

# Examining the Scene: How Race Matters in STEM Doctoral Education at an HBCU

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## Introduction

Historically Black Colleges and Universities (HBCUs) have with intentionality provided education for Black Americans for nearly 185 years (Joseph, 2013; Lovett, 2011; Toldson, 2018; Upton & Tanenbaum, 2014). Their development was out of necessity due to the anti-Black sentimentality of society at large, that believed in the inferiority of Black people and subsequent labeling as uneducable. Prejudice, discrimination, and hate codified by law and custom resulted in most Historically White Institutions (HWI, also referred to as Predominately White Institutions – PWIs) not accepting Black students, consequently few Black Americans were recorded as attending or graduating from college (Lovett, 2011). Prior to 1837, when Cheyney University was founded by Richard Humphreys in Pennsylvania, few attended HWIs. John Chavis was the first African American to attend college in 1799. Alexander Lucius Twilight was the first recorded African American graduate in 1823 graduating from Middlebury College, and almost 40 years later in 1862, Mary Jane Patterson earned the distinction of being the first Black American woman bachelor degree holder when she earned her degree from Oberlin College.

In 1854 Lincoln University became the first HBCU to have college degree-granting status. Since then the number of HBCUs has waxed and waned with at least 120 existing in the mid-20th century, most located in the South. Interestingly, the first HBCUs were located in the North. Atlanta University (now known as Clark-Atlanta University) and Shaw University were the first southern-based HBCUs, each opening in 1865. The first HBCU to award graduate degrees was Atlanta University. Currently, 99 HBCUs are in operation (National Center for Educational Statistics [NCES], n.d.) with 38 offering doctoral degrees.

In the earliest days, HBCUs provided basic education as opposed to college curriculum in response to the immense needs born from the lack of education provided to and available for free Black Americans (Lovett, 2011). With each passing decade, HBCUs diversified their degree offerings to include doctoral education. Their population demographics shifted as well from all or nearly all Black to a diverse student body with nearly 25% being international and non-Black students (NCES, n.d.). The majority of students, particularly at the undergraduate

level across academic disciplines, are still domestic Black students, but at the doctoral level in Science, Technology, Engineering, and Mathematics (STEM) fields, they are not as well represented. This remains true of the faculty as well. Many HBCUs historically were staffed by majority White faculty and administrators (Dawson-Smith, 2006). For example, Howard University was founded in 1867 but the first Black president, Mordecai Wyatt Johnson, was not appointed until 1926. It was after this that the demographics of faculty and administrators shifted at most HBCUs from predominately White to predominately Black (Dawson-Smith, 2006). Even with Black faculty occupying approximately 60% of faculty positions at HBCUs in our contemporary times, White, Asian, and international faculty have a solid presence (Gasman, n.d.), especially in STEM departments.

## Problem Statement

HBCU faculties have greater diversity than HWIs overall but their STEM departments are often characterized by their lack of diversity, especially in terms of domestic racially minoritized people groups. This is not surprising as only 5% of STEM doctorates are held by Black students (Ladyzhets, 2020) and doctorates are required credentials for full-time tenure-track faculty at most institutions.

HBCUs represent 3% of US universities, have smaller enrollments, and operate with smaller budgets (Allen et al., 2020; Toldson, 2018). Of the 5% of Black STEM doctorate holders, HBCUs awarded either the bachelor's or master's degree to 30% (NSF, 2020), graduating 10% of all Black STEM doctorate holders (Allen et al., 2020). HBCUs' role in cultivating talent in STEM is undeniable as they have played a pivotal role in contributing to the development of Black scientists with doctoral degrees.

