strengthen my scientific arguments." Tamika shared a similar sentiment by noting her desire to receive additional methodological training from a mentor: "I've been trained as a qualitative researcher, so I'm looking for some mixed methods and quantitative research opportunities." Evalyn wanted "to know more about the actual grant writing process and proposals." While the postdoctoral scholars indicated they are receiving this type of mentorship within their postdoctoral positions, each seeks more individualized attention as they believe it would ensure their marketability in the tenure-track faculty search process.

Several postdoctoral scholars also indicated they would appreciate their mentors promoting their research

expertise, as described by Carlos: "I think access to not necessarily just conferences, but to meet other professors at other universities, somebody that can introduce me and kind of help me show off my research, what I've done and can do." Miranda also indicated it would be helpful to have a mentor who "can provide a platform for me to disseminate my work, invite me to their department, and help me network with other scientists." While some are clear on their needs in this domain, most are unable to articulate the way in which a mentor could promote their research expertise despite their understanding that sponsorship is an essential mentoring function in which to engage. Saria said, "I'm sure there are other ways to promote research besides going to conferences. I just have no idea what they are."

Theme 4: Acquiring Political Guidance on Racial/Ethnic Bias in Academia

Nearly all participants desire mentorship relative to navigating racial/ethnic bias in academia. Savannah stated, "I think the main need for me is managing micro-aggressions," the subtle everyday insults and insensitive comments heralded at people of color. As these situations occur infrequently, practice in handling them seldom occurs. Both Savannah and Aisha desire to be proactive in effectively countering these comments and behaviors and feel this occurs through mentoring. Similarly, Joaquin shared he would appreciate guidance when faced with "biases that people don't even know they have." The postdoctoral scholars are clear in realizing they face nuanced challenges as scholars of color. A few were seeking mentorship in this area because they felt "naïve" about the way in which racial/ethnic bias affects faculty careers. Martin noted the need for a mentor with whom he shares a background to have these pointed conversations:

I want to have a personal connection [with my mentor] because that will facilitate having conversations of what does it mean to be an underrepresented minority at these top levels of higher education? What does it mean in terms of the politics?

Mentorship on racial/ethnic politics in academia was cited as a need by nearly all the postdoctoral scholars. Participants are generally optimistic about their ability to effectively manage these issues with guidance. Interestingly, only half of the postdoctoral scholars believe a mentor of color is essential in meeting this need.

The postdoctoral scholars are well aware that having a mentor of color in their engineering sub-discipline could be difficult since "there are so few." Dante noted that while he prefers a mentor with his shared background, he expects his mentor to "have a working knowledge of what it's like to be a minority in a predominantly White space." Similarly, Savannah shared, "I think someone who is honest with the landscape regarding pedigree, SES, gender bias, and racial bias but the race and gender [of my mentor] doesn't matter as long as they are aware that these things exist." In contrast, Hakim prefers a mentor of color

who could provide the strategic advice necessary to balance research, teaching, and service expectations, which he feels are more complicated for faculty of color. For instance, he desires support in knowing when and how to say "no" to service opportunities:

I think the pressure not to say no to overburdening yourself is there. I do. You want to do a good job, and you certainly don't want to be seen by your colleagues as someone who isn't willing to play ball, but yet in academia, time is finite, and you're still going to be held accountable for the research that you're not doing during that time.

As students and into their postdoctoral positions, most participants reported being generally aware of the racial/ethnic politics of higher education. However, as scholars of color, they believe they would benefit from more direct support in managing these realities.

Discussion

This phenomenological study (Moustakas, 1994) sheds light on the self-identified mentoring needs of Black and Latinx engineering postdoctoral scholars who aspire to the professoriate. Each is eager and committed to the mentoring opportunity offered by the AGEP Engineering Alliance and believes their mentors could elevate their potential for securing a tenure-track faculty position, which is their ultimate career goal. While all scholars intimated "getting into academia can be tough," they expressed a shared hope and belief that mentoring would neutralize this concern. Four themes emerged relative to postdoctoral scholar mentoring needs. Two primary themes related to immediate mentoring needs around obtaining a position in the professoriate: expanding their professional network and receiving support in being a competitive faculty applicant, and coaching on work-life balance. The two secondary themes presented as less urgent needs: enhancing and promoting their technical skills, and acquiring political guidance on racial/ethnic bias in academia.

The mentoring needs identified in this study coincide with and extend the scarce but growing literature for postdoctoral scholars of color (Faupel-Badger et al., 2015; Karalis Noel et al., 2021, 2022; Pyhältö, 2018; Rybarczyk et al., 2016; Scaffidi & Berman, 2011; Van Benthem et al., 2020; Yadav & Seals, 2019; Yadav et al., 2020). The participants see great value in expanding their professional network to prepare for the academic job search, as noted by Scaffidi and Berman (2011). Additionally, in their discussions on the need for coaching around work-life balance, they intimated mental health concerns such as burnout and stress, which have been found could be combatted by mentoring (Karalis Noel et al., 2022; Muñoz & Villanueva, 2022; Van Benthem et al., 2020; Yadav et al., 2020).

