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Abstract

Whiteness is prevalent in higher education and therefore permeates science, technology, engineering, and mathematics (STEM) fields. While research shows STEM's long history of exclusion and marginalization in higher education (Ong et al., 2011), there has been limited research on the ways students with minoritized identities of sexuality and/or gender (MIOSG) in STEM interact with systems of dominance, such as whiteness. Using white supremacy culture (Okun, 2021; Okun & Jones, 2001) and the white racial frame (Feagin, 2010) as sensitizing concepts, this paper explores how students with MIoSG are situated in relation to systems of whiteness and white racial dominance in STEM learning spaces. Our findings included three emergent categories: color-evasiveness, desiring diversity in STEM, and the simultaneous invisibility and hypervisibility of Black, Indigenous, and People of Color (BIPOC) in STEM. Findings illuminated the complex ways BIPOC and white students with MIoSG experienced and thought about whiteness and white supremacy in STEM. Data point to the need for intentional anti-racist research, policy, and practice in STEM learning spaces.

Introduction

While researchers have long established exclusionary and marginalizing trends in postsecondary science, technology, engineering, and mathematics (STEM) fields (Ong et al., 2011; McGee, 2016, 2020), less attention has been paid to the ways that whiteness operates in STEM spaces. Additionally, although students with minoritized identities of sexuality and/or gender (MIoSG; Vaccaro et al., 2015) in STEM have received increased scholarly attention (e.g., Vaccaro et al., 2021; Cech & Waidzunas, 2011; Cech et al., 2016; Hughes, 2018), there has been little exploration of the ways that college students with MIoSG interact with systems of whiteness. Understanding this interaction is necessary to pushback against systemic, interpersonal, and cultural exclusion of college students within STEM across identities. As part of broader systems of power, privilege, and oppression (PPO), STEM fields often engage in exclusionary practices, serving to push out students with minoritized identities (Johnson, 2012). It is important to understand the ways students in STEM can both experience and perpetuate exclusionary norms to better understand how the STEM environment can be more inclusive to students

with historically minoritized identities at the intersections of race, gender, and sexuality. In this paper, we explore the ways that students with MIoSG are situated in relation to systems of whiteness and white racial dominance in STEM learning spaces to better understand both implications of whiteness and to provide recommendations to create more inclusive STEM environments (Leyva et al., 2022).

This paper developed as part of our ongoing engagement with data from a large constructivist grounded theory study (Charmaz, 2014). After publishing our main model (Vaccaro et al., 2021), in which we discussed the ways that MIoSG students' STEM meaning-making is embedded in their personal chronologies and systems of PPO, we continued to reflect on how whiteness informed the study. We decided to continue our constant comparative analysis (CCA; Charmaz, 2014) with a fresh set of sensitizing concepts in mind: namely, the white racial frame (Feagin, 2010) and white supremacy culture (Okun, 2021; Okun & Jones, 2001). This process uncovered three emergent themes: 1.) color-evasiveness; 2.) desiring diversity in STEM, and 3.) the simultaneous invisibility and hypervisibility of Black, Indigenous, and People of Color (BIPOC)* in STEM.

Sensitizing Concepts: White Supremacy Culture and the White Racial Frame

Per constructivist grounded theory methods (Charmaz, 2014), we use sensitizing constructs (instead of a traditional literature review) to structure inquiry and analysis. As we reflected on our rich data and our original grounded theory model (Vaccaro et al., 2021), we wanted to more fully account for the ways that whiteness impacted the ways that MIoSG students navigated STEM environments. Therefore, we turned to theories about whiteness to help us explain themes that became more apparent to us as we interrogated our own racialized understandings of the data. Whiteness is a system of dominance that sets the standard and limits the scope of how all racialized people can be, act, and do in a particular space (Collins & Jun, 2017; Guess, 2006). The purpose of whiteness as an ideology is to create and maintain racial domination (Leonardo, 2002) which serves to set parameters for unachievable or unattainable social status (Collins & Jun, 2017; Guess, 2006; DiAngelo, 2018) based on birth origin and phenotype (Deliovsky, 2008).

White supremacy culture refers to the context in which society and organizations operate (Okun, 2021; Okun & Jones, 2001) and is perpetuated through normalized standards of whiteness, unnamed cultural practices and expectations, institutional policies, and individual superiority (Jones, 1972, 1981). White supremacy culture within organizations can make it impossible for other cultural norms and standards to exist, thus perpetuating systems of dominance and oppression. Examples of this pervasive culture include power hoarding, fear of open conflict, quantity over quality, perfectionism, sense of urgency, objectivity, and either/or thinking (Okun, 2021; Okun & Jones, 2001). These characteristics permeate most organizations and lead to exclusionary environments.

