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Dilara Yaya-Bryson

Lisa Merriweather

Marah Lambert

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Author Information

Dilara Yaya-Bryson, Lisa Merriweather, Marah Lambert, Cathy D. Howell, and Edith Gnanadass

**Culturally Liberative Mentorship:
Developing Agents for Change in STEM Doctoral Education**

**Dilara Yaya-Bryson¹, Lisa R. Merriweather¹, Marah Lambert², Cathy D. Howell¹,
and Edith Gnanadass³**

¹Educational Leadership, University of North Carolina at Charlotte, NC, USA

²Educational Research, Measurement, and Evaluation, UNC Charlotte, NC, USA

³Leadership, University of Memphis, TN, USA

Abstract

This mixed-method study explores the perceptions and experiences of STEM doctoral faculty regarding their cross-cultural mentoring practices. Researchers highlight implications for faculty development in higher education settings.

Keywords: STEM doctoral mentoring; culturally liberative mentoring; critical race theory; mentoring; adult education; bioecological theory

This research explored faculty perceptions and experiences regarding mentoring racially minoritized doctoral students in Science, Technology, Engineering, and Mathematics (STEM) fields to understand the knowledge gap around culturally liberative (CL) mentoring practices.

Literature Review

Racially minoritized students (African American, Latine American, Native American, Native Pacific Islander, Native Hawaiian, and Native Alaskan) as named by the National Science Foundation (NSF) have been historically underrepresented within the STEM fields. According to recent data, they represent only 10.8% of full-time enrollment in STEM doctoral programs (NCSES, 2023). This low enrollment rate and subsequent matriculation rate suggest the presence of systemic inequities and barriers (McGee, 2019). Of those who persist in graduation, few pursue academic careers, preferring a career in industry (Hiraldo, 2010). In the long run, this prevents the STEM academic context from being more diverse and inclusive. Challenging these issues within higher education requires a collective effort to improve understanding and practice at the policy and institutional levels. Faculty, as a fundamental stakeholder group, play a pivotal role.

Doctoral education is a significant time and energy investment for students and is necessary to pursue careers requiring advanced terminal degrees. Ideally, students and their faculty mentors collaborate in a reciprocal alliance to support personal and professional growth. Effective mentorship involves not only ensuring the student is meeting the program requirements but also providing career and psychosocial support with cultural awareness (Dahlberg et al., 2019; Merriweather et al., 2022). From this point of view, faculty doctoral mentorship is a fundamental component of doctoral students' success and well-being. However, literature indicates that racially minoritized STEM doctoral students receive less effective mentorship compared to White Americans, as well as some Asian American population groups (Dahlberg et al., 2019; Howell et al., 2021).

Considering the extant literature, radical changes are needed at the individual and institutional levels in the higher education context. Mentoring practices require both cognitive and behavioral change to a more holistic, humane, and inclusive mentoring practice (Merriweather et al., 2022).

Theoretical Framework

Guided by critical race theory (CRT) and Bronfenbrenner's bioecological theory (Bronfenbrenner & Morris, 2007), this research asserts that faculty development can catalyze a more inclusive and equitable STEM doctoral education context. Critical race theory provides a framework for unpacking racialized experiences within mentoring relationships, emphasizing the importance of challenging systemic structures of oppression (Hiraldo, 2010), while bioecological theory considers human development and learning in an interactive, social, contextual, and holistic way instead of in isolation. With the help of these theories, this study explored STEM faculty's cross-cultural mentoring experiences..

Methodology

Researchers conducted a mixed-methods research design to explore the perceptions and experiences of STEM doctoral mentoring from the perspective of STEM faculty. Quantitative data were collected through an online survey that utilized an adapted version of the Mentoring Competency Assessment-MCA (Fleming et al., 2013) and Cross-Cultural Mentoring Inventory-Revised – CCMI-R (LaFromboise et al., 1991). The MCA included items to understand faculty perceptions of quality mentor-mentee interactions and the CCMI-R included items on cross-cultural competency.. In addition, researchers collected qualitative data through semi-structured interviews with a subset of nine faculty members, allowing for a deeper exploration of mentor/mentee dynamics from the faculty perspective. The interview data was analyzed with thematic analysis (Clarke & Braun, 2017): first, coding the data by capturing the smallest and most interesting units to the research questions; then identifying patterns within the codes, and finally interpreting the patterns to develop relevant themes (Clarke & Braun, 2017).

