Exploring the Journey of STEM Faculty into Justice-centered Pedagogy

Desiree Forsythe,[†]* Bryan Dewsbury,[‡] and Jeremy L. Hsu[§]

[†]Department of Biological Sciences, Santa Clara University, Santa Clara, CA 95053; [‡]Department of Biological Sciences, Florida International University, Miami, FL 33131; [§]Schmid College of Science and Technology, Chapman University, One University Drive, Orange, CA 92866

ABSTRACT

In higher education and science, technology, engineering, and mathematics (STEM), interlocking oppressions can lead to inequitable environments for those who hold marginalized identities. Instructors can play key roles in either exacerbating or mitigating these inequities through their pedagogical approaches and choice of curricular material. However, it remains unclear how instructors who self-identify as committed to justice achieve higher levels of consciousness around areas of injustice and develop the self-efficacy to dismantle barriers for students over time. Here, we draw upon critical race theory and critical white studies to investigate what events or life experiences influence STEM instructors to understand the importance of social justice and examine how STEM instructors use this understanding to drive pedagogical shifts. We find variations in the ways that instructors' experiences and identities shape their understanding of justice. In addition, we uncover factors that influence the switch moment; curriculum and pedagogical shifts; their relationship to justice work broadly; and barriers and supports for justice work. These stories hold powerful lessons for STEM education, but also for education more broadly, both in terms of pedagogical practice and the questions that shape research agendas on equity in education.

INTRODUCTION

Interlocking oppressions, which include racism, sexism, ableism, and discrimination against queer people, have long been documented in higher education (Harper, 2012; Dolmage, 2017; Greathouse, 2018; Jackson and Sundaram, 2020). For example, intersectionality, a phrase coined by Kimberlé Crenshaw (1991), is one particular kind of interlocking oppression that describes the experiences of women of color with racism and sexism. The term interlocking oppressions was first used by Barbara Smith, Beverly Smith, and Demita Frazer (Combahee River Collective, 1983; Combahee River Collective, 1995) and can be described as both a political and a theoretical understanding that systems of oppression occur across multiple fronts and cannot be thought of, or dismantled, as separate, standalone systems (Taylor, 2017). In higher education specifically, these systems create inequitable and unjust policies and practices that can lead to hostile environments for those who hold marginalized identities (Lincoln and Stanley, 2021). These hostile environments have a gamut of ramifications including higher stress and negative mental health conditions (McGee, 2021; Wilkins-Yel et al., 2022), impact on processes such as hiring, tenure, and promotion (Yoder and Mattheis, 2016; Eaton et al., 2020), and often result in fewer people who hold marginalized identities at every level within academia (Eaton et al., 2020; Casad et al., 2021).

Within STEM (science, technology, engineering, and mathematics), these inequities are often exacerbated as the culture of STEM is often situated deeply in interlocking oppressions. For example, Callwood et al. (2022) found that all 15 characteristics of white supremacy culture (Jones and Okun, 2001) were

deeply embedded into the practice of STEM, including individualism, objectivity, and power hoarding. In regard to students, this often results in students of color experiencing significantly worse academic outcomes in STEM than their White peers (Binkerd and Moore, 2002; Moss-Racusin *et al.*, 2012; Dortch and Patel, 2017) due to several factors, including differences in resource availability, racial discrimination and marginalization, and instructors' treatment of students based on biased perceptions (Estrada and Matthews, 2016; Le and Matias, 2019). Similarly, women and students who hold minoritized identities of sexuality and gender (MIoSG; Vaccaro *et al.*, 2015) report that many STEM environments consist of a "dude culture" (Miller *et al.*, 2021) that is highly competitive, cold, and isolating. Marginalization also happens at the curricular level itself as biology curriculum can often introduce misconceptions around concepts such as gender and sex or have problematic framing around how we conceptualize and discuss disability (Hales, 2020).

 It is important to acknowledge that because of the deep complexity found in interlocking oppressions, they cannot be addressed through any one action. However, it is important to call attention to the role that instructors can play in either exacerbating or mitigating inequities through their pedagogical approaches and/or their curricular material. For example, White instructors can hold racist mindsets toward students of color via deficit thinking, essentialism, and colorblind ideology (Le and Matias, 2019) and can also reinforce gender and racial stereotypes of students of color (Jackson, 2004). Similarly, studies looking at STEM instructors' perception of students with disabilities cite many barriers, including instructors' lack of connection with the disabilities offices and perceptions that the STEM fields were too difficult for students with disabilities (Bettencourt *et al.*, 2018). Students also report that instructors are important in helping them conceptualize anti-oppression concepts within STEM disciplines. Forsythe (2023) found that White women in STEM overwhelmingly had no curricular exposure or practice with anti-racism within their STEM classrooms, leaving many unsure how to be anti-racist within their STEM fields. While these examples highlight how instructors create inequitable environments, instructors can also help dismantle interlocking oppressions within their classroom or teaching practices. For example, Russo-Tait (2023) found that how faculty conceptualized the term equity (as equality, inclusion, or justice) informed how faculty see themselves as advancing "equity" in their classrooms. Others have worked to find more inclusive language and approaches to biology material, such as the work of Hales (2020) that explores how to tackle inclusive language in a genetics course. Callwood *et al.* (2022) looked to uncover how white supremacy manifested in science spaces to uncover and disrupt its existence.

These works are important and explore both how faculty conceptualize aspects of interlocking oppressions in STEM and the pedagogical or curricular changes that faculty may undertake to create a more inclusive environment. However, there is a gap in knowledge in how faculty come to understand interlocking oppressions in the first place, especially oppressions that do not directly impact them. More specifically, it remains unclear how instructors who self-identify as committed to justice achieve, or are motivated to achieve, higher levels of consciousness around areas of injustice and develop the self-

efficacy to dismantle barriers for students over time. The limited past work that has been done has identified that faculty of color tend to rely on their own experiences as a guide and are empathetic to the importance of inclusion in STEM (McNeill *et al.*, 2022). Thus, there is an urgent need to investigate how STEM instructors who hold various identities become aware of inequities and how this process informs their pedagogical practices and curricular choices. For this study, we conceptualize social justice along two lines of thought: 1) social justice is the ongoing practice of dismantling harmful policies in order to create a society free from injustice and inequities and 2) social justice is the responsibility of everyone within a society to create a community of care which lifts marginalized voices and needs. Within the context of curriculum and pedagogy, social justice centered teaching both works to reduce structural inequities within the classroom while building curricular content that both addresses current and historical inequities and forefronts the voices of those who are historically marginalized. We investigated the following research questions:

1. What events and/or life experiences influence STEM instructors to understand the importance of social justice?
2. How do STEM instructors use this understanding to drive pedagogical shifts?

