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"It's Dude Culture": Students With Minoritized Identities of Sexuality and/or Gender Navigating STEM Majors

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Science, technology, engineering, and mathematics (STEM) career pathways can be both lucrative and transformative in regard to social change (e.g., Christensen, Knezek, & Tyler-Wood, 2014; Fuesting, Diekman, & Hudiburgh, 2017; Wang, Ye, & Degol, 2017). However, research shows that STEM learning environments are inhospitable to students with minoritized identities—most notably, women, people of color, and people with disabilities (e.g., Gottfried, Bozick, Rose, & Moore, 2016; O'Brien, Blodorn, Adams, Garcia, & Hammer, 2015; Stout, Grunberg, & Ito, 2016). Almost no research has examined the experiences of students with minoritized identities of sexuality and/or gender (MIoSG) in STEM. Using grounded theory, this study documented how 56 students with MIoSG experienced and navigated a pervasive culture of centering cisgender heterosexual men within STEM learning environments—referred to by students as dude or bro culture. Rich quotes from participants across gender and sexual identity spectra described how dude/bro culture included bonding over hypermasculinity, assuming heterosexuality, perpetuating anti-lesbian, gay, bisexual, transgender, queer, intersex, and asexual discourses, treating students with MIoSG as if they are not smart or invisible, and objectifying and sexualizing cisgender women. Implications for higher education practice are provided.

Keywords: STEM, gender, sexuality, LGBTQ, bro culture, cisheteropatriarchy

Enrollment in, and completion of, undergraduate degrees in science, technology, engineering, and mathematics (STEM) can be a pathway to lucrative careers with the potential for transformative social change (e.g., Christensen, Knezek, & Tyler-Wood, 2014; Fuesting, Diekman, & Hudiburgh, 2017; Wang, Ye, & Degol, 2017). However, STEM learning environments have consistently proven inhospitable to students with minoritized identities—most notably, for women, people of color, and people with disabilities (e.g., Gottfried, Bozick, Rose, & Moore, 2016; O'Brien, Blodorn, Adams, Garcia, & Hammer, 2015; Stout, Grunberg, & Ito, 2016). In response, interventions intended to create more welcoming STEM learning environments for minoritized students are both vitally needed and demonstrably effective (e.g., Byars-Winston, 2014; Moss-Racusin et al., 2018; Rincón & George-Jackson, 2016). However, STEM inclusion initiatives that use limited understandings of the complexity of identity risk rendering people invisible. For instance, the frequent contrast drawn between the experiences of men and women in STEM fields is predicated on cisheteronormativity and therefore runs risks ignoring the experiences of people who do not fit within a cisgender binary (cf., Muñoz, 1999; Yoder & Mattheis, 2016). This binarist approach to gender may also reinforce norms of compulsory heterosexuality that tacitly assume that gender-based harassment typically involves a man targeting a woman when, in reality, gender nonconformity and queer sexuality are also frequent catalysts (e.g., Jauk, 2013; McCready, 2004).

At present, there is limited literature on the experiences of students with minoritized identities of sexuality and/or gender (MIoSG; Vaccaro, Russel, & Koob, 2015) in STEM fields. However, the inhospitable learning environments encountered by MIoSG college students in other campus learning environments (e.g., Nicolazzo, 2016; Rankin, 2005; Vaccaro et al., 2015; Woodford & Kulick, 2015) provide little reason to believe that their experiences would be better in STEM fields. As such, this study used a constructivist grounded theory design to explore how students with MIoSG majoring in STEM experienced and navigated campus learning environments and their disciplines/fields.

Literature Review

Higher education research shows that gender and sexuality-based oppressions are a persistent reality on contemporary college campuses (Bilimoria & Stewart, 2009; Bilodeau, 2009; Gortmaker

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& Brown, 2006). Decades of higher education research shows that MIoSG people endure violent attacks, harassment, and threats (Bilimoria & Stewart, 2009; Gortmaker & Brown, 2006; Rankin, 2005; Nicolazzo, 2016; Rankin, Weber, Blumenfeld, & Frazer, 2010; Vaccaro, 2012). MIoSG college students also report being the target of offensive comments and experiencing unfair treatment (Bilodeau, 2009; Gortmaker & Brown, 2006; Nicolazzo, 2016; Rankin et al., 2010; Vaccaro, 2012). Others have noted how higher education institutions reproduce MIoSG oppression (Vaccaro et al., 2015; Woodford, Joslin, Pitcher, & Renn, 2017). For instance, Woodford et al. documented five types of systemic exclusion experienced by transgender (trans) collegians: lack of safe bathrooms, exclusionary and binary options (male/female) on forms, limited sexual health information, assumptions about appropriate health care, and the lack of gender inclusive housing options. While discussions of campus climate often focus on the macroenvironment, other research has shown that various microclimates (Vaccaro, 2012) can be more or less welcoming to individuals with MIoSG (Nicolazzo, 2016; Rankin et al., 2010). Yet, we know almost nothing about how MIoSG students fare in STEM learning environments.

Limited research shows that STEM learning environments are often unwelcoming to students with minoritized identities. A large body of research has addressed the experiences of students of color and women in STEM fields (e.g., Lord et al., 2009). Yet very little attention has been paid to how students with MIoSG experience STEM learning environments (Cech & Waidzunas, 2011; Cooper & Brownell, 2016; Hughes, 2017; Linley, Renn, & Woodford, 2018). Linley et al.'s (2018) qualitative, interview-based study with 15 participants found that students experienced "multiple STEM microsystems influenced by faculty, peers, and colleagues" (p. 1) and that courses outside of STEM—namely, humanities and social sciences—offered a venue where students felt safe to be out about their lesbian, gay, bisexual, transgender, and queer or questioning (LGBTQ) identities. Though students described positive experiences with STEM faculty, they did not generally describe faculty as allies (Linley et al., 2018). Another qualitative, interview-based study with seven participants showed that LGBTQ, intersex, and asexual (LGBTQIA) students face a hostile climate in biology classrooms (Cooper & Brownell, 2016).

Moreover, a number of studies have shown that engineering schools often promote hegemonic masculinity and heteronormativity (Cech & Waidzunas, 2011; de Pillis & de Pillis, 2008; Hughes, 2017). In an exploratory study on one campus with 17 students (11 gay, four bisexual, two lesbian), Cech and Waidzunas (2011) used interviews and focus groups to document the ways students often passed or covered their sexual identities to succeed in hostile, socially isolating, and heteronormative engineering environments. In a study with seven gay men, Hughes (2017) documented how masculinity dominated the engineering climate and shaped participant experiences with safety, internalized homophobia, and the development of an engineering identity. de Pillis and de Pillis (2008) invited a convenience sample of 47 male and 56 female undergraduates enrolled in a business course to offer insight into the mission statements of 20 engineering and liberal arts schools. They concluded that "masculinity and hierarchy may be so deeply entrenched that it is evident even to casual observers" (p. 33; e.g., business undergraduates). Given these engineering studies, literature on cisheteropatriarchy, toxic masculinity and hegemonic masculinity shaped our study.