Faculty members participated in the present research from three public universities in the southeastern region of the US; two of which were Predominantly White Institutions (PWI), and one was a Historically Black College or University (HBCU). Survey data was collected from 144 STEM faculty members with the majority being White, non-Hispanic men. Because the present study is part of an ongoing project, the qualitative sample was limited to nine faculty members with three interviews randomly chosen from each university to increase the representation.

Findings

The results of the survey data from 144 faculty members indicated that the respondents perceive themselves as moderate to highly skilled in both their mentoring competency skills ($M=5.3$, $SD=.81$, on a 7-point Likert scale) and cross-cultural mentoring skills ($M=4.8$, $SD=.6$, on a 6-point Likert scale). In addition, thematic analysis of the interview data results revealed two themes: *mentoring as a holistic effort to support professional independence* and *barriers hindering the DEI practices in STEM doctoral programs*. This paper focuses on the latter, which revealed two sub-themes: faculty-centered barriers and institutional barriers.

Faculty-centered barriers: Upbring, awareness, preparedness, and resistance

Interviews with the faculty members indicated that their perceptions and experiences are not distinct from their worldviews, upbringing, and efforts. Most faculty members mentioned that although their mentoring practice is a work in progress, their cultural background and upbringing have much to do with their implementation. For instance, two international faculty members discussed their effort to learn more about their mentees' cultures and be sensitive to prevent a potential disconnect due to a culture clash. On the other hand, domestic faculty members' answers implied that their upbringing, gender, and age could predict their interactions with their doctoral mentees, especially the ones who grew up in homogenous, white domestic families. Many mentioned how they grew up thinking culture is not and should not be a problem

because everyone is similar and there is only one race. These explicitly color-blind ideas could easily build invisible walls between the faculty members and their students who do not share the same cultural background.

If you asked my students, you could very well get a different answer. But I don't feel like I've ever had a barrier that was a cultural difference. I don't know that I ever treated anyone differently based on a real or perceived cultural difference. It's never really been an issue from my perspective, but I'm a white male. Maybe I'm brought up to feel that it's not going to be an issue. I don't know. (Aidan)

Results also showed that culture is understood and interpreted as a vague concept. Several faculty members associated “cross-cultural” experiences mainly with international students. One faculty member even referred to their interdisciplinary collaborations as cross-cultural interactions.

In addition to the upbringing and conceptual confusion around culture, the findings indicated that the majority of the faculty members were not trained to be doctoral mentors and did not feel prepared to mentor racially minoritized students. Eugene said “maybe if I got some skills, I can improve the efficiency, but I don't know. I never get the training, so I don't know what... skills can ... improve the efficiency.”

On the contrary, one faculty member praised their departmental mentoring support, especially during the first years of assistant professors’ tenure. This department provides mentoring in research and teaching as well as co-advising roles for mentoring doctoral students. This way, a less experienced professor could shadow a more senior professor to learn the doctoral mentoring process. Although this is an excellent example of departmental support, the remaining eight faculty members within the sample did not mention any similar practice. Further, the respondents who perceived their mentoring skills as adequate mainly emphasized the importance of years of experience.

We're up to our own individual expertise. So definitely quite limited starting off, especially from the personal one-on-one interaction parts. I learned a lot by having students that had concerns, troubles, hindrances. I learned by responding to those and not having any preparation for how to deal with them whenever they actually happened. (Mark)

Lastly, the faculty responses revealed a lack of interest and awareness about the professional development opportunities as a means of improving the effectiveness of their cross-cultural doctoral mentoring efforts, particularly with racially minoritized students.

Several interviewees stated that they were not aware of whether their institution provides mentoring training. One faculty member also shared their concern about their colleagues’ resistance to professional development:

I feel the overwhelming majority of faculty would resist being told they had to receive mentorship training, particularly I think the resistance would go up exponentially with how poor of a mentor the faculty member really is. In fact, last month a couple of these workshops were introduced, and I said can we make faculty go to them, and the answer was basically no, we cannot. (Aidan)

Overall, faculty-centered barriers appeared to be relevant to their cultural background, lack of understanding, interest, and preparedness for cross-cultural doctoral mentoring. However, these results cannot be interpreted in a vacuum because these perceptions and experiences are also shaped according to their larger context, including their department and institution. The next theme explains the faculty members’ experiences in this larger context.