THEORETICAL FRAMEWORKS

Three theoretical frameworks guided our investigation: intersectionality (Crenshaw, 1991), critical race theory (CRT; Delgado and Stefancic, 2023), and critical white studies (CWS; Nayak, 2007). We believe these frameworks help illustrate how interlocking oppressions manifest and influence both the experiences and perceptions of individuals within society. Intersectionality helps illustrate how interlocking oppressions impact those with multiple marginalized identities. In addition, we draw upon CRT and CWS. Racism is one of the most highly charged and often challenging topics to discuss. For example, this topic can often be challenging for persons of color (POC) because of the backlash and violence they receive when discussing the impacts of racism. The topic can also be challenging for White people because of their fear of either being perceived as racist and/or their hostility toward POC (Harries, 2014; Sue, 2016). Thus, theories that specifically look to uncover the way racism manifests, both in how it impacts POC (CRT) and how it occurs in and is perpetuated by White people (CWS), are necessary. Additionally, given that white supremacy actively works to silence discussions of race and mitigate policies that liberate POC, many activists have argued that all justice movements need to be grounded in an understanding of Black liberation and anti-racism to ensure that the needs of POC are not ignored. By continuing to omit racial realities from justice work is to continue to center whiteness.

Intersectionality and Intersectional Identities

Kimberlé Crenshaw (1991) first coined the phrase intersectionality to describe the double bind (Malcolm et al., 1976) that women of color face due to the intersection of both race and gender. This double bind results in women of color experiencing both gendered and racial discrimination that is

unique to experiencing either form of discrimination on its own (Collins, 1990; Crenshaw, 1991; Combahee River Collective, 1983; Combahee River Collective, 1995). Since its inception, there has been an ongoing debate on whether intersectionality should be applied to other forms of intersectional oppression, such as class and gender or disability and race (Nash, 2017; Duran and Jones, 2020). This study's purpose is not to add to this debate. To ensure that the focus of this analysis stays on how identities who at times face oppression on multiple fronts, we use two separate terms: intersectionality and intersectional identities. We will use the term intersectionality when looking at the experiences of participants who are women of color and intersectional identities for those whose identities are not women of color.

Critical Race Theory

CRT was developed in the late 1970s by activists, legal experts, and scholars, including authors Derrick Bell, Alan Freeman, and Richard Delgado, in response to the backlash and subsequent reversion of racial justice progress that had been temporarily advanced during the Civil Rights era (Delgado and Stefancic, 2023). CRT has roots in both critical legal theory and radical feminism and disputes the narrative that the United States is postracial (Anderson, 2016; Taylor, 2016). Since its inception, CRT has been effectively used in other disciplines, including education, through the foundational work of Ladson-Billings and Tate (1995) and Solórzano and Yosso (2000). CRT in education has five main tenets (Solórzano and Yosso, 2016):

1. **The intercentricity of race and racism with other forms of subordination:** Race and racism are permanent fixtures within the United States, and while race and racism are centric to critical race analysis, it is important to note the ways in which race and racism intersect with other forms of oppression such as gender, sexuality, and disability.
2. **The challenge to dominant ideology:** Institutions (such as higher education) operate under white privilege and white supremacy and use claims such as meritocracy, objectiveness, and race neutrality to obfuscate their claims for power and self-interest. This tenet is also used to reject the notion of neutrality in the research process and expose research that silences or distorts the voices of people of color.
3. **The commitment to social justice:** Research using CRT must be used for liberatory or transformative purposes. This research should aim to eliminate racism (and other forms of oppression) and empower people of color.
4. **The centrality of experiential knowledge:** The voices of POC should be centric to CRT, as POC hold experiential knowledge and lived experiences that are critical to understanding, analyzing, and disrupting racism within educational contexts. CRT also pushes back against traditional research paradigms or approaches that are often deficit-framed and values narratives, storytelling, and other research approaches that draw upon the knowledge of POC.
5. **The transdisciplinary perspective:** Research on race and racism should be placed in both historical and contemporary contexts and should draw across a wide range of fields and methodologies to create nuanced understandings of the way race and racism manifest within different environments.

Critical White Studies

CWS separates itself from CRT by turning the lens from the experiences of POC with race and racism to instead focus on uncovering whiteness and how whiteness is implicit in racism (Green *et al.*, 2007). CWS differs from CRT in that it does not have rigid tenets; however, CWS scholars share several guiding beliefs: whiteness is continuously changing, whiteness produces privileges, and whiteness can, and should be, dismantled (Nayak, 2007; Applebaum, 2010). CWS frames whiteness as structural and pervasive, and not solely as an identity one holds (Frankenberg, 1993; Foste and Jones, 2020), therefore allowing for a critical analysis of how whiteness manifests, impacts, and reproduces in society. As with CRT, CWS has been adapted by scholars to investigate white supremacy in several contexts, including higher education. This paper will utilize the constructs specifically adapted by Foste and Irwin (2020), who used CWS in higher education to locate White people "within particular cultural, social, and political contexts" (p. 440). These three constructs are:

1. **White complicity**: White people, regardless of their intentions or beliefs, uphold and produce white supremacy through white privilege and/or social conditioning (Applebaum, 2010).
2. **Epistemologies of ignorance**: This describes the collective amnesia of White people to both purposely misinterpret actions of white supremacy and collectively erase contributions of POC (Mills, 1997).
3. **White normativity**: Whiteness is manifested as the baseline, "normalized," for White people to not have to think about race or their situated positions within a racialized world (Yancy, 2018).

MATERIALS AND METHODS

For this project, we used postintentional phenomenology (Vagle, 2018). Phenomenology is a way of investigating the becoming and being of a phenomenon (Sokolowski, 2000). When using phenomenology, a researcher looks at how a phenomenon manifests through the experiences and relationships that individuals have with each other but does not study the individual themselves (Vagle, 2018). Rather, the focus is placed on how a particular phenomenon, in the case of this study, the phenomenon of coming to understand the importance of social justice within STEM contexts, arises. Postintentional phenomenology distinguishes itself from phenomenology with a shift from knowing and being into *becoming* (Vagle, 2018) and encourages scholars to put "phenomenology… in conversation with other theories" (Vagle, 2018, p. 115). Two central themes separate this branch of phenomenology from others. First, postintentional phenomenology states that phenomena are in a constant state of flux (being made and unmade) and arise in varied and multiple contexts (Vagle, 2018). Second, postintentional phenomenology is explicit that there is no one way of understanding a particular phenomenon given the constant state of flux and fluidity of both individuals and individuals' relationships to others and encourages

scholars to avoid either-or-thinking. Instead, postintentional phenomenology asks scholars to grapple with multiple ways of becoming and "play" with putting different theories in conversation with each other to better understand the complexity of the world around us.

We chose postintentional phenomenology for several reasons. We wanted to better understand the phenomenon of how STEM instructors *become* committed to social justice, not just the ways in which they understand (knowing) or enact (being). Additionally, given that participants of our study have intersectional identities and live within interlocking systems of oppression, we believe that a methodology that explicitly calls attention to these complexities was needed. Finally, postintentional phenomenology encourages scholars to utilize multiple theories to uncover the political and social dimensions of a phenomenon (Vagle, 2018), as we have done here through intersectionality, CRT, and CWS.