White supremacy culture and normalized white racial dominance can lead to overt violence, as seen in lynchings, forced sterilizations, state-sanctioned brutality, and physical and epistemic genocide. Normalized white racial dominance can also lead to more covert racism such as color-evasiveness, which is the direct refusal to acknowledge and address race and racism and the consequences of both (Bonilla-Silva, 2003), and race neutrality. Color-evasive racism's subtle mechanisms and technologies lead to white people often not realizing they are raced

until interacting with BIPOC, allowing racism to be perpetuated unconsciously (Bell Jr., 1980; Ladson-Billings, 1998). Color-evasiveness, race-neutrality, and whiteness permeate society and frame policies, practices, and experiences in higher education, often through the lens of the white racial frame (Feagin, 2010).

Often referred to as the "hidden barrier" (Feagin, 2010, p. 1), the white racial frame articulates racial matters as desirable or undesirable and operates out of the subconscious (Feagin, 2010). This frame influences how white people think and act in daily life, utilizing it to fuel their privilege and evaluate their identities in relation to BIPOC (Feagin, 2010). The white racial frame serves to uphold white supremacy culture, individual superiority, and institutional policies (Jones, 1972, 1981; Okun & Jones, 2001). There are three tenets of the white racial frame, which include: (a) virtuous whiteness: belief in a great chain-of-being, experience of whiteness as emotionally normative, denial of racism's magnitude and impact, and the un-raced nature of white thinking and acting, all in alignment with the nature of color-evasiveness (Annamma et al., 2016), meaning that whiteness has been normalized and idealized as a force to uphold dominance. The second tenet includes (b) negative stereotyping of BIPOC: major forms of negative stereotyping, continuing white framing of Indigenous, African American, Asian American, and Latinx people. This negative stereotyping serves as a way to continue the normalization of white people and white culture while simultaneously doing harm to communities of color. These tenets can be obverted through the third tenet, (c) counter-framing by Communities of Color (Feagin, 2010), where the voices of BIPOC communities are elevated, centered, and respected.

Higher education often perpetuates systems of PPO, which serve to maintain white supremacy culture (Cabrera et al., 2016; Gillborn, 2005) and the white racial frame (Feagin 2010), leading to color evasiveness of white students and inequitable treatment for BIPOC students (Nebeker, 1998). This allows for "racist campus climates and exclusionary practices [to] persist because institutions of higher education themselves are structurally rooted in whiteness and white supremacy" (Corces-Zimmerman & Southern, 2021, p. 306). Within these systems, "white students are constantly engaging in racist actions but usually without the knowledge that what they are doing is oppressive" (Cabrera & Corces-Zimmerman, 2017, p. 311), creating and contributing to oppressive environments for BIPOC (McGee, 2016). Furthermore, whiteness, white supremacy culture, and the white racial frame collude with systems of PPO that minoritize and marginalize multiple sexualities and genders. Stewart and Nicolazzo (2018) argue that whiteness is an epistemic network of "tacit assumptions" that inform the way that college students are imagined to be (p. 135). In other words, white supremacy and the white racial frame do not apply simply to race; their epistemic reach means that other identity systems, such as sexuality and gender, are shaped by and involved in white supremacy culture (Stewart & Nicolazzo, 2018). In this case, we explored the ways that whiteness impacted that ways that MIoSG STEM students are assumed to be and act as well as the ways they shape racialized experiences in STEM.

Methods

For this project, we used a constructivist approach to grounded theory research (Charmaz, 2014). This particular type of qualitative grounded theory assumes that emergent data reflects social realities that are constructed and multiplistic, rather than fixed. In this research project, we drew from a constructivist framework that "stress[es]

social contexts, interaction, sharing viewpoints, and interpretive understandings . . . [and] viewing knowing and learning as embedded in social life" (p. 14). As such, this methodology was ideal for answering the following research question: How do students with MIoSG majoring in STEM experience and navigate campus learning environments and their disciplines/fields? A secondary question included: How do participants describe their other social identities (e.g., race, ethnicity, nationality, class, disability status) relative to their experiences of postsecondary STEM learning environments? Although our main model (Vaccaro et al., 2021) centered systems of PPO, this paper delves more deeply into white supremacy because we believed that deeper interpretive understandings about whiteness gleaned from our participants warranted attention.

In this manuscript, we first present our emergent categories related to whiteness in STEM identified across the dataset. Then, we use extended excerpts to illuminate the categories and to illuminate the depth of participant experiences regarding race and whiteness. Collectively, these six extended excerpts reflect a deep read of the dataset, highlight the ways that whiteness operated through participant experiences from an array of identities, and offer rich contextualized evidence of our emergent categories. Charmaz (2014) explained how an effective grounded theory manuscript "takes the reader into a story" (p. 314), contains extended excerpts with "enough details for providing the context and the setting" (p. 316), and oscillates between "interpretation and empirical evidence" (p. 287). We contend that the unique structure of our findings section accomplishes these goals and affords readers both theoretical interpretations related to whiteness and robust empirical evidence about the ways MIoSG students in STEM make meaning of, and navigate, whiteness, white supremacy, and the white racial frame.