This is accountable in part to how staff and faculty at HBCUs have created an undergraduate environment that embraces culture and enables emotional support for their students, affirming student identity (Lovett, 2011) helping to account for their success at the undergraduate level. Gasman and Nguyen (2014) called it the HBCU educational approach which Rankins (2019) described as “embody[ing] the best practices for educating students who are marginalized in other learning environments” (p. 50). Further, Upton and Tanenbaum (2014) found

that HBCUs “better foster[ed] academic and social integration in science and engineering among Blacks than PWIs” (p. 10). HBCU undergraduate environments when juxtaposed against HWIs were characterized as more supportive, welcoming, and nurturing with stronger relationships with faculty and peers, resulting in a sense of belonging and increased social capital (Joseph, 2013; Newsome, 2021; Upton & Tanenbaum, 2014). The differences were both structural in terms of practice and policy with HBCUs having more communalistic hues (Newsome, 2021). The HBCU undergraduate experience has been well documented but fewer have explored the doctoral experience (Palmer et al., 2016), and even less have looked at the mentoring experiences of Black HBCU STEM doctoral students (Alston et al., 2017; Griffin et al., 2020). The purpose of this study was to further explore STEM doctoral mentorships involving Black students, asking the question in what ways does anti-Black racism frame the practice of STEM doctoral mentoring at HBCUs? What follows is an overview of the most relevant literature, a brief summary of the theoretical frameworks and methods, and a description of the findings and discussion.

## Literature Review

Mentoring is consistently cited as critical to the success of doctoral students across a range of disciplines, including STEM (Chavous et al., 2018; Griffin et al., 2010; NSF, 2020; Noonan et al., 2007) but Black and Brown students consistently report having ineffective mentoring experiences across all levels of education and disciplines (Chavous et al., 2018). Mentorships involve a multitude of actions that contribute to the holistic success of students, including course and career advising, networking and sponsorship, and psychosocial and emotional support (Howell et al., 2021; Sancyzk et al., 2021).

While the benefits of mentorships are commonly reported (Chavous et al., 2018; NSF, 2020; Noonan et al., 2007), the literature also points to characteristics that increase effectiveness. One in particular is the critical role of same race and same gender mentorships (Chavous et al., 2018; Griffin et al., 2010). Other researchers such as Blake-Beard et al. (2011) and Williams et al. (2016) have cast doubt on the importance of same cultural identification as a decision factor in the effectiveness of mentoring

practice. Williams et al. (2016) found “that although URM [underrepresented racial and ethnic minority] mentors can be seen to provide unique vicarious learning opportunities for URM PhD students, as a result of their common identity as URMs within science, non-URM mentors were just as likely to be perceived as useful” (p. 15). These studies suggest that ultimately the measured impact of effectiveness may be due to the commitment by both the mentee and mentor as opposed to same-culture mentorships, raising questions about what students need out of a mentorship, who has access to quality mentorships, and do all students experience the same level of quality in their STEM doctoral mentorships, especially cross culturally? Alston’s et al. (2017) research on African American men in STEM suggests the quality may not be the same as the men were cognizant of their minoritized status positioning them as outsiders and in cross-race cross-gender mentoring relationships were skeptical of whether “other-race/gender mentors can relate to them the same way an African American male mentor could” (p. 60). They were also motivated by the presence of other Black men. This is an important consideration as Chavous et al. (2018) and Alston et al. (2017) note the paucity of racially minoritized STEM faculty available to serve as mentors for racially minoritized students.

Fontaine (2012) and Griffin et al. (2010) conceptualized STEM doctoral mentorships as connections driven by intentional mentor engagement subject to internal and external factors. According to Griffin et al., STEM doctoral students value and benefit from intentional, meaningful, and quality mentoring from mentors “who believed in them and their abilities” (Griffin et al., 2010, p. 98). Moreover, there is a generational impact as these students move into professorial roles wherein they can replicate their positive mentoring experiences and pay it forward to other racially minoritized students by advocating and helping them to navigate and succeed in spite of the structural racism in STEM and higher education (Griffin et al., 2010). Much of the research on mentoring in STEM is within the context of HWIs, little scholarship exists that explores STEM doctoral mentoring at HBCUs.