Critical scholars of gender have shown that contemporary American society is structured in ways that are fundamentally cisheteropatriarchal (e.g., Bronski, 2012; Johnson, 2014). By privileging the experiences and identities of cisgender, heterosexual men, the resultant social order affords social, cultural, political, and economic power to those whose gender identities and gender performance align with the cisheteropatriarchy (Brookfield, 2004; Butler, 2004; hooks, 2004; Muñoz, 1999). The result of this power structure is the creation and perpetuation of a culture that values traits associated with men in ways that are fundamentally maladaptive—namely, hegemonic and toxic masculinities (e.g., Connell, 2005; hooks, 2004).

Scholars use the terms hegemonic masculinity and toxic masculinity to refer to two clear problematic manifestations of the cisheteropatriarchy (Christensen & Jensen, 2014; Connell & Messerschmidt, 2005). Broadly, these concepts refer to the harmful effects of the normalization of a social order that privileges cisgender men, masculine behaviors, and heterosexuality. Hegemonic masculinity refers to a system of beliefs and behaviors that legitimate the dominant societal positions of cisgender men and justify the marginalization of all those who do not fully uphold to the masculine ideal (including cisgender women, trans and gender nonconforming persons, and cisgender men whose gender performance is not hyper-masculine and/or who are not heterosexual; Connell, 1987). In turn, toxic masculinity refers to the way in which the internalization of cisheteropatriarchal norms actively harms both those who are oppressed by them and those to whom they afford privilege (cf., Connell & Messerschmidt, 2005; Keith, 2017). For example, toxic masculinity has been linked to negative mental health, physical health, and educational outcomes for cisgender men who conform to masculine behavioral and emotional archetypes (e.g., Archer, Pratt, & Phillips, 2001; Fleming, Lee, & Dworkin, 2014; Hickey, 2008; Kupers, 2005; Sloan, Conner, & Gough, 2015).

Although this prior research on hegemonic and toxic masculinity offers important lessons for how STEM fields might function according to cisheteropatriarchal norms, far more research is needed to understand MIoSG student experiences in STEM environments as well as the ways students navigate those environments. Prior research on how minoritized students experience systems of oppression within STEM learning environments highlights the importance of both navigational capital (e.g., Listman & Dingus-Eason, 2018; Martin & Newton, 2016; Samuelson & Litzler, 2016) and coping skills (e.g., Godwin, Potvin, Hazari, & Lock, 2016; Hsieh, Sullivan, Sass, & Guerra, 2012; Mamaril, Usher, Li, Economy, & Kennedy, 2016). Navigational capital refers to the strategies and resources that minoritized students utilize to work around institutional structures that normalize oppressive ideological systems (Yosso, 2005). In turn, coping refers to the strategies and resources that minoritized students use to maintain resilience as these same oppressive ideological systems result in negative experiences or stress within the educational environment (Lazarus & Folkman, 1984). For this article, we combine these insights with literature from critical gender and queer theory that highlights the performative nature of both gender and sexuality (cf., Butler, 2004; Muñoz, 1999). Therein, theorists clearly demonstrate how people with MIoSG use a variety of strategies—ranging from the internalization of oppressive ideolo-

gies, to the resignification of dominant forms of meaning-making, to the active resistance to an inequitable status quo—to navigate inhospitable social environments. We use this insight to help answer the following main research question: How do students with MIoSG majoring in STEM experience and navigate campus learning environments and their disciplines/fields?

Method

We used a constructivist approach to grounded theory research (Charmaz, 2014) rather than earlier grounded theory approaches (cf., Glaser & Strauss, 1967). An assumption of constructivism is that social reality is constructed and multiplistic, rather than fixed. In accordance with Charmaz's (2014) perspectives on grounded theory, we subscribe to 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). This framework aligns with the work of Vaccaro et al. (2015), which explicated how the campus experiences of MIoSG students are always embedded in social life, including recent and historical as well as international, national, regional and local contexts. In this study, we used constructivist grounded theory to document how participants made meaning of their STEM experiences within their particular campus contexts. Grounded theorists typically conclude their projects by constructing grounded models. As we wrote this article about bro or dude culture, we concurrently constructed an overarching grounded theory model (Vaccaro, Miller, Kimball, Forester, & Friedensen, 2019).

We collected data for this project at three public and one private institutions of higher education—three institutions in the Northeast and one in the Southeastern United States. Given the personal and sensitive nature of questions about MIoSG, we were committed to allowing participants to select a mode of interview that they were most comfortable with (e.g., in person, online, phone). This decision limited us to sites within driving distance of the research team (as well as those where we could obtain institutional review board approval).

We used theoretical sampling (Charmaz, 2014) to identify a diverse pool of students with MIoSG who could help us answer our research question. We sent electronic recruitment flyers to STEM colleges and academic departments (e.g., engineering, computing, natural sciences, life sciences, environmental science, applied sciences, health sciences, ocean sciences, statistics, math) on four campuses and asked deans and department heads to forward our recruitment to their faculty and students. We also sent e-mails with our recruitment materials to campus LGBTQ centers and LGBTQ student organizations (e.g., Gay Straight Alliance and Out in Science, Technology, Engineering, and Mathematics). We posted flyers around the four campuses—largely in STEM academic buildings and campus diversity centers. The flyer explained how we were "recruiting 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.

Our sample of 56 participants includes five graduate students and 51 undergraduates. We invited students to use their own words to self-report their gender and sexual identities. As such, the total number of responses in the following sentences exceeds the number of 56 participants because we asked participants to describe all the ways that they thought about their gender and sexual identities. Participants self-reported their gender identities as man ($n = 24$), woman ($n = 18$), cisgender ($n = 14$), trans ($n = 7$), genderqueer ($n = 6$), nonbinary ($n = 5$), female ($n = 4$), male ($n = 2$), and agender ($n = 1$). Participants self-described their sexual identities as gay ($n = 22$), bisexual ($n = 18$), pansexual ($n = 11$), lesbian ($n = 7$), asexual ($n = 4$), queer ($n = 4$), questioning ($n = 3$), gray-asexual ($n = 2$), dyke ($n = 1$), gynophile ($n = 1$), homoromantic ($n = 1$), panromantic ($n = 1$), straight ($n = 1$), and woman-loving-woman ($n = 1$). Roughly 20% of our sample self-identified as students of color, which included Latinx ($n = 4$), Black ($n = 4$), Asian American ($n = 2$), Arab/North African ($n = 1$), bi- or multiracial ($n = 2$), Native American ($n = 2$), South Asian ($n = 1$), and White ($n = 45$). These racial demographics mirrored the predominantly white institutions where data were collected. Participant majors/fields included engineering ($n = 29$), computer science ($n = 9$), biology ($n = 5$), food science and nutrition ($n = 4$), environmental science ($n = 2$), marine science ($n = 2$), neuroscience ($n = 2$), kinesiology ($n = 1$), mathematics ($n = 1$), and natural resources ($n = 1$). Twelve participants identified as having a disability. See Table 1 for a summary of key participant demographics and pseudonyms.