We collected data at three public and one private U. S. institutions of higher education—one in the Southeast and three in the Northeast. Our sites included historically white institutions with multiple high-enrollment STEM programs to yield a pool of students with MIoSG who could help us answer our research question. Because our protocol included sensitive questions about MIoSG, participants were able to select a mode of interview they were most comfortable with (e.g., in person, online, phone). This decision limited data collection to sites within driving distance of the research team (as well as those where we obtained IRB approval).

In line with constructivist grounded theory, we engaged in purposive sampling (Charmaz, 2014). Recruitment processes included: sending emails and study flyers to STEM departments, campus diversity centers, and LGBTQ student organizations (e.g., GSA, oSTEM). Recruitment materials explained how we sought "participants for an interview study exploring the experiences of people who identify as LGBTQIA+ in STEM (Science, Engineering, Technology, Math) fields." Eligibility criteria included: "Any student majoring in a STEM field whose gender and/or sexual identity is minoritized within American society. Having a minoritized gender and/or sexual identity means that at least one of the following two statements accurately describes you: 1) you do not identify as a cisgender woman or man; or 2) you do not identify as heterosexual." We accepted all 56 volunteers who fit these criteria. The recruitment materials intentionally used both the common LGBTQIA+ acronym as well as the phrase "minoritized gender and/or sexual identity" to cast a wide and inclusive net for a heterogeneous population that often uses identity terminology that falls outside of traditional acronyms.

All participants were given a gift card in exchange for their time. The full sample of 56 participants includes 51 undergraduates and five graduate students. Approximately 20% of our sample self-identified as BIPOC students, specifically: Black (4), Native American (2), Latinx (4), Asian American (2), Arab/North African (1), bi/multiracial (2), South Asian (1), and white (45). These racial demographics mirrored the historically white institutions where participants were enrolled. Participant majors included engineering (29), computer science (9), biology (5), food science and nutrition (4), environmental science (2), marine science (2), neuroscience (2), kinesiology (1), mathematics (1), and natural resources (1).

We collected data through intensive semi-structured, audio-recorded individual interviews, as this method enabled us to answer our research questions and represents the most common data collection method in constructivist grounded theory (Charmaz, 2014). We began with basic questions about participants' backgrounds (e.g., "Tell me about yourself." and "You indicated you identified as [Gender/Sexuality]. Would you please tell me a bit about what that means to you?"). After several questions about gender and sexuality, we asked all participants to identify and describe other social identities important to them and how they experience STEM fields, and we provided examples including race, ethnicity, religion, social class, and disability. Next, the protocol moved into questions about participant experiences with STEM fields and included specific questions about classroom interactions, curriculum, instructional strategies, peers, faculty members, and the physical environment; in posing these questions, we began questions with a focus on gender and sexuality, then followed up each topic by asking participants' experiences with other social identities including race and ethnicity. We followed Charmaz's (2014) recommendation to construct an interview guide centered on the purpose of the research and the participants' experiences with the topics at hand rather than relying primarily on prior literature and frameworks to guide questions. Thus, while our use of white supremacy culture and white racial frame were employed primarily during analysis, we collected sufficient data from participant interviews to enable the present analysis focused on whiteness.

Per grounded theory (Charmaz, 2014), we concurrently collected and analyzed data using constant comparative analysis (CCA). We also used intentional memoing (Charmaz, 2014) after and between interviews. For CCA, we assigned initial codes to interview and memo data—which resulted in 100 initial codes. Next, we assigned selective codes by combining similar open codes into broader categories. Then, through focused coding, we highlighted the relationship of selective categories to each other. As we focused our CCA on whiteness, we explored sensitizing concepts of white supremacy culture and white racial framing, and reviewed concordant literature, as discussed in earlier sections of this paper. Some example focused codes that aligned with our sensitizing concepts included: avoiding discomfort; claiming race neutrality; internalizing color evasiveness; naming racial dynamics; navigating overt/covert racism and stereotypes; and recentering whiteness. Our focused codes, which we identified across the full dataset, led to the emergent categories presented in this paper including: color evasiveness, desiring diversity in STEM, and invisibility/hypervisibility of BIPOC in STEM. In findings, we share extended quotations from six participants who most clearly exemplified these three emergent categories. Although not a traditional format, extended quotations from a small number of participants have been used to portray conclusions from grounded theory studies (c.f., Newman et al., 2019; Vaccaro et al., 2020). We chose extended vignettes to illuminate our rich and complex findings. This choice aligns with Charmaz's (2014)

perspectives on writing up grounded theory who specifically argued that writing up grounded theory findings "includes taking the reader into a story and imparting its mood through linguistic style and narrative exposition" (p.314).