One study that has contributed to an understanding of the Black STEM doctoral experience at HBCUs is McGee et al. (2019) who found lack of sense of belonging, deficit framing, and negative coping strategies were as normative for Black STEM HBCU doctoral students as they were for those attending HWIs whose practices, policies, and dispositions are viewed as anti-Black. For example, Alston et al. (2017) reported that onliness is experienced by Black men STEM doctoral students at HWIs as well as HBCUs. Harper (as cited in Alston et al., 2017) described onliness as “the psychoemotional burden of having to strategically navigate a racially politicized space occupied by few peers, role models, and guardians from one’s same racial or ethnic group” (p. 59). Onliness is problematic in many ways as it results in reduced opportunities to form

same-race, same-gender mentorships essential for successful development and matriculation (Upton & Tanenbaum, 2014). Black faculty helped to mitigate onliness because they were perceived as understanding “Black culture” (Toldson, 2018, p. 96) which in turn improved the quality of the mentoring relationship, increasing capacity for greater sense of belonging.

Furthermore, academic progress and success are often impacted by the quality of experiences doctoral students have. Alston et al. (2017) highlighted that Black men STEM HBCU doctoral students were satisfied with the career preparation mentoring received transactionally, but dissatisfied with the overall relationship development with their mentors. These students felt that their mentors only wanted them as mentees to use their identity as leverage for external research funding. Mentees are commodified in this type of transactional relationship reminiscent of anti-black plantation politics (Squire et al. 2018; Williams et al., 2021) with structures, practices, and operations embedded in US higher education. This study sought to understand mentoring relationships between Black STEM doctoral students and STEM doctoral mentors at HBCUs. Increased understanding of the mentorships racially minoritized STEM doctoral students at HBCUs experience would provide essential framing for developing more effective STEM doctoral mentors at HBCUs that challenge anti-Black racism ideology and practices.

## Theoretical Framework

Given this emphasis on race, anti-Black racism theory (Gordon, 1995; Dumas & Ross, 2016) and Critical Capital Theory (Bancroft, 2018) were used to frame this study. Bancroft (2018) developed the concept of Critical Capital Theory describing it as an “integration of critical race theory, forms of capital, and fictive kinship” (p. 1319) while anti-Black racism is a theory of Black racialization that speaks to implicit negative bias toward Black and Brown people in which there is an assumption of white supremacy and acceptance of Black inferiority. Critical capital theory gives “racism full explanatory power within the context of US STEM doctoral” education (Bancroft, 2018, p. 1319) and examines how the convergence of structural inequalities, economic and social capital, and racial identity create a deficit educational system for racially minoritized STEM students.

Anti-Black racism with its focus on the oppression of Black and Brown people interrogates the hegemonic underpinning of white supremacy and privilege in STEM mentoring and the ways in which anti-Black racism permeates STEM education and mentoring. It centers the experiences, ways of knowing, and knowledge of racially minoritized and underrepresented students in STEM through an Africentric lens, countering their deficit positioning in STEM education.

Each provides a critical lens for interrogating assump-

tions and deconstructing common practices such as mentoring by highlighting systemic and interpersonal incongruencies and inequalities that uphold the current system in place. They highlight the violence Fanon (1952/2008) understood resided in the thoughts and mindsets of those engaging in projects of dehumanization like those that may be present in STEM doctoral mentoring. Combined they provide the foundation for a critical race philosophy that contextualizes the lived experiences of STEM doctoral learning for racially minoritized students from a non-deficit lens.

## Methodology

A multiple-embedded mixed methods case study using semi-structured interviews and a quantitative survey was employed. These cases were drawn from a National Science Foundation Alliances for Graduate Education and the Professoriate (NSF AGEP) sponsored program involving three institutions of varied types – HWI Flagship/R1, HBCU/R2, HWI Regional/R2 – in the Southeast. This paper explores one case: the HBCU, which is known for its STEM programming. Institutions were selected based on program participation. The study’s authors identify as women, one domestic White American who is a doctoral student with a background in mathematics education, two domestic Black Americans and one South Asian American, who are faculty studying mentoring.

