

Exploring the Benefits of a Community of Practice for Engineering Postdoctoral Scholars of Color (Research)

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Abstract

A descriptive phenomenological research design (Giorgi, 2009) explores the benefits of a Community of Practice (CoP) (Wenger, 1998, 2000; Wenger et al., 2002, 2011) for engineering postdoctoral scholars of color that resulted from a National Science Foundation (NSF) Alliances for Graduate Education and the Professoriate (AGEP) award. Ten participant interviews were analyzed inductively and deductively using Giorgi's (2009) five-step descriptive phenomenological data analysis process. The essential structure of the phenomenon was conceptualized as: Engineering postdoctoral scholars of color meaningfully engaging in a CoP bond through an empowered learning community of peers that nurtures feelings of belonging and provides strategies for a successful start to a career in the professoriate. Greater awareness of the personal and professional needs of postdoctoral scholars of color, and of ways to meet them, such as through CoPs, could pay dividends in retaining their talent in the academy and in supporting their transition to faculty roles. Implications for postdoctoral scholar program designers and higher education leaders are included.

Introduction

A descriptive phenomenological research design (Giorgi, 2009) was employed to explore the benefits of a Community of Practice (CoP) (Wenger, 1998, 2000; Wenger et al., 2002, 2011) for engineering postdoctoral scholars of color that resulted from a National Science Foundation (NSF) Alliances for Graduate Education and the Professoriate (AGEP) award (which was terminated in 2025 under the Trump administration). The AGEP award was designed to develop, implement, study, evaluate, and disseminate a model focused on the career development of engineering postdoctoral scholars of color aiming to enter tenure-track faculty positions. A career development model was co-constructed with the AGEP Alliance participants, employing a culturally responsive, asset-based approach consisting of a series of professional development enrichment sessions. Sessions included topics on the tenure-track faculty hiring process, grant writing, entrepreneurship, and more nuanced topics such as parenting in academia. These sessions, led by the AGEP Alliance PIs, capitalized on the shared racial/ethnic identities and career goals of the postdoctoral scholars, as well as their desire for peer connections.

When COVID-19 shut down campuses across the U.S. in Spring 2020, monthly wellness check-ins were added to the enrichment series. Unknowingly, this added focus on personal wellness ushered in a transition from an identity-based group to a CoP (Wenger, 1998, 2000; Wenger et al., 2002, 2011), as the check-ins led to more intentional promotion of social-emotional support, resource sharing, and collaborative problem-solving. While the concept of CoPs has evolved, three core components continue to define it:

1. Domain: The shared identities and goals that bring a community of people together;
2. Community: The relationships and connections built through communal dialogue and collaboration; and

3. Practice: The collective knowledge and resources that advance and reflect the lived experience of the community.

It is important to note that an identity-based group is formed around shared characteristics, such as race and/or gender, to provide support and community to its members. The transition into a CoP occurs as the focus shifts from shared identities and interests to collaborative practices that leverage collective knowledge in a specific field, with skill development, professional growth, resources, and connections at the center (Hoadley, 2012; Suh & Jensen, 2020). All CoPs are identity-based groups, as members share identities within the domain component, which can be defined by demographic indicators, but may also be defined by profession or expertise (Hoadley, 2012; Wenger et al., 2002, 2011). However, to be a CoP, the group's focus must be on enhancing professional practice, knowledge, and skill development through the lived experience of the community. Through interviews with the AGEP Alliance participants, the benefits of the CoP were explored. Awareness of their support needs may be instructive to postdoctoral affairs staff and postdoctoral advisors seeking to ensure a productive and satisfying postdoctoral experience and seamless career advancement.