To address trustworthiness and credibility, we used multiple strategies including: offering thick descriptions, member checking, expert reviews, analytic triangulation, and discrepant case analysis (Charmaz, 2014; Glesne, 1999; Jones et al., 2014; Morrow, 2005). Through the use of extended excerpts, we provide thick and rich contextualized descriptions of the emergent categories—a hallmark of both qualitative competence (Jones et al., 2014; Morrow, 2005) and strong grounded theory methods (Charmaz, 2014). Another way we sought trustworthiness and credibility of findings was through post-interview, member-checking focus groups. Focus groups are an excellent strategy for member checking (and analytic triangulation) as they allow participants to indicate whether researchers' interpretations are consistent with their lived experiences (Morgan, 1996). While these focus groups were not specific to the present analysis, their wide-ranging and reflective nature offered insights that helped us confirm the findings of this analysis. We also conducted analytic triangulation by comparing data from multiple sources including: interview transcripts, focus group data, and researcher memos. Finally, we used discrepant case analysis throughout the CCA process.

We attempted to address relational competence (Jones et al., 2014) via reflexivity about our social identities, positionality, and power relationships. At team meetings, we participated in reflective discussions about the ways our interactions with participants, as well as our study conclusions, were potentially shaped by our positionality. The authors included three cisgender women and two cisgender men. Four of the five authors self-identify as people with MIoSG. All authors with MIoSG are publicly out and advocate for MIoSG on our campuses. These identities likely influenced the swift and sizable response to our recruitment as LGBTQ researchers can be viewed as having insider knowledge and terminology which improves recruitment and rapport with participants (Bettinger, 2010; LaSala, 2003). The research team was all white, which may have had the opposite effect on BIPOC recruitment. We do believe, however, that some of the powerful emergent categories about whiteness emerged from white participants because they felt comfortable sharing their perspectives on race with a white interviewer, though some white participants still avoided discussing whiteness or race (Best, 2003). Reflecting on our whiteness as a group and as individuals, and how we maintain and/or disrupt whiteness, informed our CCA of categories relating to whiteness in the dataset. Finally, we attempted to address power differentials in a variety of ways. We ensured that no interviewer had a direct relationship with an interviewee (e.g., professor, advisor, supervisor). We also used process consent and revisited our obligations for confidentiality during all communications, before the start of each interview, during the interview, and during member checking (Jones et al., 2014; Morrow, 2005).

As with any study, there are some limitations. First, we limited data collection to institutions within driving distance where we could also gain institutional review board approval. Therefore, our findings may be impacted by political and social contexts tied to the particular geographic locations in question. While we did not specifically ask about political and social contexts, many participants shared this as a factor in their experiences. Additionally, the participant pool was predominantly white, reflecting the demographics at the four institutions

where data collection took place, limiting our understanding of whiteness in STEM to a dominant perspective. Third, the focus of this study was not specifically about whiteness and white supremacy, even though whiteness emerged as a significant theme in the data. If the study had focused specifically on whiteness, we may have asked different questions or had a different pool of participants. Therefore, while the categories that we identified in this paper echo across participant accounts, there may be aspects of whiteness and white supremacy culture in STEM that we did not find.

Findings

In this section, we present extended excerpts highlighting how students with MIoSG perceived and navigated whiteness within their STEM majors and broader campus contexts. Participants' experiences are situated within the context of white supremacy culture. In the excerpts, we emphasize (in bold/italics) three emergent categories evidenced across participants. First, students described *color-evasive* STEM climates that positioned whiteness as default and neutral. Some participants exhibited color evasiveness by shifting the conversation away from whiteness, as though whiteness did not warrant examination, even when explicitly asked by the interviewer. Second, all students displayed familiarity with the notion of *desiring diversity in STEM*—the common, taken-for-granted knowledge that STEM fields lacked substantial proportions of BIPOC and that some institutional resources are devoted toward increasing racial diversity in STEM. However, the desire for diversity looked different to different students. Some saw diversity as a tool or a skill to master, while others, namely BIPOC students, desired diversity in order to mitigate the impact of white supremacy culture. Additionally, several BIPOC students counter-framed this notion of desiring diversity, arguing that it focused on a distant future rather than on the conditions that BIPOC currently in STEM fields faced. Lastly, color-evasive STEM fields coupled with a pervasive notion of desiring diversity led to the simultaneous *invisibility and hypervisibility of BIPOC in STEM* along with the *hypervisibility and hyper-representation of white students and faculty in STEM.* BIPOC students were often ignored in interpersonal situations with peers and broader representations of scientists and engineers, yet were often hypervisible when they were negatively stereotyped and surveilled by faculty and peers. Further, many white participants spoke about peers, friends, or family members of Color when discussing race, rather than addressing whiteness. Each excerpt that follows shows the interplay of these three emergent categories for interview participants, starting with Aspen.