The postdoctoral scholars also shared an interest in continuing to develop their technical skills and having

their research expertise promoted, which is a significant benefit of mentoring (Burt, 2019; Faupel-Badger et al., 2015; Karalis Noel et al., 2021; Pyhältö, 2018; Scaffidi & Berman, 2011). All participants desire mentoring on navigating issues of racial/ethnic bias due to their experiences with microaggressions and discrimination as students and postdoctoral scholars, an all too prevalent theme in the literature (Eaton et al., 2020; McGee & Bentley, 2017; Mendez et al., 2022; Robinson et al., 2016; Yadav et al., 2020). These findings suggest mentoring for postdoctoral scholars is particularly beneficial when it is responsive to the unique, individual circumstances of the mentee and enhances their scholarly and technical skills, as well as their social and emotional development (Javier et al., 2021; Rybarczyk et al., 2016; Scaffidi & Berman, 2011; Van Benthem et al., 2020; Yadav et al., 2020).

The ideal mentoring model for postdoctoral scholars of color (Zambrana et al., 2015) was a useful tool for considering, organizing, and communicating ideas about the mentoring needs shared by the participants. While this model was initially conceived with the mentoring needs of faculty of color, this study indicates that the adaptation has merit with postdoctoral scholars. The themes aligned well with the four domains of the model: forging connections, encouraging scholarly opportunities, using a hands-on approach, and providing political guidance. The two primary themes relating to forging connections and a hands-on approach were linked to more immediate career acquisition needs and were of utmost importance to participants. Secondary themes aligned with scholarly opportunities and political guidance and were couched as less urgent despite the value attributed to them.

Implications

It is important to consider the ways in which higher education institutions may unequally distribute resources such as mentoring. The inability to address the unique mentoring needs of postdoctoral scholars of color may be key to understanding the persistently low numbers of faculty of color in academe. This supposition suggests a systematic change may be required in the postdoctoral training environment if their mentoring needs are to be effectively addressed and their professional growth advanced. Each participant had been in their postdoctoral position for at least six months, and their mentoring needs had not been attended to or even queried. If this practice continues, they likely will not receive the career support or professional development desired to move into the professoriate. If those next in line to successfully compete for a tenure-track faculty line do not receive sufficient mentoring, the structural systems of power in higher education will persist. If this is the case, the call to action to diversify engineering academia is going unheard.

This study also illustrates critical implications for postdoctoral offices, postdoctoral advisors, and postdoctoral scholars. Institutional-based mentoring programs offered

by postdoctoral offices and other entities may want to consider leveraging disciplinary alumni in government and industry to fill gaps in available academic mentors, as the identified mentoring needs are not all germane to the higher education context. Attending to mentoring matches that consider a mentee's demographic background is important because some participants intimated a desire for a mentor with a shared cultural background. Postdoctoral advisor mentoring training also may be warranted to increase awareness of the mentoring needs of their advisees and the value of querying them on needs distinct to individual circumstances. For instance, participants who are parents or in dual academic career-seeking households held unique work-life balance considerations. Similarly, some postdoctoral scholars could not articulate their mentoring needs, which may hinder them from receiving the career support required to achieve their career goals. Thus, training in this area is needed for postdoctoral scholars.

Future Research

A fruitful area for future research involves continuing to study the applicability and efficacy of the ideal mentoring model for postdoctoral scholars adapted from the research of Zambrana et al. (2015). It is also essential to discern whether a fundamental difference exists between supporting themes deemed primary and secondary by the participants. Does the provision of mentoring support in only the primary domains of forging connections and using a hands-on approach greatly outweigh the benefits of support in all four domains? In addition, identifying how mentoring in each area directly influences career trajectories, both positively and negatively, is important. Future exploration must investigate the differences in educational experiences between Black postdoctoral scholars who attended HBCUs as undergraduate and graduate students, as participants intimated less experience with negatively charged political climates and microaggressions. These scholars appear more optimistic regarding traversing future political hurdles and the racial/ethnic power dynamics in higher education. Participants who attended PWIs, particularly the Latinx postdoctoral scholars, had more experience with microaggressions and feeling tokenized, so they ascribed a greater need for support in this area because they were already wearied from their student experiences.

Conclusion

This phenomenological study (Moustakas, 1994) provides a deeper understanding of Black and Latinx engineering postdoctoral scholars' mentoring needs, particularly those that are unmet. While each of the four domains of the ideal mentoring model from the research of Zambrana et al. (2015) was acknowledged as a crucial area of need for engineering postdoctoral scholars of color,

the domains of forging connections and using a hands-on approach were assigned greater importance. Encouraging scholarly opportunities and providing political guidance were regarded as less urgent. Black and Latinx engineering postdoctoral scholars must be afforded the opportunity to expand their professional network and receive support in being competitive faculty applicants, obtain coaching on work-life balance, have their technical skills enhanced and promoted, and acquire political guidance on racial/ethnic bias in academia. Meeting these mentoring needs may contribute to more postdoctoral scholars of color successfully transitioning to faculty roles. Although the findings of this study are specific to the unique circumstances of the AGEP Engineering Alliance postdoctoral scholars and their mentoring needs, the goal of phenomenological research designs is to promote the transferability of findings to others with similar experiences. Readers are encouraged to consider the pertinence of these self-identified mentoring needs to other postdoctoral scholars and to subsequently make changes to the postdoctoral training environment.