Brief Literature Review

The need and desire for a peer community amongst postdoctoral scholars of color is well documented in the literature (Faupel-Badger et al., 2015; Pyhältö, 2018; Rybarczyk et al., 2016; Scaffidi & Berman, 2011; Van Benthem et al., 2020; Yadav & Seals, 2019; Yadav et al., 2020). With under 5% of engineering postdoctoral scholars identifying as Black, Latinx, or Indigenous, their scholarly lives can be quite isolating (Wilson, 2020). Isolation coupled with experiences of invisibility, marginalization, microaggressions, and blatant bias in the academy can be wearing on their personal and professional endeavors (Brockman et al., 2022; Karalis Noel et al., 2022; McGee & Bentley, 2017; Mendez et al., 2023; Robinson et al., 2016; Yadav et al., 2020). Postdoctoral scholars of color often report feelings of “onlyness” and express a yearning for belonging, social identity, and professional growth during their postdoctoral appointment (Karalis Noel et al., 2022; Mendez et al., 2023; Mendez et al., 2024; Yadav et al., 2020).

Black and Latinx undergraduate and graduate students can often turn to identity-based organizations like the National Society of Black Engineers (NSBE) and the Society of Hispanic Professional Engineers (SHPE) to honor their racial/ethnic identities and enhance their personal, professional, and intersectional identities. However, for postdoctoral scholars of color, with their numbers being so low, it can be much more challenging to make those kinds of organized peer connections within their institution. In fact, Yadav and Seals (2019) argued that higher education institutions must provide these disciplinary socialization support systems for postdoctoral scholars of color to ensure their successful transition to faculty positions. Career development mentorship and tailored programming are critical features for these support systems (Brockman et al., 2022; Karalis Noel et al., 2022; Pyhältö, 2018; Mendez et al., 2023; Mendez et al., 2024; Rybarczyk et al., 2016; Scaffidi & Berman, 2011; Yadav et al., 2020). Additionally, institutions that invest time and effort in building postdoctoral networking opportunities foster a strong sense of belonging (Yadav et al., 2020).

Methodology

Research Design. A descriptive phenomenological research design (Giorgi, 2009) was employed to explore the benefits of a CoP through interviews with 10 Black and Latinx engineering postdoctoral scholars involved in the AGEP Alliance. Wenger and colleagues' (Wenger, 1998, 2000; Wenger et al., 2002, 2011) conception of a CoP served as the conceptual framework guiding this study. The research question guiding this study was: What benefits were accrued for engineering postdoctoral scholars of color engaging in a community of practice?

Participants. A total of 10 postdoctoral scholars of color were recruited and interviewed for this study. All participants were invited based on their involvement in the AGEP Alliance. All were from one of three higher education institutions located in the South. One of the institutions is a Historically Black College or University (HBCU) classified as a doctoral university with high research activity (R2). Another is a predominantly White institution (PWI) classified as a public doctoral university with very high research activity (R1). The final institution is a private R1 and a PWI. The sample comprised five women and five men, all of whom self-identified as Black or Latinx. They hailed from various engineering disciplines, including aerospace, agriculture, biomedical, chemical, and mechanical. Pseudonyms were used to protect their identity; the pseudonyms are not linked to their higher education institution, race/ethnicity, or engineering sub-discipline. This was done to limit identification, as only a few Black and Latinx engineering postdoctoral scholars are employed at these institutions in these disciplines.

Data Collection. After completing the Institutional Review Board approval process, each participant received an email with an informed consent form detailing the study and interview procedures. They were informed that the interview aimed to learn about their postdoctoral experience and to identify ways to improve it through the AGEP Alliance. The interviews were conducted one-on-one via web conferencing and lasted approximately one hour. Participants were compensated with \$50 for their time. The interview questions covered a variety of topics. However, this study focused on their engagement with the AGEP Alliance and the benefits of participating in Alliance activities. After each interview, the web conferencing platform generated a transcription. All recordings were permanently deleted once transcriptions were reviewed and cleaned for errors and identifying information.