Institutional barriers: Policies, recruitment, faculty hires, and financial restraints

In addition to individual factors, the faculty interviews revealed that they experience institutional barriers that prevent them from effectively serving in cross-cultural mentorships. They attributed these barriers to both the departmental and larger university contexts. When it comes to departmental issues, some of the faculty members highlighted the need for clear graduate faculty policies that are applicable to diverse student groups. Eugene mentioned how difficult it is to adjust the existing policies when all the students come from different backgrounds and have different needs:

For example, if the faculty only has international student[s], [and] other faculty has many students from different culture[s]. You have to treat them differently. If you use the one policy to treat everyone the same, for the faculty there's no issue, but for the student maybe there are some problems. (Eugene)

Findings around institutional barriers indicate that research performance is the primary focus at the department level, disregarding the importance of DEI and effective mentoring practice. Relatedly, a faculty member stated that whenever students come up with certain needs or concerns, departmental strategies tend to be reactive instead of proactive:

that's more focused on how to write grants and maybe how to attract some students to the lab, and not really about a sustained mentoring program or strategy. It's primarily responsive to problems typically or to challenges. And not about being proactive. (Mark)

The lack of proactive policies and practices to support racially underrepresented students could also be explained by the relatively low enrollment rates. Two faculty members underlined the lack of diversity in their doctoral student enrollment, and most of the diversity is sourced from international student recruitment. Mark said, "I think part of that has also been that we've had historically a pretty low diversity program. And where we have had cultural diversity, it's been primarily from international students." This finding aligns with the nationwide enrollment rates of racially minoritized doctoral students in STEM fields.

Two faculty members brought up implications about the faculty hiring processes, underscoring the importance of diversifying the faculty hires. One of the professors was at an HBCU, and they argued how lacking diverse faculty defeats the purpose of being an HBCU. They said more diverse faculty positions mean more research and more doctoral students.

The last institutional barrier was attributed to the scarcity of financial resources within higher education institutions. The same HBCU professor, William, also pointed out the unfair funding competition in the nation, saying, "I don't have really too much support, but these big universities have everything at their own discretion. So, in some way, the university has to support, make funds available for students." Financial resources are one of the fundamentals for keeping a sustainable research agenda and assuring financial security for doctoral students. When the competition is not equitable, and there is not enough funding, recruiting doctoral students becomes almost impossible. Relatedly, Eugene said:

Domestic students also have some problem from their financial standpoint. For example, they say, 'Okay, right now I have pressure, like I need to work, and I need to pay my student loans, so I don't have much time on my study.' So, I have to try to help them in those aspects too.

Several other faculty members also stated similar concerns about assuring financial security for their students because most students already come with the financial burden of previous student loans and familial responsibilities. Thus, when the stipend stays small, student attrition becomes more expected due to more intriguing offers from industry. To sum up, the

results indicate that institutional barriers include a lack of inclusive policies, a lack of diverse faculty hires, mostly internationally diverse student recruitment, challenges when competing for national grants, and concerns about assuring doctoral students' financial stability through internal and external funds.

Implications and Conclusion

In light of these results, this research conveys significant implications for academic institutions, faculty development, and policy implementation. The findings highlight the importance of intentionally fostering a culture of inclusivity and equity within STEM doctoral education through supporting faculty development on culturally liberative practices and policies. Liberative refers to “any theory, action, or effort contributing and related to bringing justice in the world. It requires one to intentionally and actively change the status quo to bring positive change to result in justice” (IGI Global, n.d., para 1). Culturally liberative practices and dispositions are action oriented and reflexive. With liberation from culturally repressive mindsets being paramount to such practices, multidimensional and ongoing education is required. Providing the faculty with resources and training to advance their understanding beyond skill development that resides at the micro level of the bioecological model (Bronfenbrenner & Morris, 2007) is necessary for mentoring doctoral students within cross-cultural mentorships (Merriweather et al., 2023; Sanczyk et al., 2020). These findings are consistent with CRT and the bioecological model in this regard as they recognize that if the problem has racialized undertones that are supported by macro levels systems, then remedies must also be constructed within that sphere. That is institutional and societal structures are also subject to liberative actions. Creating a faculty development plan covering topics such as *cultural competence*, *implicit bias awareness*, *effective communication*, and *strategies for tailoring individualized mentoring plans* according to students' unique needs can contribute to effective and culturally liberative mentorship practices at the micro level but macro level change necessitates challenging institutional and societal barriers. Widespread culturally liberative mentoring practices hold widespread promise success among racially minoritized STEM doctoral students. Other macro level recommendations include 1) institutionalizing ongoing culturally liberative mentorship training programs for faculty development, 2) incorporating mentoring as a metric in faculty evaluations, and 3) establishing brave and transparent spaces to discuss the issues of race and equity within cross-cultural mentoring relationships will ultimately contribute to a more diverse and thriving STEM academic community.

Acknowledgment This material is based upon work supported by the National Science Foundation under Grant Nos. 1820536, 1820538, and 1820582. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation

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