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Sylvia L. Mendez is a professor in the Department of Leadership, Research, and Foundations at the University of Colorado Colorado Springs. She received a BA in Economics from Washington State University, a MS in Student Affairs in Higher Education from Colorado State University, and a PhD in Educational Leadership and Policy Studies from the University of Kansas. Dr. Mendez's research centers on creating inclusive higher education policies and practices that advance faculty careers and student success. She is engaged in several NSF-sponsored collaborative research projects focused on broadening participation and success in STEM academia.



Sarah E. Cooksey is a former Research Assistant and Lecturer at the University of Colorado Colorado Springs in the College of Education. She earned her BS in Psychology from Colorado State University, her MA in Special Education from the University of Northern Colorado, and her PhD in Educational Leadership, Research, and Policy from the University of Colorado Colorado Springs. Currently, Dr. Cooksey is an Assistant Director of Special Education in the Denver/Metro area. Her research interests include educational access and equity for marginalized populations and improving the special education experience and outcomes.



Kathryn Watson is a doctoral candidate in education leadership, research, and policy at the University of Colorado Colorado Springs. She earned her MA from Marist College in integrated marketing and her BA from Michigan State University in interdisciplinary social science and secondary education. She is also a graduate research assistant funded by the NSF-AGEP grant under the mentorship of Dr. Sylvia Mendez. This work focuses on diversifying the STEM pipeline, which Ms. Watson loves as she is passionate about reducing equity gaps in education.



Comas Haynes is a faculty member of Georgia Tech and former Joint Faculty Appointee at the Oak Ridge National Laboratory. His research includes modeling steady state and transient behavior of advanced energy systems, inclusive of their thermal management, and the characterization and optimization of novel cycles. Dr. Haynes has advised numerous, diverse research assistants and has received multi-agency funding for energy systems analysis and development. He also develops fuel cells and alternative energy systems curricula for public and college courses and experimental laboratories. Finally, he is the PI of multiple STEM diversity initiatives also funded by the National Science Foundation.



With more than 20 years of teaching experience that spans K-12 to higher education, **Dr. Tammy M. McCoy** is an engineer, a mentor, a people developer, a leader, and an encourager. Her educational values rest on the pillars of connecting, caring, cheering, and championing others to success. Dr. McCoy is currently the TA Development and Future Faculty Specialist in the Center for Teaching and Learning at Georgia Tech, where she also earned a Ph.D. and completed a postdoc in materials science and engineering. She holds a master's in materials engineering from Auburn University, and a bachelor's in mechanical engineering from Mississippi State University.



Canek Phillips is currently a Research Scientist with the George R. Brown School of Engineering at Rice University. He earned B.S. and M.S. degrees in Mechanical Engineering from Rice University and Colorado State University, respectively, and a Ph.D. in Engineering Education from Purdue University. Dr. Phillips' current interest is to use engineering education research that is attentive to the implications between labor and capital on educational outcomes to further the capacity of engineering programs to enroll and graduate students who reflect the nation's population and to teach students engineering in an inclusive manner to benefit all.



C. Fred Higgs III is the John & Ann Doerr Professor of Mechanical Engineering and a Professor of Bioengineering at Rice University, where he is also the Vice Provost for Academic Affairs. Since 2016, he has served as the Faculty Director of the Rice Center for Engineering Leadership. An Associate Editor for the *Tribology Transactions* journal, his research lab conducts computer modeling and experiments. A Fellow of ASME and AIMBE and a past winner of NSF CAREER and ASME Newkirk awards, Dr. Higgs has been the advisor to nearly 120 undergraduate, 20 masters, 20 doctoral, and 6 postdoctoral research students.



Ilyya V. Hicks is the professor and chair of the Computational Applied Mathematics & Operations Research Department at Rice University. He received a BS in mathematics (1995) from Texas State University and both an M.A. and Ph.D. in Computational and Applied Mathematics (2000) from Rice University. In terms of research, Dr. Hicks' interests are in combinatorial optimization, graph theory, and integer programming with applications in big data, imaging, social networks, political redistricting, energy, and logistics. He is an Institute for Operations Research and the Management Sciences (INFORMS) Fellow.



Dr. Natalie Arnett is an Associate Professor in both the Department of Chemistry at Florida A&M University and the Department of Chemical and Biomedical Engineering at the FAMU-FSU College of Engineering. Dr. Arnett received her BS in Chemistry from Grambling State University and her PhD from Virginia Tech. Dr. Arnett's research focuses on multifunctional polymers for various applications. She has been awarded numerous NSF awards, including CAREER, EIR, and PREM Seed awards. Her unique interest in growing students into researchers by strengthening their fundamental abilities to problem solve has stimulated her to promote pedagogical changes and establish collaborative programs.