The quantitative surveys included the Mentoring Competency Assessment (MCA) survey developed by the University of Wisconsin at Madison Institute for Clinical and Translational Research (Fleming et al., 2013) to measure faculty mentoring competency skills as perceived by students and a demographic questionnaire. Each was administered to STEM doctoral students enrolled in participating departments at the three universities (HBCU, HWI-Regional, HWI-Flagship). The MCA was included to provide a broader context for the interview data. The MCA consists of six constructs derived from 26 statements assessed using a 7-point Likert scale: maintaining effective communication, aligning expectations, assessing understanding, addressing diversity, fostering independence, and promoting professional development. A total of 137 responses were collected, which included 33 HBCU students, 44 HWI-Regional, and 60 HWI-Flagship (See Table 1).

It should be noted that the quantitative analysis using the MCA is limited due to the small sample size for the HBCU. To analyze the survey data, the average of total mean scores for each construct was used. By using the Mann-Whitney U Test, the HBCU student responses were compared with the HWIs student responses to look for any statistically significant differences between their perceived mentoring experience. Furthermore, due to small subgroup sample sizes, the averages were compared descriptively to look at any differences between AGEP and international students. AGEP students are populations

Demographic	HBCU (%)	HWIs (%)
<b>Gender</b>		
Female	12 (36.4)	51 (49.0)
Male	21 (63.6)	49 (47.1)
Prefer not to report/Missing	0 (-)	4 (3.9)
<b>AGEP Status</b>		
AGEP	10 (30.3)	18 (17.3)
International	21 (63.6)	42 (40.4)
Other	2 (6.1)	42 (40.4)
Missing	0 (-)	2 (1.9)
<b>First-Gen</b>		
Yes, First Gen	20 (60.6)	26 (25.0)
No, Not First Gen	13 (39.4)	78 (75.0)
<b>Age</b>		
21-30 years old	11 (33.3)	76 (73.1)
31-40 years old	16 (48.5)	24 (23.1)
41-50 years old	5 (15.2)	4 (3.8)
Prefer not to report/Missing	1 (3.0)	0 (-)

*Note.* Data is from Spring 2021. HWIs = HWI-Flagship and HWI-Regional.

**Table 1. Demographic Representation at Institutions, HBCU (n = 33) and HWIs (n = 104)**

targeted by AGEP programming which include African American, Latine, Native American, Native Pacific Islander, Native Hawaiian, and Native Alaskan. Students were considered international if they were born outside the US, were not US citizens, and came to the US to pursue higher education (Urban & Palmer, 2014).

The primary qualitative data sources were nine Black domestic HBCU STEM doctoral students (six women and three men), and eight STEM HBCU faculty (one woman and seven men; two Black Americans, one White American, and five international: 4 Asian, 1 Black African). Interviews averaged 60 minutes in duration and were professionally transcribed. Various STEM departments agreed to participate, including those from life sciences, physical sciences, and mathematics. The interviews were designed to explore how participants understood mentoring and how they were experiencing their identified mentorships. The qualitative interview data were analyzed using narrative analysis (Chase, 2005) which involved attention to social circumstances (context) and as well behaviors and perceptions (content). A thematic approach was used to understand the primary plots, characters, and influences within the stories. This involved a careful reading and re-reading of the data and identification of key moments which were coded, with themes being constructed from the emerged patterns.

## Findings

In this section, we present the survey and interview data analysis findings.

### Survey Findings

The survey analysis revealed no statistically significant differences for comparing the HBCU (n = 33) and the HWIs (n = 104) student responses for each of the six constructs in the MCA, indicating insufficient evidence of different perceptions between the two groups. However, when looking at two subgroups of students (AGEP and International) at the HBCU, a different picture emerged. Descriptively, HBCU AGEP students (n = 10, nine were Black students) overall had lower mean scores for each construct than the HBCU international students (n = 21) (Table 2). The two constructs with the largest differences were 1) *Fostering independence* (e.g., mentor's ability to acknowledge their contribution) and 2) *Promoting professional development* (e.g., receiving help towards their career goals) (Fleming et al., 2013).