To collect data, we used semistructured, audio-recorded individual interviews (Rubin & Rubin, 2011), which is a commonly used technique within constructivist grounded theory (Charmaz, 2014). Semistructured interview protocols allow researchers to vary the precise phrasing and sequencing of questions to replicate the norms of a conversation (Charmaz, 2014; Rubin & Rubin, 2011). It also establishes sufficient structure to ensure that we asked all participants about the same set of topics core to the inquiry. Due to space constraints and the fact that our semistructured approach led questions to be asked slightly differently by each of the five interviewers, we do not share our complete protocol here. Instead, we share examples of semistructured questions that relate most directly to the topic of this article. Our protocol began with 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?") and continued on to questions about experiences with STEM fields (e.g., "I'd like to ask you to tell me a little bit more about what it's like to be [gender/sexuality] in [field]"). We probed for information about if, and how, gender and sexuality manifested in curriculum, instructional strategies, and classroom conversations. We also asked questions about the environment and people they interacted with in STEM. Examples of those questions included "How common are people in your field—faculty, staff, and peers—that share your gender/sexual identities?"; "Can you tell me about a time in your major/field of study when you felt included/affirmed because of your gender identity or sexuality?"; "Can you tell me about a time in your major/field of study when you felt and/or marginalized/excluded because of your gender identity or sexuality?"; and "What resources or supports have you found to be particularly helpful (specific people, resources, clubs, services)?" We concluded each interview by asking participants to

Table 1
Participant Pseudonyms, Majors and Demographics

Pseudonym	Major	Gender	Sexual orientation	Race/ethnicity[a]
Aiden	Engineering	Man	Gay	Caucasian
Amelia	Engineering	Woman, cisgender	Bisexual	Caucasian
Ana	Engineering	Woman	Bisexual, gay, pansexual	Black
Annalise	Biology	Woman, cisgender	Gray asexual, bisexual	Caucasian
Asha	Engineering	Woman	Bisexual (identify most with), pansexual, queer	Caucasian
Aspen	Computer science	Nonbinary	Gray-asexual	Black
Aura	Engineering	Transgender, nonbinary	Pansexual	Caucasian
Bri	Nutrition	Woman, cisgender	Bisexual	Caucasian
Callie	Engineering	Transgender, nonbinary	Gynophile	Caucasian
Camila	Neuroscience	Woman, female	Lesbian, dyke, queer, gay	Latina
Carlton	Engineering	Man	Gay	Caucasian
Caroline	Nutrition	Woman, cisgender	Gay	Caucasian
Cato	Mathematics	Man	Gay	Latino
Channing	Engineering	Man, cisgender	Gay	Caucasian
Cherrie	Natural resources	Woman	Lesbian	Caucasian
Cole	Engineering	Transgender	Bisexual	Asian
Corey	Engineering	Man, cisgender	Gay	Caucasian
Crystal	Engineering	Woman	Bisexual, pansexual	Caucasian
Dennis	Nutrition	Man	Gay	Caucasian
Devin	Engineering	Man	Gay	South Asian
Ethan	Computer science	Man, transgender	Asexual	Black, Caucasian
Faith	Engineering	Woman	Lesbian	Caucasian
Finn	Engineering	Man	Bisexual	Caucasian
Flint	Environmental studies	Man, cisgender	Gay	Caucasian
Gareth	Engineering	Man	Gay	Caucasian
Gloria	Engineering	Woman	Pansexual	Caucasian
Hazel	Biology	Female-aligned, femme	Bisexual, pansexual, queer	Black
Jack	Biology	Man	Gay	Caucasian
Jade	Marine biology	Woman, genderqueer, nonbinary	Bisexual, pansexual	Caucasian
Jamie	Neuroscience	Transgender, genderqueer, "genderfluid between androgyne, agender, and fuck-it-autism-is-my-gender"	Asexual, panromantic	Caucasian
Jax	Engineering	Man	Bisexual	Native American
Jesse	Computer science	Genderqueer, agender	Questioning	Caucasian
Jordan	Engineering	Man	Gay	Latino
Joseph	Engineering	Man, genderqueer	Queer	Caucasian
Kane	Engineering	Man, cisgender	Gay	Asian American/Pacific Islander
Kennedy	Environmental studies	Genderqueer	Asexual, homoromantic	Caucasian
Kylie	Computer science	Woman, cisgender	Gay, lesbian, queer	Caucasian
Lance	Engineering	Man	Gay	Caucasian
Liam	Engineering	Man	Bisexual	Caucasian
Luna	Computer science	Female-aligned, femme	Lesbian, woman-loving-woman	bi/multiracial, Caucasian, Arab/North African
Malia	Engineering	Woman	Asexual, bisexual	Caucasian
Marina	Nutrition	Woman	Bisexual	Caucasian
Nia	Kinesiology	Woman, cisgender	Bisexual, questioning	Caucasian
Nolan	Computer science	Man, cisgender	Gay	Caucasian
Ophelia	Engineering	Woman, cisgender	Lesbian, questioning	Caucasian
Reid	Engineering	Man	Gay	Caucasian
Rowan	Engineering	Man	Gay	Latino
Russ	Marine biology	Man, cisgender	Gay	Caucasian
Sam	Engineering	Nonbinary	Pansexual	Caucasian
Skyler	Engineering	Transgender	Asexual, bisexual, pansexual	Caucasian
Stella	Physics, computer science	Female, woman, trans woman, girl, trans girl	Functionally lesbian, sapphic, technically bisexual, lesbian	Caucasian
Titus	Computer science	Male	Straight	Caucasian
Ty	Computer science	Genderqueer	Pansexual	Caucasian
Vaughn	Engineering	Man, cisgender	Bisexual	Caucasian
Zane	Biology	Male	Gay	Caucasian

Note. trans = transgender.
[a] Recognizing the racist and colonialist origins of the term, we did not use the term "Caucasian" in our interview questions. The vast majority of these participants identified as "White" in our interviews and we refer to students as such in our writing. However, during the review process for this manuscript, we discovered that we had inadvertently allowed participants an option to self-identify as "Caucasian" on an outdated demographics form collected prior to the interview. We include this footnote so that future researchers might learn from our mistakes.

provide any additional information that they felt we should know about gender and sexuality in STEM. We also invited participants to offer advice to other students who shared their constellation of social identities or to administrators working to support students with MIoSG in STEM fields.