Aspen

Aspen, a computer science major who identified as a Black, non-binary, gray asexual Muslim, described the impact of feeling erased and often invisible in queer spaces because of their racial identity illuminating the *invisibility of BIPOC* discourse:

> Being Black, Black and queer, that's like, yeah, that's a huge one because I mean you can tell but you can't obviously see that I am a Black Muslim … like not everyone knows … I'm a Muslim but especially because I think everyone just has this picture of what a Muslim looks like in their head and they don't see me. But then like … I'm obviously Black. But, I feel like people in queer spaces are erased a lot, like

> literally, even in queer or trans spaces, even within the gender inclusive movement.

While they often felt their Muslim identity was rendered invisible, Aspen also explained the hypervisibility of their Black identity. The *simultaneous invisibility and hypervisibility* of Aspen's experience with multiple marginalized identities led to exclusion in multiple communities. This was further perpetuated by the hyper-representation and hyper-visibility of white students in their field and within identity-based communities. Aspen explained how they felt excluded in STEM classes because of both their race and gender identity:

> I'm excluded. Yeah. Like every day. All the time… and then they're like, oh, you're a Black girl, you definitely don't know anything because … there's always that one person in a group that … people like ask the questions to you. [STEM peers never ask] "Oh, how do you do this?" Because they literally see Black female, that's it … I'm not a female but … that's how they see me or whatever. … [I]t's always like that one white guy that's the point person to ask questions to [in classes].

Aspen discussed the way that they are not only excluded from participating in group spaces in their STEM classes, but also shared how others presumed their incompetence (Gutiérrez y Muhs et al., 2012) by perceiving them as not good or smart enough based on their racial and gender identities. Aspen is also regularly misgendered simultaneously with these other experiences.. This reaffirmed the necessity for attending to current conditions in STEM that are exclusive and harmful to Black, Indigenous, and Students of Color before *wishing for more diversity* in the future.

Jax

Jax, a Native American, bisexual man, shared his experience of how he felt growing up in an area with people who share his Native American ancestry and how, upon coming to college, he was hyper-aware that he was no longer in a place where his ethnicity was represented. He shared that he neither felt included or excluded, but rather alluded to the pervasive *hypervisibility of BIPOC* at a historically white university, which is in direct contrast to his home community. Jax, when discussing his upbringing, shared the connection he felt with his community:

> But when I came out here, it was mostly white males, white heterosexual males, to be exact. I necessarily did not feel excluded or included, but I just was rather self-conscious about the fact that I was out of the majority, along with a few other people in the class… But yet, I feel proud to be a Native American. I feel proud to be a member of the [names redacted for to protect anonymity] tribes...

Although Jax described feeling acutely aware of his ethnicity at the university, he also experienced *hyperinvisibility* within his ethnic identity as he is often referred to as an 'Indian', highlighting the white racial framing of his identities by his peers. These microaggressions contributed to the ways Jax experienced both hypervisibility and hyper invisibility in his identity. While Jax felt self-conscious about his identity, he also felt proud. Self-consciousness was a product of him feeling *hypervisible* as one of the only Native American and

bisexual people in his program, highlighting the importance of representation of BIPOC within STEM spaces and the consequences of pervasive white supremacy culture in STEM fields.

Throughout his interview, Jax discussed his *desire for more diversity in STEM*. This desire came from a place of feeling seen and part of a community instead of a benefit to white people. Jax described his experience writing a research report with other BIPOC:

> We just spent a good three hours coming up with the report and just helping each other, just enjoying each other's time, as well. I felt happy to think that I'm not alone, being a male of Color in the field of engineering. It just made me feel … part of the community, like a subgroup, I guess you could say.

Jax's contentedness with feeling like part of the community served as a reminder that there are already BIPOC students in STEM, highlighting the importance of visibility of BIPOC scientists.

Jordan

Jordan, who identified as a Hispanic, gay man discussed his disappointment with the lack of diversity in engineering, stating:

> I think when I came here I was expecting a little bit more diversity. Joining the engineering field you notice that it's not as diverse as I was hoping. I don't think social class really steps in because I feel as all the engineering majors that I've run into in my discipline are all trying to get out of a difficult situation. Like I want to be in engineering because I want to make money.

Jordan explained that his desire for advancement within the engineering field is fueled by capitalism and posited it as a way to climb the proverbial ladder of social class. Jordan also explained that he felt minoritized in his ethnic identity due to the lack of representation:

> I think it's more the ethnicity that I do feel really like a minority. They'll have one or two Hispanic people in the class. It is mostly Caucasian either male or females…I don't feel negative in any way. We're all working really hard to do well in the classes. I don't think that people make slurs or negative comments.