This survey finding suggests that HBCU AGEP student experiences differ from their international counterparts in HBCU STEM doctoral programs, a finding consistently seen across all institutions. However, AGEP, domestic

Asian, and White students at the HWIs also had lower means when compared to their international peers. This prompts further questions regarding why international doctoral STEM students view their experiences more positively than their peers.

George Mwangi et al.'s (2019) study of African international graduate students suggest faculty often group international students as one, thus omitting their separate, individual identities and cultures, but participants did not appear to internalize the negative messages and perceptions they received from campus members. Instead, they engaged in resistance through attempting to be successful... despite the master narratives they encountered telling them that they were not capable or were lesser than their peers who are of the majority. (p. 61) International students may experience the institution differently, impacting their perception of satisfaction. Survey findings suggest Black domestic HBCU students were less satisfied with their mentoring experiences.

### Interview Analysis Findings

The two organizing themes constructed from the narrative data analysis of the qualitative interviews were scarcity and mattering race.

#### Scarcity

There is a scarcity of domestic Black students studying in STEM doctoral programs and domestic Black faculty teaching in them. Each of the nine student interview participants noted the absence of Black people in their programs, both students and faculty. One Black man student said, "I would have loved to work with another Black man, but not one" was available. The HBCU campus was majority Black but not one of the STEM departments was. The majority of their peers were international students from Asian countries and the vast number of faculty were White or Asian, domestic and international, respectfully. It seemed ironic to the students that their Blackness was not really part of the STEM doctoral landscape at an HBCU.

Scarcity was also evident in terms of the amount of respect they commanded. Students repeatedly indicated that faculty seemed to not respect them in the same ways as other students. This sentiment was present in faculty interviews as well. Several faculty tended to hold deficit views of domestic Black students, suggesting they were not as competent as other students. An Asian man faculty said,

These underrepresented students, most of them [can't] take the same path as other students because their background in math may be weak. They have the potential, but maybe it is not as good as others, so their path towards the final PhD is different from the other classical students.

This quote highlights how Black domestic students may be subconsciously "othered" by the faculty. They are un-

Constructs by Subgroups	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>
<i>Communication</i>				
HBCU	33	5.64	1.42	6.00
AGEP	10	4.52	1.20	4.17
International	21	6.06	1.28	6.83
HWIs	104	5.66	1.40	6.00
AGEP	18	5.33	1.20	5.25
International	42	6.04	1.39	6.75
Other	42	5.38	1.45	5.82
<i>Expectations</i>				
HBCU	33	5.57	1.60	6.20
AGEP	10	4.51	1.46	4.40
International	21	5.95	1.50	6.75
HWIs	104	5.56	1.51	6.00
AGEP	18	5.42	1.39	5.30
International	42	5.89	1.58	6.60
Other	42	5.25	1.47	5.30
<i>Understanding</i>				
HBCU	33	5.61	1.66	6.00
AGEP	10	4.47	1.62	4.67
International	21	6.03	1.49	7.00
HWIs	104	5.61	1.35	6.00
AGEP	18	5.48	1.14	5.67
International	42	5.83	1.65	6.50
Other	42	5.40	1.08	5.67
<i>Independence</i>				
HBCU	33	5.40	2.02	6.60
AGEP	10	3.73	1.79	3.67
International	21	6.07	1.75	7.00
HWIs	104	5.52	1.59	6.00
AGEP	18	5.44	1.43	5.55
International	42	5.80	1.72	6.68
Other	42	5.22	1.52	5.60
<i>Diversity</i>				
HBCU	30	5.58	1.79	6.25
AGEP	10	4.75	2.23	4.50
International	18	5.89	1.45	6.25
HWIs	100	5.68	1.71	6.25
AGEP	17	5.47	1.57	6.00
International	42	5.93	1.70	7.00
Other	39	5.45	1.81	6.00
<i>Professional Development</i>				
HBCU	33	5.33	1.97	6.00
AGEP	10	3.65	1.97	4.20
International	21	6.03	1.55	6.80
HWIs	104	5.41	1.56	6.00
AGEP	18	5.03	1.52	5.30
International	42	5.68	1.74	6.45
Other	42	5.27	1.39	5.45

Note. Data collected Spring 2021. HWIs = HWI-Flagship and Regional. "Other" = domestic Asian and White students and was not included due to small sample size for the HBCU.