Consistent with constructivist grounded theory, we began the data analysis process concurrently with collection and used constant comparative analysis (CCA) to structure this process (Charmaz, 2014). In CCA, researchers begin by assigning initial codes to data. The purpose of initial codes is to sort and organize data into manageable segments. Examples of the more than 100 initial codes included fear, outness, peer interactions, support, and faculty. Selective and focused codes are then used to begin to narrow the analysis. Selective codes create larger categories of data that are linked by similarities. Sample selective codes included masculine/male privilege, binary reinforcement, identity, intersectionality, and bro culture. Focused codes help to identify important segments of data that require focused analysis and theorizing. For this article, we focused our attention on segments of the data related to dude/bro culture. Those focused codes appear in this article as subcategories related to bro culture, including hypermasculinity and assumed heterosexuality, inferiority and invisibility, objectification and sexualization, microclimate variation in bro culture, and varied strategies students used to navigate bro culture. In CCA, this inquiry process is supported by intentional memoing (Charmaz, 2014) after and between interviews. Around Interview 25, we began to hear consistent patterned responses (Charmaz, 2014; Jones, Torres, & Arminio, 2014). However, in line with grounded theory CCA processes, we conducted further interviews to refine our selective categories (Charmaz, 2014). This article shares the selective category and focused subcodes related to bro/dude cultures described by 56 STEM students.

To ensure trustworthiness and credibility, we used a number of qualitative research strategies including analytic triangulation, discrepant case analysis, member checking, and expert reviews (Charmaz, 2014; Glesne, 1999; Jones et al., 2014). Analytic triangulation was conducted between interview transcripts from different campuses, member checking focus group data, and memos from the research team. Our use of a research team also strengthened trustworthiness of the study, as we leveraged benefits of team-based qualitative research including the use of multiple perspectives, reaching consensus on findings, and the ability to uncover each other's assumptions (Danzl, Hunter, & Harrison, 2017; MacQueen & Guest, 2008). Team members coded interviews conducted by other team members and we discussed our notes and impressions from conducting and analyzing interviews during team meetings.

We also used discrepant case analysis. In a seminal article about qualitative credibility and trustworthiness, Morrow (2005) explained discrepant case analysis as

> a deliberate and articulated search for disconfirmation and helps to combat the investigator's natural tendency to seek confirmation . . . [It] involves finding disconfirming instances of a phenomenon and comparing them with confirming instances in order to understand the complexities of the phenomenon. Through repeated comparisons, the investigator is able to revise key assertions or categories until they accurately reflect the experiences of participants. (p. 256)

Given the diversity of majors, genders, and sexualities of our participants, we used discrepant case analysis to ensure that we included all voices and that overarching conclusions about bro/dude culture were accurate.

We invited all participants to attend member-checking focus groups. Morgan (1996) suggested focus groups can be ideal for analytic triangulation and member checking because focus groups afford individual participants an opportunity to indicate whether researchers' interpretations are consistent with their experiences. Member checking allows a collective space to question, challenge, and extend researcher interpretations while building off of one another's reactions (Charmaz, 2014; Jones et al., 2014). Seventeen students participated in five member-checking focus groups where we presented preliminary findings and invited students to offer feedback on the clarity of our emergent categories. We also asked students whether or not study categories and conclusions resonated with them. All agreed that our conclusions captured their experiences. For instance, one focus group participant said, "That really sums it right up."

For the strategy of expert peer review, we invited 25 gender, sexuality, and STEM experts on three campuses to six separate presentations where we shared print copies and verbally summarized our emergent categories and conclusions. Experts offered overwhelmingly positive verbal feedback about the trustworthiness and credibility of our work. A preliminary version of this article was also presented to 40 higher education experts in November 2018 where we received affirming discussant and audience feedback.

We addressed relational competence through reflexivity about our social identities, positionality, power relationships, and preunderstandings (Jones et al., 2014). We engaged in reflective discussions about the ways our positionality and worldviews shaped our interactions with participants and interpretations of the data. All of the researchers are active in social justice work on and off campus. Three of the four authors of this article self-identify as people with minoritized sexual identities. Those of us with minoritized sexual identities are out in our careers, disciplines, and on campus. Though we did not explicitly identify ourselves as MIoSG in recruitment materials, we advocate publicly for MIoSG on our campuses (e.g., as leaders of LGBTQ organizations and events that are advertised to the campus community). A Google search from a prospective participant would reveal our ongoing work with MIoSG in research, service, and other professional contexts. We also revealed our MIoSG in the course of interviews with participants, either before the formal interview began or in the course of the interview when relevant. Most interviews took place in our offices, which each include a variety of LGBTQ signs and symbols (e.g., rainbow flags, photographs of a same-gender partner). Our MIoSG likely had some influence on the swift and sizable response to our call for participants. In our experience, students from minoritized social identities are more likely to volunteer for a study and/or talk to a researcher who shares a MIoSG, a notion supported by scholars who note that LGBTQ researchers have insider knowledge and terminology that can establish rapport and facilitate recruitment and data collection (Bettinger, 2010; LaSala, 2003).

The research team included two cisgender women and two cisgender men—affording us varying access to gender privileges. Despite the relatively large pool of trans ($n = 14$), nonbinary ($n = 6$), and genderqueer ($n = 4$) participants, we recognize that other students with minoritized gender identities may have felt less

comfortable volunteering to talk with a cisgender interviewer. Our racial backgrounds—all White—may have also shaped our participant pool and interactions with interviewees. In terms of power, we made sure that none of the interviewers involved a direct power relationship with students such as that of a professor, advisor, or supervisor. However, we recognize that our varied campus roles (committees, presenters, activists) involve access to differing sources of power and may put us into contact with participants outside of our classrooms or offices. We attempted to mitigate potential power differentials by using ongoing process consent and revisiting our commitment to confidentiality before the interview, during the interview, in thank-you e-mails, and during member checking (Jones et al., 2014; Morrow, 2005).

Findings

What Is "Dude" or "Bro" Culture?

Participants across various gender and sexual identity spectra identified a pervasive culture of centering cisgender heterosexual men within STEM learning environments. In the words of several participants, this constituted a "dude culture" or "bro culture." Some of the manifestations of dude or bro culture included: bonding over hypermasculinity and assumed heterosexuality, treating students with MIoSG as if they are inferior or invisible, and sexualizing and objectifying others. Participants also noted that bro culture manifested differently in various campus microclimates (e.g., STEM classrooms, extracurricular settings), including in a food science and nutrition department that is analyzed as a discrepant case.

Hypermasculinity and assumed heterosexuality in bro culture. A number of participants explicated how bro culture was synonymous with hypermasculinity. Dennis explained how hypermasculinity created unrealistic expectations of men (assumed heterosexual) as physically strong and unemotional:

> I feel like people think that men are stronger. There is different societal views of being a man. I feel like you have to live up to expectations, too. You have to be the societal view of a man—I feel like. And if you're not, people look down on you. Or [think] you're not as much of a man—especially emotionally wise. If you're more emotional, or if you cry, it's not socially acceptable—which is not right because [being] emotional is being a human.