Interview Protocol Development

Our project centered on interviewing STEM instructors who self-identified as committed to justice (see Participant Recruitment and Interviews section). We created a semistructured interview protocol (Rubin and Rubin, 2011) centered around several topics relating to the phenomenon of becoming committed to racial justice and how that commitment in turn impacts instructors' pedagogy and/or curricular materials. Given that postintentional phenomenology explores the variation and fluidity of experiences under a shared phenomenon, semistructured interviews are useful in providing participants with broad focused questions and allowing participants to fill in the parts of the phenomenon that are most pertinent to their experience (Vagle, 2018). Drawing upon our own unique experiences and our prior work (Forsythe, 2023), the research team independently brainstormed interview themes around the process of committing to social justice in STEM and how that commitment may or may not impact one's teaching approach or curricular materials. We followed an iterative process where the authors would meet to discuss and refine the questions. In addition, the team also reviewed the transcripts of all the interviews to identify whether there were any concerns about the interpretation of the questions. No concerns were identified, supporting the validity of the questions. Thus, our final semistructured interview protocol (Supplemental Material) consisted of several sections that touched upon instructors committing to social justice, being an instructor in STEM, and how committing to social justice impacted their pedagogy and curriculum.

Participant Recruitment and Interviews

We used purposeful sampling, a technique often used in information-rich cases for utilizing limited resources (Suri, 2011), to identify and interview five biology and STEM instructors who self-identified as committed to justice and equity. Postintentional phenomenology calls for the selection of participants "who have experienced the phenomenon… and who collectively represent the range of multiple, partial, and varied contexts" (Vagle, 2018, p. 128). Two of the three authors reached out to instructors they knew worked in areas of justice within STEM. We chose to reach out to participants we knew instead of random sampling to utilize the participants'

TABLE 1. Participant demographics.

Demographics	Number
Field of Study	
Computer Science	2
Health Sciences	1
Life Sciences	2
Professional Title	
Graduate Student	2
Nontenure Track Instructor	2
Associate Professor	2
Full Professor	1
Race/Skin Color	
Southeast Asian	1
Racially ambiguous Latinx	1
White	3
Gender	
Nonbinary	1
Woman	4
Disclosed Disability	1

and researchers' relationships in creating a space of deep vulnerability. This allowed us to 1) be invited into a space the participant chose as most comfortable (i.e., a home) and 2) allowed us to uncover directions that may not have been as easily uncovered with participants who were less familiar, and therefore less comfortable, with us. All participants who were contacted agreed to interview. These five instructors had a range of positions and salient identities (Table 1) that added rich nuance to the data collected. The columns below do not always add up to 5, as several participants either had multiple identities or multiple titles that informed their experience in becoming committed to social justice. Participants self-described their race and gender categories. To protect participants' identities, we report only aggregate demographics and identities.

Interviews took place in-person at a location chosen by the participant, including on campus spaces, within participants' homes, or within a local business. These chosen environments allowed the participant to feel more at ease during the interview process, as some questions covered, at times, difficult topics. All procedures were reviewed and approved by the Chapman University (IRB-23-45) and Florida International University Institutional Review Boards (IRB-22-0435).

While there are no definitive rules in determining sample size in phenomenology, we follow a few guidelines laid out by scholars in the field. Many variants of phenomenology, including postintentional phenomenology, point to smaller sample sizes to ensure each participants' voice is heard to the fullest extent possible (Giorgi, 2009). Bartholomew *et al.* (2021) describes choosing participant size as a "tenuous dance between the harmony of the choice and cacophony of rogue solo performers" (p. 3). Additionally, Bartholomew *et al.* (2021) found that a larger sample size in phenomenological research coincides with lower quality in research because of the dilution of participant voices, with a range of 5 to 10 participants producing the highest quality. For these reasons, we chose to reduce the sample size to 5 participants to more fully explicate the phenomenon being studied and share more extensive participant narratives.

Data Analysis and Validity

After the data were collected and transcribed, all three authors met in person to review each transcript. The authors read a single page of a transcript at a time and then engaged in the process of postreflexivity, via dialogic reliability, a practice that centers "discussion and mutual critique of the data and of each researcher's interpretive hypotheses" (Åkerlind, 2005, p. 331). Vagle (2018) describes postreflexivity as the process of validity in phenomenological research and as one of the most important methodological components of postintentional phenomenology. Postreflexivity is the process of constant self-reflexivity around our own "connections/disconnections, assumptions of what we take to be normal, bottom lines, and moments we are shocked" (Vagle, 2018, p. 132). Part of the postreflexive process is through "bridling" (Dahlberg and Dahlberg, 2003). In phenomenology, bridling helps a researcher be aware of their own agency and understanding of a phenomenon while not allowing their preconceived notions to solely determine that phenomenon (Vagle, 2009). In other words, bridling asks researchers to balance their preconceived notions and understandings while simultaneously allowing for new insights in the data. While the two interviewing authors engaged in postreflexivity throughout the research process via memoing and conversations with each other after interviews, during the data analysis process all authors engaged in postreflexivity around their social identities, positionality, power relationships, and preunderstandings to address relational competence (Jones *et al.*, 2014). This process allowed each researcher to tap into both their scholarly lens on, and their personal experiences with, navigating interlocking systems of oppression, while relying on the other co-authors to help bridle one another, and provide feedback on their interpretive hypotheses.

During the collaborative coding session, the authors formed profiles (Seidman, 2006) for each participant and assigned each participant a pseudonym. Profiles are clear narratives that closely follow the structure of the interview, are unique to each individual, and highlight the dimensions of the phenomenon being studied. For this study, the profiles included identities and past experiences, the switch moment (the time when participants began to understand the need for social justice broadly; we expand on this more below), curriculum and pedagogy, relationship to justice work, and the barriers/supports in being able to engage in justice work. We followed Cilesiz's (2009) approach and labeled these profiles as *individual textural descriptions*. Next, we used our discussions during the postreflexivity data analysis to form *individual structural descriptions* of the participants' experiences that represented our interpretation of the participants' understandings using the critical frameworks that frame this study. We then identified similarities across the textures of participants' experiences to create a more general description of the phenomenon called a *structural synthesis*. This synthesis represents the experience of the phenomenon of committing to racial justice and how this commitment does or does not impact their pedagogy and/or curriculum. It is also important to note that this synthesis does not represent a universal truth, but rather captures a collection of individuals' experiences in a specific time and context, and as seen from the lens of us as researchers (Moustakas, 1994).

Positionality of the Authors

We hold a variety of identities that influence both the approach to the research and the interpretation of the findings. Our team consists of a White, queer, cisgender woman; a Caribbean born man of African descent; and an Asian American man. We have lived experiences in different communities that provide a diversity of perspectives, perspectives that impacted all aspects of our research. For example, while all three of us have had separate journeys toward socially just pedagogy, we have all come to deeply value inclusive teaching strategies as well as integrating socially relevant material into our own courses. These separate, but coalescing journeys influenced the questions we wanted to ask. When it comes to our research process, all authors have intersectional identities and are constantly navigating spaces of privilege and oppression, creating a deep understanding and empathy with participants who are experiencing the same challenges. In regards to race, two of the authors are POC (people of color) and are often navigating their own liberation while creating spaces of liberation for others, and take on extra burden in hearing the stories of others who are similarly experiencing racism. One author is White and often researches the way that whiteness manifests within STEM and engages in constant reflexivity on how her whiteness serves as a point of connection and familiarity for participants to be more open and vulnerable.