Table 2. Mentoring Experiences at HBCU and HWIs



derstood to be less than their peers with their Blackness signaling inferiority to some of the faculty, forcing them to prove their competence as opposed to their competence being assumed as present.

### **Mattering Race**

Despite Black domestic students' hypervisibility of being one of few Black students in their programs, a recurring theme was not being seen. Race mattered in the lived experiences of Black STEM doctoral students at this HBCU. Mattering race seeks to unpack the impact of the recognition of the physicality of their Blackness while their culture and racialized experiences were simultaneously not seen. As one Black woman student said,

So, it's like I notice that I have to, I guess, tread lightly with some people instead of just being myself unfortunately because of my Blackness, and it sucks because it's like at an HBCU. . . . It's just like, here we go again, and this time, it's HBCU edition.

This student alluded to the performativity of race and the inability to show up as her whole self. She had to use mental energy to assess academic and social situations to determine how to "present" herself to others. This survival tactic was draining and diverted attention and focus away from academics. Negotiating one's presence and their Black bodies was not how Black students imagined spending their time in doctoral study.

Black STEM students in effect spoke to the legibility of their Blackness, acknowledging how race occupied space and place in ways viewed as instrumental to their success. Whether attending to societal dysfunction or connecting in meaningful ways to how they have been racialized and minoritized, Black STEM doctoral students yearned for awareness from their mentors that race matters. A Black man student shared,

I should be able to say to whoever's on faculty, no matter what their color is. . . .

I'm going to look at it as part of your advisor duty. Is that something that you can handle? . . . Because as a Black man, this world just won't give me no peace.

While some faculty hyper-focused on their perceptions of the social imaginary of the Black academic, other faculty in STEM still functioned from the color-blind bind as if not acknowledging race made their behaviors, perceptions, and dispositions neutral. Students desired intentionality from faculty toward preparing them for the racially fueled oppression and isolation they would inevitably face in STEM.

However, STEM doctoral faculty seemed to operate within a culture of science in which developing students to become scientists was primary. The culture of science tended to blind faculty from the culture of people, revealing a presumed hegemonic science identity wherein race was not salient. Many faculty indicated that they just work with students as individuals, not discussing the ways in which the identity markers of their mentee influenced

how they approached mentoring. More importantly, these faculty were unable to talk about how those markers of identity influenced the experience of their racialized students, particularly those who were Black. One White man faculty remarked,

In terms of how they [Black students] learn things and how we interacted with each other, I can say I can't see that much difference actually. Maybe it's the nature of our discipline.

For this faculty member, interactions with students were always race-neutral and he could interact with every student the same way because the nature of science is one of presumed universalism. His assumption was that the universal nature of science transcended racial differences. Ironically, most of the faculty interviewed saw the benefit in acknowledging and attending to cultural differences as seen in their international STEM doctoral students but many did not see culture as related to Black STEM doctoral students. Black STEM doctoral students were not recipients of equity-minded pedagogy and they took notice. Their stories consistently spotlighted the mattering race.

### **Discussion and Implications**

The analysis of the research data suggests that mentoring experiences of Black STEM doctoral students at an HBCU are infiltrated by anti-Blackness and racialization. The survey data suggests that Black students may experience the HBCU STEM doctoral environment differently than their international peers. Interviews with racially minoritized students highlighted ways in which the culture of international students was attended to in mentoring practice as opposed to that of Black domestic students. Failure of faculty to have similar awareness for Black domestic students' culture creates conditions that breed trauma, loss of self-confidence, anxiety, and invisibility.