Bracketing and Positionality. To effectively employ a descriptive phenomenological research design, the research team first engaged in phenomenological reduction through bracketing (Giorgi, 2008). This entailed a collective discussion of our prior knowledge of the benefits of engineering postdoctoral scholars of color engaging in community-building activities. It was imperative to expose our thoughts, feelings, and experiences to minimize bias in the data analysis process. This led us to understand that what was built was more than an identity-based group—it was a CoP. The makeup of our research team shaped this understanding, as some had the same lived experience of serving as engineering postdoctoral scholars of color, while others had experience participating in CoPs through their own education and training. Additionally, Lincoln and Guba (1985) contended that researchers must disclose their positionality, so readers know the unique perspectives they bring to the study. The research team included a diverse group of women and men with academic backgrounds in educational leadership or engineering. All are engaged in engineering education research, with a particular focus on increasing diversity in the

engineering professoriate and expanding success in engineering academia. Additionally, all were involved in the AGEP Alliance as PIs, social science researchers, or evaluators.

Data Analysis. Interviews were analyzed inductively and deductively using Giorgi's (2009) five-step descriptive phenomenological data analysis process: (1) sense of the whole, (2) meaning units, (3) transformation, (4) structure, and (5) essential structure. To begin, three of the researchers read the interview transcripts several times to gain a *sense of the whole* of the interviews. In the second step, each researcher developed *meaning units* independently by defining segments of the data, yielding 22 meaning units. *Transformation* occurred by converting meaning units into higher levels of meaning through imaginative variation, with contextual factors considered to better understand participants' words and expressions. The three components of CoPs (domain, community, and practice) were reviewed as another analytical lens to transform the meaning units. In the fourth step, *structure* was achieved by consensually identifying the shared constituents of the CoP's benefits. Two constituents emerged: (1) The CoP responded to participants' desire for peers with similar backgrounds and interests in academic careers to combat feelings of isolation through collaborative learning, and (2) The CoP activities centered on strategies for career advancement and navigating racial/ethnic bias in the academy by leveraging collective knowledge and resources. The fifth step involved specifying the *essential structure* of the phenomenon, which entailed collectively clarifying the relationship of the constituents. The essential structure was conceptualized as: Engineering postdoctoral scholars of color meaningfully engaging in a CoP bond through an empowered learning community of peers that nurtures feelings of belonging and provides strategies for a successful start to a career in the professoriate.

Validity and Rigor. Sundler et al. (2018) highlighted the importance of addressing issues of validity and rigor in descriptive phenomenological studies by upholding reflexivity, credibility, and transferability. Reflexivity through bracketing and the involvement of several researchers in the study allowed for continuous, critical reflection of the constituents and the essential structure. Credibility was achieved by following Giorgi's (2009) data analysis strategy to ensure the process was transparent and accounted for the wholeness of the data rather than confirmation bias. To ensure transferability, participant quotes were used to provide rich descriptions of the benefits of the CoP and to bolster the "relevance, usefulness, and meaningfulness" (Sundler et al., 2018, p. 737) of the essential structure to other contexts.

Limitations. As with all research inquiries, this study has a few limitations. First, all postdoctoral scholars who participated in the study were involved in the AGEP Alliance, which suggests their viewpoints and experiences may not be transferable to others in different programs and contexts. The study exposed researcher bias through bracketing and positionality, but its potential to influence the findings and interpretations cannot be guaranteed. While the research team possessed a balance between "insiders" (those with the same lived experience of serving as engineering postdoctoral scholars of color) and "outsiders," our positionality within the AGEP Alliance may cloud our ability to be neutral about the benefits that accrued from the CoP.

Findings

Theme 1: The CoP responded to participants' desire for peers with similar backgrounds and interests in academic careers to combat feelings of isolation through collaborative learning.

Each AGEF Alliance participant expressed a desire to connect with peers seeking to enter the professoriate. Joaquin shared, “I always want to connect with others and see what their experiences have been. It was a good group of minority postdocs sharing their experience at different stages of their research or faculty applications. So that gave me a little bit of a sense of community, even though we were in different places, we were all on the same journey.” Similarly, Haakim said, “What I took away from [the AGEF Alliance] was sort of a sense of community...that was for me the principal value...I really wanted to have a community of postdocs outside of my department.” Beyond developing a sense of community through the AGEF Alliance, participants reported learning from one another. Martin said, “Having group discussions, sharing with other people your career goals, and talking to people in different stages, I think that was good insight as to what I should be doing; it definitely felt like we were a community of postdocs who cared about each other's success.” Several AGEF Alliance participants also shared that the PIs were integral to their learning. Tamika indicated, “I enjoyed [the check-ins] because we could give updates and other scholars could say, well, I’m having similar issues, and this is what I did. And then you could also get feedback from the PIs in the chat or in the group, and they could help you solve issues.”