We have a deep understanding of our participants' vulnerability in sharing their stories with us. This understanding is what led us toward methods (interviewing participants who knew us and choosing to do so in a location of their choosing) that would help create a safer environment. Finally, during our data analysis stage, we were able to call upon our various identities and experiences to both assist us in developing deep understandings of the data and help us bridle our own biases (Vagle, 2009). For example, all of us have had (and continue to have) various positions of power within academia. One author is beginning her first year as a tenure track professor and had been working at various staff and postdoctoral positions previously. This allows her to more fully understand participants who are in either contingent positions and/or positions as graduate students. Another author made the transition from nontenure track faculty to tenure-track faculty and has experienced both sides of faculty expectations. One author is an immigrant to the United States and has risen through academic ranks to become an Associate Professor. Our own separate, yet coalescing experiences have led us to the research project we describe in this paper.

FINDINGS

Below we first situate the *textural* and *structural* descriptions of the 5 participants in this study. *Textural* descriptions were taken directly from the interview transcripts and follow a loose order of

- identities and past experiences: participants' descriptions of their identities and/or how their identities and experiences influenced their journey into justice work.
- the switch moment: participants' description of when they began to understand social justice broadly, and racial justice specifically in the context of their teaching and

pedagogy. This is the moment that participants describe as becoming aware of interlocking oppressions and began the work to incorporate changes into their professions.

- curriculum and pedagogical shifts: changes the participants made to their teaching philosophies and/or curriculum due to their awareness of social justice.
- their relationship to justice work broadly: participants' description of how their awareness of social justice impacts both their definition of justice and how they incorporate justice into their broader practices (outside the classroom).
- barriers and supports for justice work: participants' description of both the factors that hinder justice work (including personal and systemic barriers) as well as the factors that advance justice work.

Next, brief *structural* descriptions follow each participant's *textural* description and connect this study's theoretical frameworks to the participants' navigation of social justice in their lives. Finally, we end on a *structural synthesis* that draws these themes together, comparing and contrasting each participant's lived experiences and meaning making.

We chose to present our findings in this way, instead of discussing more strict themes or categories, to mirror the messiness and complexity in our participants' journeys. Strict themes or categories would have created false lines around the ways our participants understood themselves in relation to their work, and how their understanding and approach to justice impacted their pedagogical and curricular choices. Instead, we present the participants' narratives in a way that allows the reader to follow a loose pattern within the participants' profiles, with the understanding that no one profile can be completely separated from another.

Textural Description of Zoe's Experiences

I grew up on the west side of Chicago, moved around a lot. Eventually we were able to secure Section 8 housing. My mom and grandma are immigrants. They made sure that we kept a lot of cultural traditions and that I didn't lose our language. My mom was like "Spanish at home, English outside." I always feel weird describing identities because it just feels like a laundry list where I'm like, "Yes, I check all your boxes, you're welcome." I think the race 1 is one that I struggle with, partially because growing up in a Latin American household, race is something that you don't talk about. And so, I never really understood what race really meant until I got to college. I think once I started to better understand how race and racism work in the United States, and in particular, anti-Black racism, I was like, "Oh, I can now recognize my privilege as a light skinned person who is really racially ambiguous."

I took this class called the craft of teaching. It's where I learned the term Black English for the first time. And [the teacher] called me out because I was like, why is it called that, I grew up in a neighborhood that wasn't all Black and we all use that. She's like, Yeah, you're appropriating, and I was like, Gasp! She just fucking told it how it is! We read Freire for the first time, the Pedagogy of the Oppressed, and I was like, first of all, how much harm have I done in the roles that I've had as a mentor, as a tutor, as a teaching assistant? And also, like, how much harm has been done to me? How do I not perpetrate this? That was really, really life changing.

I think I'm better about doing [justice] in my pedagogy and I'm a big fan of systemic supports. And so I think I'm better about building those into the course than I am about actually putting it in the curriculum itself. And I want to make sure that I didn't just say "I acknowledge their humanity" but they felt that their humanity was being acknowledged through the course design. And so I want to incorporate as much flexibility as possible. I'm very transparent with my own learning process, if I say something and then I later realize that it was problematic, I'll definitely be like, hey, the other day I said this, like, I now recognize that it was traumatic because of XYZ *[sic]*. I'm being vulnerable, and I'm apologizing. And I'm showing you that I understand the harm. And I'm committing to not doing it again. In my teaching, I brought a lot of what I wish instructors had done when I was taking the class.

I think these conversations need to be had because everything is shit. The only way to make it better is if we can name the issues. So, I'd rather be able to provide some amount of exposure, right? And so I think that fighting against white supremacy, which includes racism, anti-Black racism, xenophobia, ableism, capitalism [is important]. Beyond that, it's about continuing to learn to better understand not just what past and current injustices are, but what future injustices could be to try and prevent them? A lot of people have been saying this shit for fucking years, especially Black woman, and we don't listen to Black women. So, I think for those of us who hold positions of power and identities of privilege, like listening to what others are saying, and making sure that we are undoing current harm as best as we can.

I think I was very close to nearing a breakdown, right when COVID hit. I was driving throughout the whole fucking state to teach to all these places. And I was so tired and so overwhelmed. And the community college doesn't give you TAs, so I had like 100 students 150 students that I had to grade for. And I fell super behind. The whole world literally felt like everything was imploding. And so that forced me to give myself grace. Currently, I'm a plug with no fucking leverage or power in anything as a grad student. I [don't] want things to go poorly and then people to be able to point to either my identities or my beliefs about education and pedagogy, and be like, this is why we don't hire people like this person. Last quarter I was working with a professor and we were working on incorporating accessibility into her curriculum. That was a really wonderful experience, where someone who in many ways felt like my superior saw me as their equal and colleague.

Structural Description of Zoe's Experiences

Zoe engages with the concept of intersectionality multiple times throughout their profiles, both through the impact of intersectionality on their own experiences and their understanding of intersectionality when it comes to interlocking oppressions. Zoe describes their intersectionality as "checking all your boxes" and weaves their experiences with interlocking oppressions throughout their narrative. We can see how Zoe is constantly navigating a system that creates barriers (Section 8 housing, holding light-skin privilege while still being oppressed as a POC, navigating student pushback because of their identities, lack of power as a TA) that culminates into an overall narrative of exhaustion, frustration, but also, hope. Zoe uses a deep self-awareness as they articulate a balance

of their own privileges and oppressions, and communicates clearly, without guilt or shame, their own responsibilities in dismantling systemic racism. For example, Zoe was explicit in how their switch moment (taking a class on the craft of teaching) made them understand their role as an educator and their role in perpetuating racism.