Many of the findings from this study support themes noted in the existing literature on Black doctoral STEM HBCU students (Alston et al., 2017; Griffin, et al., 2010; McGee et al., 2019; Merriweather et al., 2022a, Merriweather et al., 2022b). Similar to those studies, this research found that faculty held color-blind and hegemonic science identity perspectives, negating race, however for their Black students, race still mattered because being seen mattered even in spaces where students were minority majorities. The power of being able to show up as one's authentic self matters, as does being able to see yourself in the space. Intentionality toward culture and identity has always been a core operational tenet at HBCUs and central to the HBCU educational approach (Gasman & Nguyen, 2014) but is lacking in the STEM doctoral experience for many Black students in STEM doctoral mentoring.

These findings also call for greater awareness of the ways in which anti-Black racism infiltrates mentoring practice. Recognition is required of all stakeholders. Since racism is dynamic and evolves, it operates differently ac-

ording to the cultural-historical context. Unlike domestic Black students, international students might not be able to recognize, acknowledge, and name anti-Black racism and how it operates in the US higher education setting, even though US higher education has been built on and benefited from slavery (Smith & Ellis, 2017). Lack of international student's historical awareness and present-day micro and macro aggressions could shape their perceptions and responses to the environment which in turn shape faculty expectations and responses to them, a continued playing out and reproduction of structural racism in STEM.

Further, microaggressive passive assaults on Black bodies must be named and confronted by policy, practice, and culture change. Most clearly communicated were perceptions of anti-Black racism, resulting in a devaluing of Black STEM students' cultural and intellectual capital. This was evident in the extant research as well (Alston, et al., 2017; Boykin, 2016; McGee et al., 2019; Palmer et al., 2016). Greater intentionality by administrators is needed to orchestrate long-standing change. Much of the responsibility for the change rests with the faculty and administrators who have great influence over who is hired and how they are developed as mentors.

Consistent among the Black STEM doctoral HBCU student participants was the desire for more Black faculty in their programs. Hiring practices therefore should be reviewed to determine the system-level factors that inhibit the hiring and retention of Black STEM faculty. Culturally liberative (Merriweather et al., 2022c) mentor training should be ongoing, mandated, and should focus on developing competencies and dispositions for cross-racial/cultural mentorships that better honor the cultural personhood of Black students. As evidenced by Preston's (2017) study, faculty's responsiveness and their "willing(ness) to engrain themselves in the culture" were found to be supportive factors for Black students pursuing STEM (p. 145). The STEM doctoral environment should be a place where Black students can embrace their Blackness and have it valued by faculty, administrators, and university policy. We propose culturally liberative mentoring as a necessary antidote for attending to this need.

Better understanding of how STEM doctoral mentoring is facilitated at HBCUs holds the promise of informing a mentoring practice that supports cultural liberation instead of cultural degradation and suppression. It becomes one avenue to decolonize the STEM academy by holding STEM doctoral mentors and the institutions they represent accountable for socially just mentoring practices. Greater intentionality as well as mandated training informed by the study's results are recommended. The HBCU educational approach cultural ethos (Gasman & Nguyen, 2014) demands that faculty honor, support, and encourage the critical capital their Black STEM doctoral students possess as well as recognize the ways in which they may be consciously or unconsciously promoting anti-Blackness in

their labs, classrooms, and mentorships. The specific STEM doctoral program culture, not just the overarching culture at an HBCU, needs to be culturally pluralistic, supportive, and receptive. The findings from this study provide a clear picture that work still needs to be done to strengthen the skills, knowledge and dispositions of faculty doctoral mentors who mentor Black STEM doctoral students regardless of institution type. The development of STEM faculty scholar-activists is the aspiration of more culturally liberative STEM doctoral mentorships. Black students need mentors who are willing and equipped to be advocates and accomplices in their success.

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## 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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