All AGEF Alliance participants also spoke about isolation during their postdoctoral appointments. Miranda said, “I think it hit me when I saw so few of us, how isolating it can feel. Like, wow, we’re in the Deep South, and I’m one of four postdocs that qualify for [the AGEF Alliance]. That’s terrible.” Evalyn shared, “My position was naturally isolating, because I was working on curriculum directly with faculty...I had done enough sort of research about postdocs and graduate student experiences to know I needed a network of support to deal with the isolation.” Even in larger, more diverse engineering disciplines, postdoctoral scholars reported little intentionality on the part of departments or postdoctoral advisors to create connections among postdoctoral scholars. Carlos indicated, “So I guess isolation is another part of being a postdoc...even though there were other postdocs brought in with me, there wasn’t much of an emphasis on putting us together.” Likewise, Brian shared, “I feel like I know more than I would have if I wasn’t part of AGEF. If I just been a postdoc that wasn’t part of any group or any kind of meeting and I was just in a lab, I would have felt more alone.” Each shared a deep appreciation for the opportunity to build a peer network of postdoctoral scholars of color to reduce the isolation they were experiencing and to learn from one another.

Theme 2: The CoP activities centered on strategies for career advancement and navigating racial/ethnic bias in the academy by leveraging collective knowledge and resources.

The AGEF Alliance participants spoke of the tangible guidance they received about the faculty job market. Brian said, “There’s been a lot of forums about academic job searches, how it works, how to do an interview, how the interview process goes, writing, resume workshops, there’s just been a lot of useful forums. They gave me a good outlook on how search committees look when they’re trying to hire, and just understanding the process.” Aisha emphasized some of the nuanced issues in the hiring process that were discussed, like negotiating a start-up package,

which she had not thought about before: “[The AGEPIs] would talk to us about how to negotiate for a faculty position. It wasn’t just always about the salary; you have to think about your start-up.” Haakim shared the hands-on approach of the AGEPI Alliance PIs when he was negotiating his faculty offer, “[The AGEPIs] helped me negotiate my startup package, in terms of looking it over and looking at the proposal that I’d put together and helping me make some adjustments about how to handle communication...they helped me to learn to advocate for myself.” Most credited the enrichment sessions and wellness check-ins with putting them on the pathway to success in their next academic career step.

Beyond the nuts and bolts of understanding the faculty search process, the AGEPI Alliance participants spoke of the valuable dialogue that emerged as they considered ways to navigate racial/ethnic bias in the academy. Savannah said, “Mentors that came in and were not afraid to talk about that intersection of race and their experiences with biases. And so because they were more open...you were more willing to talk about your experiences and to see whether or not the patterns persist. And 9 times out of 10, the person who may be 30 years older than you, experienced some of the same things, which is really sad. But it was eye-opening about ways to combat these biases and keep on your trajectory.” Similarly, Haakim shared, “I think it just told us that we weren’t alone in navigating those biases. Sometimes, what will happen is that you kind of believe that maybe the biases don’t really exist to the extent that they do. I mean, there’s a strong motivation from the majority to basically dismiss it for human reasons, to believe it doesn’t exist. And so validation doesn’t make it necessarily that much easier to deal with, but knowing other people have successfully navigated it, you know you can too, or at least be better prepared for it.” Joaquin also discussed the subtle biases that can bubble up, “I feel like the days of like PI’s being openly racists, or like xenophobic, are not here anymore...it’s more about how to deal with implicit biases that people have and whatnot and those discussions were helpful in case something happened to you, and you didn’t realize it because it was subtle.” The Alliance participants were grateful to have these conversations in a “safe space” and discuss strategies for contending with bias in the academy with those with a personal understanding of that lived experience.