In this way, we also see how Zoe rejects the tenant of white normativity (that whiteness is "normal") and calls for the centering of stories from POC, especially Black women, a construct of CRT.

Zoe connects their switch moment to their role in education when they say, "how much harm have I done in the roles…and also, like, how much harm has been done to me" and expands upon this idea when discussing their vulnerability in the classroom. Zoe describes their approach to social justice in their classroom by purposefully building systemic supports, by being open and vulnerable with students through their own unlearning, and by providing exposure to conversations regarding systemic oppression and justice for their students.

Textural Description of Alex's Experiences

I definitely feel a sense of belonging in areas where Polish people are, which is actually funny, because that's why I think I felt so comfortable in Buffalo. They have a large Polish population. I'm not religious in any way. I'm obviously also White. But I don't necessarily see White people and feel like I belong among them. I think that's what I was trying to say is that when I, when people tell me they're Polish, or they are part of a close community, I identify with that. I haven't felt any, like, draw toward people that are White appearing.

I think I've always been interested in other cultures. Going to college, I was minimally exposed to health equity as a thing…But then coming back I took the inclusive teaching and learning institute with yourself [interviewer] and I think that sparked something for me because I realized that there was work that could be done on the academic level. I saw a need for it, like you presented data. And I think I still remember that and being like, I had no idea that was still happening. And then George Floyd's murder happened. And there was this national movement of like, we need to do something and people not knowing what to do. But I felt like I had a blueprint of things that I could do as an educator. I definitely gravitate toward race and ethnicity. It's the most obvious form of diversity. When I serve on other committees, I do find myself having to remind myself that we also have to be mindful of sexual and gender minorities and people with disabilities and other minoritized groups.

The undergrad class we incorporated social determinants of health, in kind of health equity as just a basic topic. They're mostly freshmen. We also talk about health disparities that were actually there before the awakening, if you will, we've kind of designed it from the beginning to discuss that. My graduate level course, I intentionally incorporate health disparities. So like we talked about breast cancer, we talk about worse outcomes that exist in triple-negative breast cancer for Black women, in Latinx women. It's gendered right now, like, the language is gendered. I'm working this winter to update that, to remove gender from it. But I think for the most part, it's more so focusing on the disparities that exist, why they exist, acknowledging it's, you know, largely due to systemic

racism and things like that, and then moving forward. And when possible, identifying ways to overcome those disparities. Obviously, that's a larger scale issue that we can't really solve in a 2-hour class.

I think we all have biases, it's just a part of our upbringing, and the only thing you can do is learn how to counteract them. So, absolutely. But I try to be graceful with myself, and then also just realize that we all have work to do. I think I feel comfortable in that the work is appreciated on a national level and that I do feel like that's the majority thought. So that's certainly a privilege. I continuously feel conflicted about being a White person doing this type of work, because I don't want to be taking opportunity or voice away from anyone who is racially or ethnically minoritized. No one's directly called me out. I care about students. And I want to remain involved in that. There's not enough time in the day to do both those things. I can't do equity in academia and disparities in cancer care, I think my North Star is always cancer care. It's a constant struggle.

I think we're connected for me is that there were other people that were doing this work in my university. So, there was precedent, there was already a community of people doing it, which meant it was safe to do. I think I'm really lucky in that most of my friends in my chosen network are interested in the same work and respect it if they're not doing it. I think I am scared to, within my neighborhood, display [signs] around times of elections. I just know that there are people whose values don't align with mine in my own neighborhood…I have a child so I think if it were just me, I wouldn't care as much.

Structural Description of Alex's Experiences

Alex wrestled with identifying as White and felt more comfortable identifying as Polish. This wrestling can be seen as one's desire to either move away from being associated with whiteness, or in a lack of an awareness that regardless of one's internal sense of place, the perception of reading her as White still gives her white privilege. In Alex's narrative, we see fewer examples of intersectional oppression or understandings of intersectionality, and we are given an outsider's perspective looking into issues of race. Alex's switch moment came from taking a professional development course that exposed her to inclusive teaching and allowed her to see her own place in justice work. The murder of George Floyd and the wave of anti-racism protests that followed reiterated the importance of this course for Alex. These experiences exemplify both white complicity and white normativity. Alex continues to uphold white supremacy with her attempt to move away and not reflect on her own whiteness. Additionally, it took the murder of George Floyd to reawaken Alex's call for justice within her work, which shows how, through her whiteness, Alex is not continuously having to grapple with her racialized position with the world.

Alex describes her approach to social justice in teaching as curricular changes in undergraduate education that exposes students to health equity and racism within the health care field. Alex mentions that she often thinks of race when thinking of diversity but realizes that there are also other forms of diversity that she should be thinking of. We can see her grappling with this later as she mentions she wants to attempt to remove gender from her curriculum but has not gotten

there yet. Alex struggles with her place in justice work and we can see that she is not fully comfortable engaging. At the end of the description, Alex describes time as one barrier to doing this work. She indicates that she cannot juggle both cancer research and inequities in education. While the difficulty of time is a real and important obstacle, this again showcases both white complicity and normativity, as the ability to walk away (white complicity) highlights Alex's white privilege (white normativity), as not everyone can step back from the responsibilities of justice work, or the feelings of oppression within society.

Textural Description of Amy's Experiences

I'm 57 years old, I am a White woman. You know, being a woman…I feel it in this department, because I'm one of few, right? Being White in this department isn't that uncommon. Being White is not something I think about identifying with because I don't have to. I learned from a very young age about trying to make the world a more equitable place and I went to a high school in New York where the population of this high school was half Black and half White. And I just grew up like it was normal. When I was 5 my parents adopted my brother, and my brother is mixed race. My parents tried to be as open culturally as possible. So, you know, we had lots of picture books that were not just like little White kids. My sister had a baby doll that was Black…it [their parenting] was purposeful.

The summer of 2020 and I just remember, feeling like, what can I do? I cried and I thought, "how can the world be like this? What can I do in my position?" And I said, I can make sure that we do everything we can to fix the little problem that we have in our own department. So, we had a search where there were choices and I pushed very hard for the choice of diversity. I feel like that was a moment where I stood my ground and said, this is important. And I'm the chair of the department. I'm the chair of the search committee, and, you know, we can have a vote, but I'm allowed to override the vote if I want to. And so, if you know, George Floyd hadn't happened and things have just stayed at sort of a simmering level, as opposed to boiling over like it did, would I have felt as strongly about that position? I don't know. I think I've been here for over 20 years on faculty and think, what am I leaving behind? I feel like I don't have, you know, great research discoveries. But I'm hoping that this little piece that we're doing will make a difference.

Because of the [social justice] work that I'm doing outside of the classroom, I think about it a lot more. I think that like, the way I'm doing [group work], and all that kind of stuff is very much influenced by my thoughts about how people learn and what kind of comfort spaces they use. [For] curriculum, I try to make the problems more diverse. And when I say more diverse, I mean, like, here's a problem that talks about women. So, I try to make the problems that they're working on as diverse as possible from the perspective of interests. Because I know that there can be a problem with making everything about [video] games, right? I think pedagogical changes, like, active learning, mastery-based assessment, all those kinds of things are, are equity-based, but they're also good for everybody. So, it's not like I'm doing this, specifically to help these students who typically struggle. So again, that's not necessarily equity-based, but it's better teaching.