While Jordan remarked that he did not feel negative about being one of "one or two Hispanic people in the class," he also shared sentiments of *color-evasiveness* as he explains the shared commitment to working hard rendering race as neutral and invisible in his experience. He also internalized the low expectation that as long as he did not experience anything overtly negative, it was a positive experience. A year later, while participating in a focus group, Jordan commented on the *invisibility* of others who shared his identities:

> But I'm also not trying to be everyone's superhero either. I just want to be an example that I wish I had. That's something I've always reiterated to people … It's like, I just wish that I saw someone like [me]

> when I was growing up. So, I'm trying to be my own example. It still kind of sucks not seeing that person. I still haven't found that openly gay Hispanic engineer out there personally, even with all the networking I've done.

In the year between data collection points, Jordan shifted from not feeling negatively about being one of the only students with minoritized sexual and ethnic identities to expressing disappointment in the lack to representation and sense of community in STEM spaces--illuminating the consequences of white racial dominance. He used this as a call to action to support others.

Amelia

Amelia, a 39-year-old white cisgender bisexual woman with physical disabilities and PTSD, identified as "100% disabled" and a non-traditional student who enlisted in the military before returning to higher education. She described her chemical engineering major as "awful," but plans to finish her degree. When asked about other salient identities, Amelia brought up being an atheist, and then her "white privilege … I try to use it to help people in the best way I can. Sometimes not productively. … I can give you a great example. A girl in my lab wore a Blue Lives Matter shirt. So the next lab I wore my Kaepernick jersey. It was my mini-protest." However, she never confronted the other student about the shirt. In this way, Amelia used the language of white privilege but also framed it as the ability to "help people"—presumably BIPOC, thus reinforcing whiteness as virtuous (i.e., the problem is not racism, it is people [of Color] who need help).

When asked how being white shaped her experiences in STEM, Amelia discussed her perceptions of Black students:

> There's very few Black students, very few. And I think it's infuriating. I think it's very unfair ... I can't think out of any of the years that any of the Black students in my classes were part of the "in-crowd." In my lab, I think there was only one Black guy. And we had to work in a group, and he definitely was not involved in things much. … You could tell he was uncomfortable.

By responding to a question about her whiteness and pointing to the presence of Black students, Amelia shifted the focus from herself—a *color-evasive* move that positioned white people as the neutral or default (i.e. the "in-crowd" is white, and Black students need to be included in it), while positioning *BIPOC as hypervisible*, evidenced in her internal struggle about how much she should "help" the Black student.

Sam

Sam, a 23-year old, white, non-binary, pansexual person with a disability, is an engineering major who has been interested in robotics since childhood. Sam was completing an undergraduate degree in computer engineering and had begun classes in an electrical engineering graduate program. Sam expressed a sense of isolation and a lack of resources available related to identifying as white and as non-binary:

> I'm not a huge fan of gender-specific groups in the sense like for example, or even race specific where it's like the society of Hispanic engineers and stuff like that. I think the reason why is because they don't have a group that's specifically for white males. There's a women in engineering [club], but it bothers me because there's no, like ... if there was one for every single race or every single category of people, it would make it much easier but there's not one so I don't like associating with it because I feel like at least one group of people doesn't have an opportunity to have that.

Sam described being *color-evasive* as Sam did not believe identity-consciousness created an equitable environment for all students. Sam stated that there is specifically no group for white men, which demonstrates Sam's lack of understanding of power and privilege and posited white males as victims within a field that centers white men. When asked about other identities, Sam did not discuss white identity and so the context in which Sam describes being white was rendered neutral. Sam only referenced race when describing exclusion from scholarship opportunities. Sam said: "There's no scholarships specifically for white males [just] women or minorities…And, I understand that people that are minorities might get less opportunities if there isn't one specifically for them." In describing liminal experience of feeling left out of student clubs and scholarships, Sam demonstrated *desiring more diversity* to feel included as a white, non-binary person. However, this desire was embedded within a *color-evasive* discourse, as Sam acknowledged that people from minoritized backgrounds have less opportunities but also felt marginalized as a white person because there are no identity spaces for Sam to participate in.

Gareth

Gareth was a 21-year-old gay white man studying mechanical engineering. He described being raised conservatively and, as a result, he valued competition, hard work, and individualism—values he saw as a good fit with a rigorous major that he described as "dog eat dog." He is out, but said he generally passes as heterosexual.

Gareth said that being gay had been a challenge when initially coming out. When asked about other social identities, including race, "I don't really like 'identity' necessarily. … I could really care less what you identify as…." This explicitly aligned with a *color-evasive* discourse that positioned whiteness as the unnamed default. He also said

> There's a lot of people who, in this world today who want to blame other people. So I'd say that I've experienced some of that just by being a guy. Like, "You're a white male, you have it so good, so easy." Which may be true but it makes me feel bad because it's not my fault, and it's not their fault either.

Gareth's words represented, in part, opposition to the *desiring diversity in STEM* discourse and diversity efforts that he viewed primarily as unwarranted complaining.