Discussion

Understanding the benefits that postdoctoral scholars of color accrued from participating in a CoP is critical to creating effective support systems for those interested in pursuing tenure-track faculty positions. Sharing the insights and viewpoints of postdoctoral scholars of color through a descriptive phenomenological research design (Giorgi, 2009) illuminated the essential structure of the phenomenon: Engineering postdoctoral scholars of color meaningfully engaging in a CoP bond through an empowered learning community of peers that nurtures feelings of belonging and provides strategies for a successful start to a career in the professoriate. These findings highlight the power of CoPs versus identity-based groups. Bringing people together around shared identities and goals can be limiting if the group does not evolve into an authentic community of learners that leverages lived experience for the common good. It was clear that the AGEPI Alliance participants were learning from one another and from the PIs while sharpening their professional practices.

The findings of this study align with research on the importance of a peer community for postdoctoral scholars (Faupel-Badger et al., 2015; Pyhältö, 2018; Rybarczyk et al., 2016; Scaffidi & Berman, 2011; Van Benthem et al., 2020; Yadav & Seals, 2019; Yadav et al., 2020). It also highlights that fact that while isolation during postdoctoral appointments has been identified as a problem, it remains a persistent area where focused attention is needed by postdoctoral affairs staff, postdoctoral advisors, and postdoctoral scholars themselves, particularly for those underrepresented in academic spaces (Brockman et al., 2022; Karalis Noel et al., 2022; McGee & Bentley, 2017; Robinson et al., 2016; Yadav et al., 2020). Last, career development mentorship and programming remain an essential component to supporting career advancement to the professoriate, as found by others (Brockman et al., 2022; Karalis Noel et al., 2022; Pyhältö, 2018; Mendez et al., 2023; Mendez et al., 2024; Rybarczyk et al., 2016; Scaffidi & Berman, 2011; Yadav et al., 2020).

Implications. This study holds important implications for postdoctoral scholar program designers and higher education leaders. Embedding CoPs within existing institutional structures, such as postdoctoral affairs offices or disciplinary-specific programming, adds a layer of intentionality to capitalizing on collective knowledge, resources, and participant lived experience. It is not enough to bring people together with shared identities and career advancement goals; connections must be built through dialogue and collaboration. Institutions may strengthen participation in CoPs by formally recognizing involvement through annual review processes, merit pay structures, or micro-credentialing and badging systems. A key element of the AGEP Alliance was its cross-institutional network, in which CoP participants began to understand the universality of their lived experience and make connections with postdoctoral scholars, early-career faculty, mentors, and the AGEP Alliance team across institutions. Thus, designing CoPs with that in mind could be critical to success. It is also imperative to assess CoP participants' experiences on measures such as retention, sense of belonging, and career progression, and to create opportunities for reflection. The AGEP Alliance participants appeared to fully recognize the CoP's need, value, and impact on their postdoctoral experience and career trajectories when asked to reflect on them during the interview process.

Future Research. Future research is warranted on how CoPs can be responsive to participants' evolving roles. For example, while the AGEP Alliance was geared toward meeting the professional (and later personal) needs of postdoctoral scholars, many still participated as early-career faculty. Their participation was cited as helpful to those in their postdoctoral appointments, as described by Aisha: "Eventually, some were getting jobs, so the monthly check-ins became about how the new job was going...that was really good, and they were able to actually talk about some of the things they would have done differently. So, for those not yet in the job market, that was helpful." Learning how the CoP could intentionally expand to meet a variety of career needs, and why early-career faculty continued to participate, could strengthen understanding of the benefits accrued.

Conclusion

This descriptive phenomenological research study (Giorgi, 2009) extends the literature on the postdoctoral experience. The findings reveal that engineering postdoctoral scholars of color who meaningfully engage in a CoP bond through an empowered learning community of peers that

nurtures feelings of belonging and provides strategies for a successful start to a career in the professoriate. Greater awareness of their personal and professional needs, and of ways to meet them, could pay dividends in retaining the talent of postdoctoral scholars of color in the academy and in supporting their transition to faculty roles. They are well-positioned to take this next career step, but structured support, such as through a CoP, is vital.

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