I think broadly, social justice is about equity. It's about ensuring that or considering that there are people who have not been given an equal opportunity and trying to figure out how to make equal opportunities available for everybody. And so how does that translate to me and my job? I identify most with women because I'm a woman. So, I can relate to that most. But I also feel a very strong need to do what I can to help students from other ethnic backgrounds from underrepresented groups where they didn't have the opportunities previously. I try very hard to relate but I don't want to presume that I can put myself in their place to understand what they're going through…so I try my best to understand the data and the research and listen to them. There are inequities within [the field], partly because of inequities outside. And so social justice, in that perspective, is trying to figure out how to make the playing field as equal as possible for students.

Time is definitely a barrier to modifying the curriculum. And I mean, I modify the curriculum every semester. But making changes like adding a module that I've never done before; I have to make sure I understand it. I asked the [teaching office on campus], I said, do you have anybody I can talk to about how to do this [equitable approaches to grading], and they said we don't really have an expert on that here. I feel like there is support from me to our faculty, from our Dean down to us. We have to write when [we] submit our annual review materials. She asks the faculty to show that they're making an effort. So, I think that there's definitely support for making pedagogical changes that helps students… [but there is] not really push back, because we haven't pushed people to do it. It's not like I'm saying, you have to do this.

Structural Description of Amy's Experiences

Amy anchors much of her approach to justice work through her lens of being a woman in STEM. Amy's narrative starts by articulating an understanding of both her oppressed (being a woman) and oppressor (being White) identities, demonstrating how she positions her intersectional identities within a system of interlocking oppressions. She describes how, in STEM, she is very aware of her identity as a woman because it sticks out, but that being White is not "uncommon." This shows that Amy is pushing against white normativity, as she is aware and reflecting on how whiteness is not something she has to think about within her department. Throughout Amy's narrative we find a tension between the desire to do equity work yet holding, at times, problematic conceptions of justice, which often signals someone early in their understandings of justice and equity (Linder, 2015). For example, Amy used problematic language when speaking about her desire to "help" students from other ethnic groups, both as a presumption that all ethnic students lacked previous opportunities as well as viewing them as a population that needed to be saved. In this way, Amy is reinforcing the dominant ideology of white supremacy through viewing students in a deficit lens. However, we also see Amy begin to unpack her understanding of interlocking oppressions when she calls attention to the inequities in the field as "partly because of inequities outside," placing the fault on the system itself and not the individuals impacted by the system. Other areas in which we can see this tension manifest is through Amy's desire to do justice work to create a more equitable society versus doing

justice work as a part of her legacy and her conflation of the terms equity versus equality. Research has shown these tensions of racist/antiracist attitudes reside within White people as they wrestle with wanting to appear and/or become more socially just while simultaneously not lose privilege within a racially stratified society (Niemonen, 2007; Hughey, 2022). This wrestling could be attributed, in part, to the recentness of Amy's switch moment (the murder of George Floyd) and from not engaging in many learning opportunities to understand justice work.

While Amy may be early into her racial justice journey, she did recognize the power she holds to make change and did not shy away from using this power. Amy took on many aspects of justice within her work, including pushing for the hiring of a person of color within the department who she viewed as equally qualified as other candidates in research and a stronger candidate in teaching. Amy also mentioned other areas of justice related work including programmatic shifts in the department as well as her own teaching.

Textural Description of Rochelle

I grew up in an all-white town pretty much, my elementary school was like 400 kids or something like that. There were literally four people that weren't White in the entire school. My parents are from India, and they, you know, came here from India as adults. And so, I was born here, my brother was born here. But there just wasn't really a lot of feeling of belonging in that community. It was something you tried to fix when you were a kid, I guess, by not being very Indian, or by not bringing Indian food or by not letting anyone see you wearing your Indian clothes. I think that my main goal in life was for no one to notice me. I was glad I was small because you know, you can kind of be like a little less noticeable when you're small. But I was also really smart. And so, the teachers would always call you out. I remember, she [childhood playmate] kept saying, you're Black, but that's okay. And I said, but I'm not Black. I'm brown, like toast. And she was like, no, you're Black, but don't worry about it. The way she said it is clearly not okay. But as a child, I thought I'm not White, I'll never be White. But I'm not Black either. And I didn't want to be lumped into that group. As a child, I was taught these things. I was taught about the stratifications.

I think that it took me a while to see this but most of us just were academics. And we think about fixing things, we think about our own ideas. And oh, this is the problem, let me fix it. We take the scientific outlook, but we just kind of forget that these are people, that people are feeling these things. I would say 2019 is when I really started working on this [Howard Hughes Medical Institute (HHMI)] Inclusive Excellence grant. And that was when I guess I allowed myself to think about all the things that I had felt and gone through and just apply that to what my students are feeling right now in my class and in this college. And so, I think, just actually having to focus on this, it made me understand that I have the power to do something that's bigger than my yeast cells.

And then in the fall of 2019, I taught my intro bio class. And I literally just saw with my own eyes, like the number of people that came up to me that were people of color that just dropped, and I kept my roster with me and I wrote an "X" on everyone that dropped. I mean, because I think, of course, it

happened before, but I just didn't see it like that. It was the first time that I actually saw it happening in front of me. It made me feel awful, a realization that I'm doing this to the students in my class. I'm in charge of this class and students feel like they don't belong. And that made me feel really bad, because I know how it feels to feel excluded. So, I think that was kind of the part where I felt like I can do one thing, I can change my class. I understand that it is my job and my place to talk about this [equity issues]. It's not just something that they're gonna hear if they take a sociology class, it actually does belong in this class. And I don't feel afraid if I'm going to say the wrong thing. I think that it's so much worse not to say anything.

When I agreed to be the program director, and I convened people on my campus, I started doing more reading and talking with other people, about experiences of minoritized students. I think I just felt a kindred sense with these stories in different ways. We had surveys that we did for students to assess their sense of belonging…those results you saw tells you the story that students of color don't feel comfortable here. And they don't feel like they're valued. And it was under my control to do something about it. I would say that [social justice] to me is that everyone feels valued being who they are, in their community or in the society that they're currently in. And also, that they're able to access things that will allow them to be successful in whatever way that they define that term. Once you can convince yourself that it [inequity] is real, then you don't really have any other choice but to keep starting and stopping. Because you can't just leave things the way they are knowing that.

I think that everyone in the department is rowing the same way. I think in the institution, we have a new president, and they are very interested in continuing to seek funding for these initiatives. Sometimes someone will not be happy with some idea that you have, it's hard to navigate sometimes. Everyone has been exposed to a different level of discomfort in their life, due to their identity. So, I do think that some of us are better equipped to handle discomfort than others, because we've experienced it enough.