He described his major as consisting of "mostly guys, with the exception of few girls. But there's a lot of Color, there's a lot of Indians, a lot of Arabics, few African-Americans," and, thus, sufficiently diverse in his view. He also said: "I think we need to take race and gender and all that demographic stuff off of college applications. I

think it would be cool to truly take the best of the best and not have to worry about quotas." He also felt judged on campus as a white man:

> I think there's a big double standard out there, especially in the grand scheme of politics now, where it's like one thing's acceptable and that's it. No other opinions matter. … I don't know why but African-American women, they love to throw the white male in your face.

While Gareth claimed to dislike the concept of identity and wanted to focus on the character and morals of individuals, he still made *BIPOC, specifically Women of Color, hypervisible* in his re-telling of his experiences on campus, demonstrating his inattention to white supremacy, racism, and other systems of power and privilege. Through this, Gareth painted himself as a victim without any attention to the ways racism is perpetuated by white people and experienced by BIPOC on a daily basis.

Discussion

While there has been a significant increase in research exploring the experiences of people with MIoSG in STEM, less attention has been paid to the ways they interact with whiteness. Therefore, in this current paper, we sought to explore the ways that students with MIoSG experience STEM majors and spaces in the context of whiteness, white racial privilege, and white supremacy culture. We identified three emergent categories: *color-evasiveness*; the *desire for diversity in STEM*; and *invisibility and hypervisibility of BIPOC in STEM*.

While our findings are rooted in the particular experiences of BIPOC and white students at four institutions, they highlight the ways that tenets of and the white racial frame (Feagin, 2010) can be used to understand the climates in STEM departments. Glaringly, these color-evasive climates echo society's broader investments in the color-evasiveness, non-performative commitment to diversity, and overt and covert racism that perpetuate white supremacy (Ahmed, 2012; Annamma et al., 2016; Bonilla-Silva, 2003; Ladson-Billings, 1998). BIPOC students with MIoSG found themselves simultaneously invisible and hypervisible, despite the color-evasive climate. The presence of BIPOC both disrupted the presumed norm of whiteness in STEM (Le & Matias, 2019; McGee, 2016; Museus et al., 2011) and became subject to normalized standards of whiteness (Jones, 1972, 1981) and the white racial frame (Feagin, 2010). The white students in this study displayed tenets of the white racial frame, including virtuous whiteness (particularly their superficial desire for diversity in STEM) and negative stereotyping of BIPOC (as expressed and experienced by BIPOC participants).

To a certain extent, our data show the effects of broad patterns of inclusion and exclusion in STEM. Previous research has firmly established the exclusionary discourses that are dominant in STEM disciplines (Ong et al., 2011; McGee, 2016, 2020). Several of our participants of color noted the ways that racialized exclusion compounded or even overshadowed exclusion based on gender or sexual identity. White supremacy culture and the white racial frame have contributed to the systematic exclusion of BIPOC people from postsecondary scientific venues, which, in turn, helped create the current push to diversify the sciences. BIPOC students in this study articulated feeling both invisible – particularly reflected in their noticing a lack of peers and faculty members –

and hypervisible in STEM. Even though many of their peers expressed color-evasion, BIPOC students still felt self-conscious, lonely, and like they were pinpoints of color against a mostly white background (Ahmed, 2012; Bonilla-Silva, 2003).

Their genders and sexualities at times worked to increase this sense of loneliness or further position them as hypervisible. The persistent whiteness and cisheteronormativity (Cech & Waidzunas, 2011; Friedensen et al., 2021; Levya et al., 2022; Vaccaro et al., 2021) of STEM may be tied to its historical entanglement with white western ways of knowing as well as eugenics movements (Castro, 2014; Le & Matias, 2019; McGee, 2016; Museus et al., 2011). We found that BIPOC students with MIoSG particularly wished for more representation and community in their STEM spaces. For these students, the desire for diversity in STEM signaled a desire to be seen and heard and to build better STEM spaces for future BIPOC and MIoSG students.

White supremacy culture and the white racial frame also constrained the ways that white MIoSG participants experienced STEM spaces. White students, and some BIPOC students, in this study often invoked a color-evasive discourse that did not acknowledge broader systems of power, privilege, and oppression. This one-dimensional understanding of identity situated whiteness as the default in STEM spaces as well as contributed to the hyper- and invisibility of the BIPOC student experience.

Many of these students, however, understood that a common discourse in STEM and STEM education was the need for more diversity; at times, this discourse was something to be opposed, but many students expressed a positive desire for diversity. More often, the desire for diversity was situated as a benefit for all students, mirroring research that shows both the educational benefits of diversity and the ways those benefits typically accrue more often to white students (e.g, Bowman, 2009; Denson & Bowman, 2017). This reflects a potential instrumentalization of DEI efforts in STEM, which deserves future research to further explore.