When asked to describe bro culture in STEM, Corey responded,

> Rampant heterosexuality? What does it look like? What does it feel like? You know what it looks like? It looks like a 20-year-old boy, in weather that's way too cold, wears like basketball shorts and a T-shirt. I do not know why, but that's the look. It's just like kind of a culture of men that need to assert their masculinity.

Corey further explained that hypermasculine bro culture extended to sexuality,

> because homosexuality is perceived as feminine—as like a feminine act, you know? Or like a feminine way of being. So like, this sort of dude bro culture . . . It's like "no homo, bro." Because you need to kind of assert your masculinity, assert your nonhomosexuality.

Corey's description captured how many participants described STEM environments as centering and prizing cisgender men and heterosexuality above all other genders and sexualities. Not only are heterosexual men prized in bro culture, but such masculine environments assume heterosexuality will shape all relationships and behaviors. Callie, who identified as a trans, nonbinary gynophile explained,

> The environment is masculine dominated. And so, I think liking girls plays into that. . . . My dad was an influence into me going into engineering. Like, this is the kind of thing that guys go in to. And you're going to find a girl [on campus] and you're going to be able to provide for her, and things like that.

In this quote, Callie described being socialized into a field that assumed heterosexuality and prized masculinity. In addition to subtle cultural expectations of heterosexuality, dude culture was also replete with anti-LGBTQIA discourses (e.g., slurs, jokes). Explaining that he had never felt positively affirmed in his sexuality (gay) within STEM spaces, Vaughn, a cisgender man, said, "It's dude culture. . . . It's just like the gay jokes. I don't like saying it, but faggot, people saying faggot." Most participants mentioned that anti-LGBTQIA jokes and discussions were normative in dude culture and that they overheard offensive LGBTQIA jokes.

Treatment of students with MIoSG as inferior or invisible. Bro culture often treated students with MIoSG as if they were inferior to cisgender heterosexual men. Annalise, a cisgender woman, noted that bro culture means that cisgender heterosexual men "look down on both women and trans folks." Jordan, a gay man, described a sense of superiority among heterosexual men in engineering: "Where I'm in a class with other men, I just feel like they [perceive me] like I'm not that smart." Skyler, a trans participant, who used she/her/hers pronouns and was read as a woman noticed how "dudes" treated some men better than others. However, she believed that in bro culture, women were valued least. Skyler noted, "I feel like they [cisgender and heterosexual men] can be more condescending towards women. . . . Maybe they feel they are smarter."

In other instances, participants noted how they were treated as if they were invisible because they were not heterosexual cisgender men. Marina described a phenomenon that she and her friends refer to as the "brick wall" that quickly comes up when men get together and ignore or "block" the participation of women. She explained,

> Everything will be totally regular [with] your good [man] friend [or] your coworkers. . . . But then a group of their friends from their frat[ernity] will come over, and they'll simply not talk to you [and] will not include you in conversation. . . . We call it the brick wall because they're all so big [physically]. And they just turn their back to you and you cannot see, hear, or look at anything, anyone. That's mostly the situation where it comes into, just like, you get excluded when they're with other [men].

The physical "brick wall" was among the most visually obvious ways students were excluded in bro culture. In many other instances, participants described being "invisible" or subtly "ignored."

Objectification and sexualization. One of the hallmarks of dude or bro culture was the sexualizing of people—mostly cisgender women. Dennis explained how cisgender men often engaged in objectifying conversations, "Like really degrading stuff about females, sex wise." Quite a few participants noted they commonly

heard cisgender, heterosexual men bragging about how many women they have slept with or referring to peers as "hot" women with whom they wanted to have sex. Annalise, who described herself as a gray asexual/bisexual cisgender woman noted, "there's a lot of objectification of women, a lot of over-sexualization of gay women, gay meaning lesbian and bisexual and pan . . . all queer women." In this instance, Annalise talked about not only the objectification of women, but the power-laden belief that "gay" women were objects for the sexual entertainment or for straight men (e.g., watching women have sex, engaging in threesomes). Amelia wove these two manifestation of bro culture together when she described,

> It comes up more when I'm talking to very normal men [who are] used to traditional gender roles and things like that. And I think it's just that they feel it's [bisexuality] something new and exciting. Because again, they assume that if you find a bi woman that they're going to have sex with a woman for you. . . . People talk about their weekends sometimes, and you'll overhear the conversation. People talk about hooking up with people [in] bro culture . . . people are bragging about everybody they're banging.

Carlton, a gay man, recalled instances where cisgender men in his STEM classes were "All talking about their girlfriends, or 'she looks so good,' or whatever . . . so you feel like that would be so weird for me to say I find that guy attractive." In addition to his earlier comments about bro culture as degrading to women, Dennis also talked broadly about the ways bro cultures normalize cisgender men using their power to sexualize, objectify, and even assault targets:

> Bro. It's just like treating people bad and thinking it's okay. Having a lot of sex with people and not respecting them and not taking no as an answer and thinking it's a joke when it's not—which is scary.

Although Dennis acknowledged objectification of women in STEM largely emanated from cisgender heterosexual men, he noted how hypermasculinity and objectification could also be found in gay men's communities off campus. He noted, "I've even seen it in the gay community too for guys that are more bro. It's just like treating people bad and thinking it's okay." While discussion of off-campus gay men's culture is beyond the scope of this article, Dennis' commentary illuminates the complexity of the intersections of sexuality, gender, objectification, and bro culture.

Bro culture varies by microclimate. Participants explained that they experienced bro or dude culture differently depending on the campus setting. Many noted how bro culture showed up in some campus microclimates (Vaccaro, 2012) more explicitly than others. Russ gave an example that cisgender heterosexual men spoke more freely to each other in the gym ("locker room talk"), a space dominated by men, than in STEM classes, where women would be present:

> In STEM classes, [bro culture is] more subtle. Or it's a little more hush-hush with your guy friend right there. He's not going to go into great detail of everything he wants to do with this girl in front of other women. In areas where it's just a bunch of bros lifting, it's cool I guess to talk about those kinds of things. . . . I've come to find that in the classroom it's more subtle and it's more hush-hush. In male-dominated spaces or men-dominated spaces, it's a lot louder because it's I guess just assumed that every man thinks the same way and that anyone around would engage in the exact same type of conversation.

Russ explained the nuances of how bro culture might be more overt depending on the space; in more male-identified spaces, men might feel freer to express their thoughts on sexuality.

Discrepant case: Food science and nutrition. One of the strategies for ensuring trustworthiness and credibility of qualitative research is to share discrepant cases (Jones et al., 2014; Morrow, 2005).[1] While most participants provided evidence of a bro culture in their STEM disciplines, a few students (mostly in one food science and nutrition department) reported supportive climates and a lack of bro culture. For instance, Caroline, who identified as a cisgender gay woman, described the opposite of bro culture in her courses in the food science and nutrition department, predominately comprised of women identified students and faculty. Bro culture was not only absent, but it seemed like women-identified faculty took steps to keep "negative" bro culture from entering into the department culture. Caroline shared,

> I would think of bros as like fraternities—excuse my language, douche guys—they were just kind of jerks . . . And I think with the bro culture's connotation where like, they're not good people. They're not accepting. Those are the people who have stigmas and say the derogatory things just because they think they're funny. They have their little cult. They have their little bro crew and I just . . . our professors are older women . . . they do not put up with it.