Structural Description of Rochelle

Rochelle's narrative gives a rich description of anti-Blackness and interlocking oppressions as she describes her experiences navigating racism as a child. Rochelle recognized early in her childhood that being Indian made her stand out in a space that was almost all white and attempted to downplay this aspect of her by being less noticeable, which meant less Indian. Rochelle also recognized early on that a racial hierarchy existed and felt shame in being called Black. Much like Zoe's experience, we can see Rochelle navigating her own experiences with racism while also holding some racial privilege. Throughout Rochelle's narrative we see her transparent descriptions of her own experiences and her understanding of justice work. Rochelle is open about her anti-Black thoughts as a child and her experiences in the classroom that resulted in many of her students of color dropping or failing the course. The openness that Rochelle engages with indicates that she has moved through her feelings of guilt and shame and into taking justice-oriented actions in her pedagogy and curriculum. Rochelle's narrative also points to the difficulty

of separating each participants' profiles, as many profiles overlap within her description. Her description of her switch moment also describes her approach to her classroom and her overall approach to justice weaves itself within her work broadly, while her approach to justice also weaves itself with the barriers/support she faces, as she discusses how her role as program director gives her the power and agency to make changes within her program. We can see here that Rochelle is centering her commitment to social justice and utilizing her power to challenge the dominant ideology.

Rochelle's switch moment happened in 2019, with two events: engaging with a HHMI grant and seeing students of color fail her class. Rochelle discusses how these two moments forced her to self-reflect on her identities and start to unpack her own experiences with racism from her past. Rochelle indicates agency and power in her description of her role as program director, realizing that she had the ability to make change. Rochelle indicates that she desires to stay within justice work as she sees it as "do[ing] something bigger than my yeast cells." Rochelle also speaks of being able to engage in justice work in a department that is all "swimming in the same direction" as well as having the support from higher levels of administration.

Textural Description of Lily

I always share that I am a White cisgender, woman. And I think that's really salient because when we look at the space of education, I look like 90% of the educators, especially in early childhood, through elementary. I was in Section 8 housing and lived with a single mom who worked two jobs. When I was 8 years old, I had some really horrible things that the principal did, standing up in front of the cafeteria, because I wasn't eating my free lunch, and saying to the whole group of students, this child is wasteful, gets free lunch and doesn't eat her lunch. I always tell my students, it was, this cafeteria thing [that brought me to] campaigns. One of [my first] campaigns was "kids are people too" and it was my first advocacy.

I think in 2020, after the murder of George Floyd, that was where it shifted away from holistic human rights to, I needed to educate myself better on racial issues. I hadn't personally taken the responsibility. So, I have a bookshelf full of Black and White covered books, asking questions, talking to faculty of color…I think that year, probably I started joining some of the [teaching office on campus] conversations and started facilitating discussions with my own team. And listening a lot better than I once had…Working in [the classroom] was really interesting for me as a White woman, knowing that I was going to have a classroom full of students of color and being like, "Who the hell am I to stand up here and talk about social justice issues when I haven't had that lived experience?" Is it difficult to have these conversations, more because we don't know how to talk to each other or listen to each other, and it's taboo in so many spaces. We all have racist biases. So, when you get into your classes, my hope is that you think about policy, and you think about the structural issues and you learn…

We need to start teaching our young children how to talk to each other. And also opening up that question like, okay, what does it mean to you? We're talking about racial justice, we're talking about inequities in education, what do you know about it? We forget that not everybody has had the opportunity to have those conversations. I'm fortunate because my course is around social justice, so that makes it easy. I'm very vulnerable with my students. I will share things that I wouldn't share with other faculty. I think when you have discussions around social justice, you have to be vulnerable, right? And I constantly look for feedback from my students. How are you feeling, what are you learning? What do you need from me differently? My first couple of weeks we do a lot of identity work, implicit bias work, and then just discussions around privilege. And the other piece is giving choice around discussions. I have students sign up if they have something that they are interested in.

When I think of social justice, I think of working toward practices that provide opportunities and give access to education in a way that is, this is hard, but less dependent on your locale. So how can we build community and invite community to be part of the conversation in a way that is accessible to people in different communities. And I also think of social justice as opening conversations and discussions, in a way that is productive. So, in my professional development space, I share what I have learned about STEM being a place that opens access for people. I share how it's important, the work that the teachers do, to understand why STEM education is important, first of all, and let's understand why it's important to discuss inequities and injustices when we're in this space. We shouldn't be talking about environmental science without talking about environmental justice. As academics, we have a privilege of having these conversations.

I think the university as a whole is working toward [social justice]. There's a long way to go. I have the autonomy to do different things. And I've also had times where my supervisor has pushed back, maybe a little less now in 2022, and then 2020. I've also had pushback as far as we don't want people to feel bad and we have to be careful how we discuss it. In 2020, I started trying to have some book discussions, which people were super open to, but was one of the first things that would be let go or my supervisor wouldn't show up to them. It was not as important for my supervisor as it was for me to continue the conversation.

Structural Description of Lily

Lily's narrative starts with a reflection of her own intersectional identities as a White woman living in poverty and describes how that experience directly impacted her involvement in justice work. When Lily's principal attempted to humiliate her in front of her classmates, this sparked a lifelong journey advocating for those who were marginalized. Lily reminds us, though, how justice and racial justice can be separated, speaking that her switch moment around racial justice really happened during the murder of George Floyd. This is indicative of the need for a highly racially charged public event to awaken their sensitivities to specific matters involving race. This exemplifies white complicity and normativity.

Lily mentions listening and vulnerability throughout her narrative, indicating that she believes these are two elements necessary for becoming involved in justice related work. She finds herself "lucky" to have courses structured around justice, as she feels this gives her more freedom in being able to put justice within her curricular material. However, as can be seen in Lily's account of justice work broadly, she believes that all STEM educators should be incorporating justice and equity

into their classrooms. Her desire to listen counters white normativity and centers herself as an agent of change. Lily also explicitly states the ways in which she thinks about her pedagogical approaches as justice and student centered, often wanting student feedback in the course materials themselves. Lily uses mostly asset-based language when describing her work and was at times reflective of her own positionality within the work she was doing. For example, she was concerned about her whiteness when leading a course around justice for students of color. Lily had many roles (professional development creator, researcher, PhD candidate, and instructor) and found more agency in some roles over others. Lily mentions having a lot of agency in her role as an educator but indicates that her justice work is less valued in her professional role as can be seen through her supervisor pushing back on her time spent working on justice related items "outside" of her work.

Structural Synthesis

Identities and Past Experiences One area that created separation in our participants' narratives was the experience and noticing of racism. Zoe and Rochelle spoke directly about how their own experiences with racism shaped both their identities and how they approach justice work within their own classrooms, through shared understandings with students on what injustice is or through the realization of harm done both onto them as instructors and the harm they were doing to students. Both Zoe and Rochelle then engage in challenging the dominant ideology of white supremacy within their contexts through their commitment to social justice both broadly, and for their students. Their stories are important to listen to and unpack, as they hold experiential knowledge in both experiencing and navigating racism within STEM. In contrast, while the White participants, Lily, Alex, and Amy, called attention to their whiteness, they did not draw clear lines between their whiteness and their approach to justice work, other than questioning if they belong in the work because they were White. This shows how white normativity allows for White people to choose when and how they think about their whiteness, as whiteness is "normalized" in society.