Taken together, our findings indicate that, even with similarities in terms of gender identities and sexualities, white students and BIPOC students still have very different experiences in STEM fields. The white racial frame privileges white students in STEM spaces and limits the potential for solidarity between white and BIPOC students with MIoSG. In other words, whiteness, homophobia, and heterosexism collude with one another (Muñoz, 1999) to both limit the quality of the student STEM experience and create divisions between students who may otherwise be able to make common cause (Le & Matias, 2019; McGee, 2016). Unlike other studies that do not mark whiteness (e.g., Cech & Waidzunas, 2011), our study shows the ways that students with MIoSG can benefit from, and be harmed by, white supremacy culture. We also found that few white students are invested in breaking those invisible edicts dictated by the white racial frame in ways that would dismantle white supremacy in STEM and create more equitable environments for BIPOC students.

Implications for Research and Practice

Future researchers should investigate whiteness and STEM at multiple types of institutions, including non-R1 institutions, minority serving institutions, historically women's colleges, and historically Black colleges and

universities. Additionally, discipline-specific research may be warranted to parse out the experiences for students with MIoSG. Future research should also explicitly explore whiteness and its manifestations in STEM for individuals with MIoSG including faculty and staff in STEM.

Our findings also suggest several implications for policy and practice. First, our findings reaffirm that there are not enough supportive STEM learning spaces for students with MIoSG (e.g., Cech & Waidzunas, 2011; Hughes, 2017, 2018; Linley et al., 2018), especially if they are also BIPOC. STEM majors, departments, and programs need to create and maintain anti-racist and MIoSG-friendly spaces. These spaces can be formal, like organizations or clubs, or informal, student-created groups supported by programs or departments. Moreover, college and university employees with a solid foundation of anti-racist praxis can advise and/or partner with students in campus organizations to dismantle heterosexism, white supremacy, and to address racism and anti-Blackness, especially in STEM- and/or MIoSG-focused spaces.

Second, our findings show ways that whiteness works to further marginalize or exclude BIPOC students with MIoSG even in the context of DEI work. This is critical as students with MIoSG are both impacted by whiteness, white supremacy culture, and the white racial frame and are responsible for perpetuating it as well. While all students, faculty, and staff are impacted, it is important to understand that the impact is different across race by other students across race who hold MIoSG and by cis/het students. Institutional, departmental, and programmatic policies need to reflect a commitment to equity for people with different racial/ethnic identities (McGee, 2016) as well as sexual and gender identities. Our findings suggest that students interpret diversity efforts in STEM differently depending on their racial/ethnic identities. STEM educators and grantees need to consider how best to communicate the DEI components of their work to students to a) help white students understand the benefits of the work that may not privilege or center their education and b) enable them to work with BIPOC students to ensure that their needs are being met. Faculty and staff should consider: whose needs are (and are not) being met?; who will be the most impacted?; and who might this benefit? Additionally, institutional planning needs to move beyond the desire for diversity to include actionable steps for ensuring that BIPOC students and students with MIoSG are supported, included, and given equitable opportunities (McGee, 2016).

Finally, our findings show that STEM students, faculty, and staff need to be trained in concepts such as color-evasive racism in order to mitigate both the hypervisibility and invisibility of BIPOC students with MIoSG. These trainings should move beyond a simple valuing of diversity and instead focus on intersectionality, multiple identities, and ways to understand and decrease racism and anti-Blackness in STEM spaces (Leyva et al., 2022). This work may involve meaningful engagement with other fields, particularly cultural and ethnic studies, with which STEM students and faculty typically do not engage.

Conclusion

In this paper, we explored the ways that students with MIoSG were situated in relation to systems of whiteness and white racial dominance in STEM learning spaces. This constructivist grounded theory (Charmaz, 2014) paper resulted from the intentional application sensitizing concepts of white supremacy culture and the white racial

frame. Our findings included three emergent categories: color-evasiveness, desiring diversity in STEM, and the simultaneous invisibility and hypervisibility of Black, Indigenous, and People of Color (BIPOC) in STEM. Findings illuminated the complex ways BIPOC and white students with MIoSG experienced and thought about whiteness and white supremacy in STEM. Data points to the need for intentional anti-racist research, policy, and practice in STEM learning spaces. More research needs to be conducted on the ways whiteness is embedded in STEM fields, how it is perpetuated through the curriculum, and the impact that has on students with and without MIoSG within the field.

Notes

We use BIPOC to center Black and Indigenous communities within Communities of Color. Throughout this manuscript, we intentionally use the term BIPOC when referring to these Communities of Color. We also use the specific language that participants used when we highlight their individual narratives, both to respect the terms they used and to demonstrate participants' varied understandings of how they are positioned, and how they position others, with respect to race and ethnicity. Additionally, while we capitalize Black, Indigenous, People of Color, and other terms referring to racially minoritized communities, we do not capitalize white/whiteness to avoid (re)centering white people.

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