Caroline also described the bro culture as "really frowned upon in our department," a departure from most other participants.

Navigating Bro Culture

Faced with the prospect of persisting within in a male-identified, cis-/heteronormative environment, students described their attempts to navigate dude or bro culture. The degree to which participants felt they could make a choice about participation in dominant norms varied greatly depending on their own gender and sexual identities and the relative visibility of their identities. Many participants felt that their intersecting gender identity, gender expression, and sexual identities prevented their full participation in the bro STEM culture. These learning environments were not designed for, or welcoming to, them. In the following paragraphs,

[1] One of the most commonly used techniques to classify academic majors, the Biglan (1973) typology, provides a useful way to think about nutrition. Typically thought of dividing academic disciplines on the basis of their paradigm consensus (hard/soft), topical focus (life/non-life), and orientation toward research (pure/applied), the Biglan types for STEM fields almost universally include a hard paradigm consensus. They are otherwise divided among life/nonlife and pure/applied disciplines. Notably, the support for people with minoritized identities within a discipline has been shown to strongly correlate with degree of paradigm consensus (e.g., Smart & Elton, 1982; Stoecker, 1993)—resulting in the tacit devaluing of applied scientific fields like nursing, kinesiology, and nutrition that do not display the high employment rates for cismen evidenced in most STEM fields. Consistent with this framing, nutrition programs have been classified as both a hard/life/applied discipline (Doberneck & Schweitzer, 2017) and a soft/life/applied discipline (Barnes, Bull, Campbell, & Perry, 2001). We used this literature to inform our inclusion of food science and nutrition. Also, our sampling asked people to self-identify as STEM students, and nutritionists in our sample did so; the field of nutrition has long regarded itself as a science (see Leaf & Weber, 1987); and the U.S. Department of Education (2010) classifies nutrition programs as either an interdisciplinary science or a part of food sciences more broadly.

we explicate the various ways students with an array of MIoSG navigated bro cultures. Students navigated bro culture by participating, resisting, blending in, or resisting bro culture and/or traversing liminal spaces.

Participating in bro culture. Some cisgender gay men, especially those who were read as heterosexual, were welcomed into bro status. Nolan admitted that he sometimes participated in bro culture. As a gay, cisgender man, he preferred to work with women and felt the strain of only working with other men in class, resulting in his attempts to "try and sound a little more masculine" even though he considered himself "a little bit more feminine." He said that after the first lab assignment in class, "I found myself saying 'bro' a little more often than usual. I never say bro. . . . I remember I texted a friend and was like, 'I just said bro like eight times.'" Nolan found that he has "to think more about it" when he's interacting with other men.

The weaving together of gender identity, gender expression, and sexuality resulted in assumptions about many participants' identities. Gareth discussed how maleness and straightness are equated with each other and that he cannot both be gay and be seen as a man. He described this perception as, "when you are a gay man and you act flamboyant you're not really a man." Because Gareth expressed his gender identity as more masculine than feminine, he thought some heterosexual men might "subconsciously see me as straight or something." Despite identifying as gay, he described himself as upholding some of the components of bro culture: as the "stereotypical guy when it comes to gritty, tenacity, not scared of hard work, physical or mental . . . I don't really do feelings." He also described wanting to avoid dating other men in his major and referred to another gay man he had hooked up with in a sexualized way ("fuck boy").

Resisting bro culture. Other cisgender gay and bisexual men tried to distance themselves from bro culture, by explaining how it was mostly perpetuated by "Greeks" versus "nerdy" gaming club men like themselves. Lance claimed he did not fit into bro culture:

> To me when I hear [bro culture] it means, typical male things like talking about sports—just things like that. Which doesn't necessarily interest me personally. I typically talk to both genders pretty equally. . . . I guess if I had to choose a culture that I associate with the most—I do typically have more female friends . . . when we're having a more personal conversation I like to say, "Yeah, it's nice to be able to talk about this stuff with someone and not just have that typical bro conversation."

For Lance, not discussing sports and primarily associating with women helped set him apart from bro culture; however, he also indicated he viewed gender as a binary when he said he associated with "both genders pretty equally."

Cisgender gay and bisexual men with more masculine gender expression may have been welcomed into bro culture, but struggled with resisting or distancing themselves from it. Dennis, a cisgender gay man, was in food science and nutrition classes that were predominately comprised of strong women identified students and teachers. As such, Dennis described how bro culture was not present in his classes, but it was certainly present in other areas on campus he frequented such as Greek life and the gym. He was in a fraternity for a year and a half and was not comfortable with the pervasive bro culture that was demeaning to women and encouraged sex without connection. Dennis shared how assumptions are made about him because he passed for straight and was in shape. Other men included him in bro conversations that were demeaning to women. While he tried to resist, he noted how hard it is to not let notions of power and control go to his head.

> I do not know, it's almost like a game to them. They think they have the upper hand or something. It's really weird psychologically thinking . . . Sometimes I feel like, "Oh god I don't want to be like that." And it's just out of my control kind of sometimes. I'm labeled as [a bro] just because I look more straight and stuff like that. But I try not to let it affect me or get to my head or something.

Although Dennis tried to resist participation in bro culture, he noted how the power, respect, and feelings of being included could be tempting and "go to [his] head."

Traversing liminal spaces. Trans and nonbinary participants described complex navigation issues in regard to bro culture. Those whose identities and/or expressions fell outside the binary often described the challenge of existing in a liminal space in regard to bro culture. Callie, who identified as nonbinary, described being able to relate to men when they discuss finding women attractive. Even in those conversations, Callie did not feel like they fit in because the conversations came from a "place of masculinity" and expressing masculinity versus talking about attraction:

> I would say that it means that I can relate to guys by talking about girls. There's a, sort of, language that we use and it's . . . the type of things you think about. Or, if you say that you're going out with someone, you can share that experience of like, "Have you ever had this happen or whatever?" . . . Sometimes I notice that I cannot relate to some of the things that are being talked about because I realize they're coming from a place of masculinity as opposed to a place of liking girls.

Callie's quote illustrates that even when they shared attraction to a particular gender, it did not allow them to relate to men peers, because of the connection between cis/het men's expression of sexuality and attraction and their masculine gender expression and gender identity as men. Callie also mentioned being "comfortable looking masculine" in bro environments and "can embrace being masculine, and taking that role societally and physically." Yet Callie also admitted, "I've had a lot of distress over not being able to do that in female roles well."

Aura shared that they did not know how they fit within engineering identifying as a trans/nonbinary student, particularly because they did not frequently disclose their nonbinary identity and were often perceived as male:

> It is a little bit weird, just because, especially when engineering's got the reputation of being a boys' club. Again, because I'm not particularly out to anybody, I cannot just be like, "Now, wait a minute. I don't count as being the boys' club thing." A good chunk of my friends are female, because that's just what I connect with better. There are times I joke about, "Us girls need to stick together," and people laugh. But, I do not know if anybody thinks that that's a little bit more serious than just joking.

Because Aura was not "out" about their nonbinary identity, comments illustrating how they can relate to women could be perceived as humorous or not serious. In sum, trans and nonbinary students described unique navigational issues as they traversed liminal spaces in regard to bro culture.

Blending into bro culture. Ciswomen students described a variety of efforts to effectively navigate bro culture. Cisgender women often felt like they had few options besides adopting some of the strategies, perspectives, and forms of capital that were valued in bro culture. Sometimes this meant paying attention to their makeup and clothing and trying to figure out what cisgender men in their classes and internships would read into their choices. A number of cisgender women explained how they tended to avoid dressing feminine (e.g., "tomboy," "no dresses or leggings")—a decision that they believed made it easier for them to blend into bro culture in STEM fields. Asha felt the need to blend in with a masculine environment at her STEM internship where she was surrounded by men in a masculine-normed work environment. Asha explained,

> I started dressing a little bit more masculine or switching day-to-day, and acting a little bit more masculine than I normally would, but I do still identify as a woman. . . . I had to make them accept me in the same sort of way. I was around mainly guys. . . . So, it's more encouraged to be less girly, less feminine. Like if we went on a trip and I spent an hour getting ready in the morning, they would be annoyed with me.

Cherrie, a self-described butch lesbian, noted how women often attempted to blend in with the men when doing field-work. She described an all-women team (whose members' gender expressions were typically more feminine in other settings) as "cult-like" in their attempts to present themselves as masculine during science fieldwork. When asked what advice she would give to other lesbians and women entering sciences, she said "no whining" is allowed (a possible coping mechanism to address sexism and survive in the field) even when the elements are harsh, the equipment heavy, and men exclusionary.

Rationalizing bro culture. Another way participants with minoritized gender identities (cisgender women, trans, genderqueer, nonbinary) navigated manifestations of bro culture was to blame it on unconscious bias. In reference to cisgender men being "condescending towards women," Skyler, a trans participant who also identified as asexual, bisexual, and pansexual rationalized that men "could also be subconsciously . . . doing it and they might not even realize it. But still, I feel like it's an issue that we need to fix." Echoing Skyler's example, several other participants also attempted to find an alternate explanation for, or excuse, the behavior of cisgender heterosexual men, asserting that negative treatment may not be intentional even as participants detailed the adverse effects of such behavior. In another instance of casting behavior associated with bro culture as unintentional, Kylie, a cisgender woman who marked gay/lesbian/queer on the demographic form, described being excluded, as men often did not acknowledge people of other genders in class:

> A lot of times you have . . . the guys who are talking with the other guys mainly because it's just that sort of like "bro bonding." . . . . From my perspective, it feels like you get excluded without really trying to be. And I do not think they were intentionally trying to exclude me, it just happened.

Such justifications for unconscious or unintentional exclusion was not similarly expressed by cisgender men.

Discussion

Prior studies have consistently shown both that MIoSG college students experience inhospitable learning environments on the basis of their genders and sexualities (e.g., Bilimoria & Stewart, 2009; Bilodeau, 2009; Gortmaker & Brown, 2006; Linley et al., 2018; Nicolazzo, 2016; Rankin, 2005; Rankin et al., 2010; Vaccaro, 2012; Woodford & Kulick, 2015) and also that STEM learning environments are unwelcoming to students with many minoritized identities (e.g., Gottfried et al., 2016; O'Brien et al., 2015; Stout et al., 2016). Although commonsense interpretations of the compulsory cisheteropatriarchy enforced in STEM disciplines would have already suggested that MIoSG college students would experience hostility in STEM learning environments, this study is among the very few that has systematically examined how people with MIoSG experience STEM fields (e.g., Barres, Montague-Hellen, & Yoder, 2017; Bilimoria & Stewart, 2009; Linley et al., 2018; Yoder & Mattheis, 2016).

Prior studies on students with MIoSG in STEM used qualitative methods, primarily interviews (Cech & Waidzunas, 2011; Cooper & Brownell, 2016; Hughes, 2017; Linley et al., 2018). Some have focused on one particular STEM discipline including biology (Cooper & Brownell, 2016) or engineering (Cech & Waidzunas, 2011; Hughes, 2017) in a single institutional context. Linley et al. (2018) focused on multiple STEM disciplines and included 15 students from 15 unique institutions. Our study, with 56 participants at four institutions, presents a more comprehensive dataset and the ability to consider students' experiences within common contexts because many participants came from the same departments and/or institutions. Our work also goes beyond existing literature by showing the complex ways in which MIoSG college students participate in, resist, traverse, blend into, and rationalize the cisheteropatriarchical norms of STEM fields (Cech & Waidzunas, 2011; de Pillis & de Pillis, 2008; Hughes, 2017). Privilege is often invisible, and can be upheld by those with privileged identities (namely, cisgender people, heterosexuals, and/or men) who participate in the system, and also supported by those with minoritized identities who rationalize or excuse it, actions that can often function as coping mechanisms to survive in oppressive environments (Christensen & Jensen, 2014; Johnson, 2014). Notably, our work demonstrates how some students across STEM fields—in contrast to prior work limited to engineering (e.g., Cech & Waidzunas, 2011; de Pillis & de Pillis, 2008; Hughes, 2017)—actively perpetuate a bro culture through stigmatizing language, actions, and belief structures. For example, while describing the varied ways in which the bro culture shaped his behaviors in, and feelings about, STEM fields, one gay man in our study referred to a former sexual partner as a "fuck boy" and described his own ability to pass as "straight" due to his masculine presentation—highlighting the complex ways that the same people who suffer under an oppressive ideological structure might perpetuate or even benefit from it. This study's ability to add depth and student voice to prior findings of inhospitable learning environments represents one of the primary contributions to the literature.

Unlike prior studies which have either aggregated all STEM fields into one monolithic category, or have focused only on a single discipline, our study's capacity to look for similarities and differences among STEM fields also provides a meaningful direction for both future research and evidence-driven intervention.

Although most STEM disciplines clearly replicated hegemonic masculinity and heteronormativity, the food science and nutrition program on one campus provided a notable exception. In that program, according to the students in our study, the influence of powerful women committed to social justice meant that the students and faculty "don't put up with" bro culture in the classroom or department. One possible reason for a more inclusive climate in a STEM department with a higher proportion of women faculty is that "a gendered division of labor in STEM disciplines . . . is mitigated by a critical mass of women faculty, which supports the critical-mass literature that argues conditions improve for minority groups once they attain critical mass" (Carrigan, Quinn, & Riskin, 2011, p. 142). The capacity for a seemingly limited number of committed faculty members to shape a departmental climate is both noteworthy and problematic. It represents a meaningful way forward provided that we recognize that people with minoritized identities do not solely bear the responsibility for creating inclusive and welcoming environments. It also suggests that those with privileged identities within institutional spaces could, and should, also work toward the creation of socially just STEM programs. Future, large-scale quantitative research should compare the prevalence of bro/dude culture in various STEM disciplinary categories to determine if, and how, our discrepant case (food science and nutrition) might be part of patterned differences across different categories of STEM fields (Biglan, 1973).

This study also revealed the exclusive nature of a cisheteropatriarchal culture in many STEM environments; participants noted that to be fully accepted in bro culture, one must identify—and be perceived—as a masculine, cisgender, heterosexual man, without exception. The culture tolerated some participation from those who could either pass for these categories or display attributes associated with these identities. For instance, a nonbinary participant noted they could participate in conversations about being attracted to women; cisgender women sometimes perpetuated the competitive, "no whining" climate of their disciplines; and several cisgender gay men discussed being seen as, or able to pass as, heterosexual. However, the students in this study voiced that they would never be fully accepted as one of the "dudes" because they did not check all of the boxes required in bro culture. Despite being able to occasionally participate, and sometimes benefit from the dominant (bro) culture, participants in this study were reminded that they still operated from the outside looking in.

Limitations

There are a number of limitations in this study. First, we made a conscious choice to limit our recruitment to institutions within driving distance and where we could gain institutional review board access. As we note throughout this article, context and the environment matter. As such, our findings are limited by the four institutions and two geographic regions where we collected data. Second, our sample is disproportionately comprised of engineering students. This may be a function of the much larger size of the engineering programs at the collection sites as compared to other STEM fields. Given this imbalance, we took extra precautions during CCA and discrepant case analysis (Morrow, 2005) to ensure that all of our emergent categories were indeed relevant to all majors. When they were not, we noted the discrepancy. Future research should delve more deeply into variations among majors, with particular attention paid to applied sciences (Biglan, 1973) like food science and nutrition. Another limitation is that this article describes the category of dude/bro culture that emerged from participant narratives. We honor their descriptions of bro culture and how they navigated it. Future research should explore the roots of bro culture and factors that contribute to this phenomenon. Finally, we collected our data at predominately white institutions and from white-normed STEM disciplines. During the CCA, we were intentional about reviewing the data to determine if, and how, whiteness could inform our analysis. Our participants did talk about race, but they rarely did so in the context of dude culture.

Implications and Recommendations

Several implications emerged as a result of this study. To disrupt pervasive dude culture, it has to first be recognized. While many participants noticed its permeated presence, they questioned whether anyone else observed it. Discussion about bro culture with students in STEM can make its existence visible to those who would not otherwise see it, namely, those who have been granted exclusive membership by way of fitting the mold of what it means to be a "bro." Dude/bro culture plays out both formally and informally through social interactions and through structures and processes. If faculty and staff do not talk about gender and sexuality in STEM, they send an implicit message that STEM fields are exclusive to cisgender heterosexual men. Therefore, hegemonic masculinity and heteronormativity become synonymous with STEM culture to the point that it is hard to see how it could operate differently. Through formal and informal conversations in senior leadership meetings, academic leaders including provosts, chief diversity officers, and chief student affairs officers, can introduce, and lead, ongoing conversations about structures and processes that need to be changed to combat hegemonic masculinity and heteronormativity in STEM.

Making dude culture visible, while necessary, is insufficient to create change. Comprehensive culture change can only happen when all campus leaders—across academic affairs, diversity, student affairs, and other portfolios—begin to identify, educate, and devote resources toward deep-rooted challenges. Chief diversity officers are ideally poised to initiate or lead efforts to address the invisibility of gender and sexually diverse students, faculty, and staff through the promotion of formalized recruitment and retention strategies. Chief diversity officers may function within a variety of structures including collaborative, unit-based, and portfolio divisional models (Williams & Wade-Golden, 2013), but engagement and relationship building across campus are critical for success (Leon, 2014). To that end, and given the scope of the problem of dude culture within STEM fields, academic leadership—including the provost, college deans, department chairs, program directors, and tenured faculty members—must also play a leading role in change efforts. For instance, academic leaders can charge search committees to be intentional about hiring applicants from underrepresented genders and sexualities and also prioritize applicants who display a commitment to access and inclusion, including a record of efforts to those with MIoSG. The mere presence of MIoSG students, faculty and staff, does not, and cannot, change the culture. In fact, people with minoritized identities are often rendered invisible, and/or the onus for change is

placed upon those who are visible. As such, support structures (e.g., mentoring, affinity groups, student organizations) should be available to MIoSG individuals who need reprieve from pervasive bro cultures. Such programs present opportunities for partnership and shared accountability between academic departments and colleges, chief diversity officer portfolios, and other campus diversity offices such as gender/sexuality centers. Although chief diversity officers can set the agenda for change, culture change must be a campus-wide effort supported broadly.

All higher educators, particularly those in student-facing roles including faculty, teaching assistants, advisors, and student affairs professionals, have a duty to interrupt direct manifestations of bro culture, such as cisgender and/or heterosexual men sexualizing women, making sexist/homophobic/transphobic jokes, and assuming women and trans people are less capable. Because food science and nutrition faculty in this study "did not put up with" such manifestations of bro culture, the learning environment felt affirming and inclusive to MIoSG students. Academic, student affairs, and diversity officers can formally (e.g., awards, promotion and tenure letters) or informally (e-mails, phone calls) recognize faculty and staff on campus who are doing the hard work of combatting oppression. Such recognition sends a campus-wide message that allyship and inclusion are deeply valued (and expected) at the institution.

To disrupt pervasive dude/bro culture, it becomes important to dialogue about not only the existence of MIoSG students in STEM, but about MIoSG contributions to the field that often go unnamed. Faculty can recognize these contributions by inviting guest speakers and creating more inclusive content within the curriculum. Chief diversity officers can partner with administrators and faculty from STEM fields as they begin to implement curricular and pedagogic change. Although faculty plays a role in shifting the culture of STEM, bro culture needs to be disrupted campus wide. All university leaders should promote intentional campus dialogues about hegemonic masculinity and heteronormativity in STEM and beyond. Findings from this study can be used as an impetus for those conversations.

Finally, success of our recommendations requires culturally competent (Pope, Reynolds, & Mueller, 2019) faculty, staff, and administrators. Employee participation in Safe Zone trainings, specific to STEM disciplines, may contribute to the recognition of challenges faced by MIoSG STEM students. CDOs can play an important role in financially supporting Safe Zone and other gender and sexuality workshops. Campus diversity leaders should partner with academic leaders (e.g., deans, department chairs) to encourage (or require) STEM faculty and staff to attend these workshops and increase their cultural competency. Only with a more culturally competent employee base can institutions of higher education begin to dismantle bro cultures in STEM learning environments.

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