Four out of 5 of the participants spoke to intersectional identities and interlocking oppressions, and how those experiences shaped their justice journey. Whether it was being a woman in STEM, growing up in low-income communities, or experiencing racism, these participants used their own experiences to shape their approach to justice. Their experiences with their own oppressions helped them connect to understandings of justice for other marginalized groups. Importantly, participants also spoke to traits such as vulnerability, self-awareness, or listening as being critical in engaging in justice work. For participants, these traits seemed to help them balance their own experiences with oppression while simultaneously unpacking what it was like to engage in justice related topics that were not aligned with their own oppression. Examples include when Amy spoke about how she tried "hard to relate" to students of color but didn't want to "presume that I can put myself in their place" or how Lily spoke to her struggles teaching racial justice in her quote "Who the hell am I to stand up here and talk about social justice issues when I haven't had that lived experience." In contrast, Alex did not spend time during the interview reflecting in depth on her own intersec-

tional identities and her narrative in turn reflects a superficial level of engagement with her place within justice work.

The Switch Moment The switch moment had interesting connections and differences across participants. In many ways, the beginning of the switch moment can be related to phase 1 (waking up) of Harro's (2000) cycle of liberation. Harro describes liberation as beginning when an individual begins to experience themselves differently in the world, which can result from either a critical incident or slowly over time. Zoe and Rochelle described their switch moment as a realization during a learning experience, with Zoe discussing a classroom that changed their life and Rochelle describing a grant that gave her time to engage in justice related approaches. Rochelle and Zoe also described a critical event that influenced their switch moment; the realization within the classroom of the harm they could potentially be doing to students of color. A clear difference between Zoe and Rochelle and the White participants was their discussion around the murder of George Floyd. Neither Rochelle nor Zoe described this event as impacting their awareness of the need to incorporate justice within their pedagogy or curriculum, while Amy, Alex, and Lily mentioned George Floyd as a critical incident that shaped their future thoughts and actions. This is one example of white normativity under the critical whiteness framework, as it took a major event and the murder of several POC in a particularly brutal spring for White people to understand the severity of racial injustice in the United States. Our participants' experience with the switch moment also establishes an important point: even when someone experiences a wake up moment in one context, it may not always translate to another context without a bridge. For example, all of our participants described being aware of the need for justice within society broadly long before the moment in which they decided to make changes within their own pedagogy and/or curricular material. The bridge in this case for many of the participants were through various learning opportunities, as many spoke to learning opportunities to be crucial in their understanding of both justice and how to incorporate justice within their curriculum or pedagogy. However, the extent in which they were able to find and engage with these opportunities differed across participants.

Curriculum/Pedagogy When asked to think about the ways that justice and equity impacted their curriculum and/or pedagogy, participants varied on their approaches, ranging from structural, curricular, or both. For example, Zoe discussed how their approach was more focused on creating an accessible environment for all students, but that they tended to focus less on curricular changes that explicitly discussed topics of justice. In Lily, Rochelle, and Alex's narratives, they discussed specific curricular changes they made to make sure that justice topics were being discussed within the classroom. Finally, Amy focused on both curricular and pedagogical supports when she discussed how she approached classroom examples as well as grading.

Another variation can be seen in how instructors discussed their approaches. For example, Zoe, Rochelle, and Lily were explicit during their narratives of the awareness they held for potentially harming their students, and how they felt it

was their responsibility to be vulnerable and/or make changes to ensure students were supported. These examples highlight how these instructors challenged white supremacy in creating spaces that shared power and/or centered voices from marginalized groups. While Amy did engage in self-reflection at times, her language was often deficit based and she did not feel comfortable explicitly supporting equity. For example, she discussed how she wanted to "help these students who typically struggle," engaging in a common deficit-based narrative that students lack skills to be successful based on their lack of preparedness and not explicitly calling out the systemic issues such as white supremacy and sexism. Furthermore, Amy wanted to make the point that these strategies are helpful to all students, not just marginalized students. In this way, Amy is reinforcing notions of white supremacy by placing the burden of responsibility on individuals instead of systems and by engaging in race neutrality to emphasize the point that these strategies work for "all students." In the previous paragraph, Amy was questioning whether she would have engaged in supporting the hiring of a POC within her department if not for the murder of George Floyd. Taken together, these two statements show how Amy is still wrestling with white complicity, as she struggles to align her actions with racial justice specifically. Finally, while Alex's narrative indicated an awareness of systemic racism, as well as how her course addressed intersectionality in health care, Alex did not engage in self-reflection within her description of her approach to social justice within her classroom. This, taken with Alex's previous narration around her lack of connection to whiteness, is an example of a way in which Alex does not engage in reflexivity around her own privilege and identity within social justice work.

Their Relationship to Justice Work Each participants' definition of justice was unique, as was their view on how they fit into the justice landscape. Zoe and Rochelle spoke directly about systems of power within their narratives, with Zoe describing how they felt like a plug with no power as a teaching assistant and Rochelle speaking to how her position as director allowed her to gather the information necessary to begin changing the culture. All participants, besides Alex, frame justice as a continuous process in which they have a past, present, and future within. Zoe, Rochelle, Lily, and Amy give specific examples of how they think of justice as it relates to their current areas of work, including advocating for more professional development, making changes that lead to a culture shift, promoting a sense of belonging, holding discussions of equity in the classroom, and reducing systemic barriers. Alex discusses her past and present but finds herself conflicted on her place within the movement as a White woman and ends her narrative by describing how she wishes to return to cancer care work instead of working on justice specifically, as it is too much to balance both. Many participants also speak toward intersectionality or intersectional identities when discussing their role in justice. While Zoe is a woman of color, she recognizes her light skin privilege earlier in her narrative and discusses how justice and equity work should be based on the narratives and work of Black women who have been working in this space for a long time. Amy points to her intersectional identities as a woman in STEM, and how justice to her

is a balance of understanding certain aspects of interlocking oppressions, such as sexism, but not wanting to assume she understands the experiences of those who hold different oppressed identities.

Barriers and Supports Participants mentioned many structural barriers and supports when discussing their ability to engage in justice work in academia, especially around time and support. Zoe, Alex, and Amy all mentioned time as being a difficult factor, but for often different reasons. Zoe talked about how they had to drive all over the state to teach, which was in an attempt to make ends meet. Zoe also discussed how the lack of TAs put a significant strain on them. Equitable practices in the classroom, especially ones around grading, often take more time (e.g., building in additional structure with formative assessments). This becomes significantly more difficult when the instructor is the only one grading for a large class size. Alex mentioned in her narrative around social justice that she felt as if she had to choose between cancer research and diversity and equity initiatives, which may be a result of mounting pressures in academia to be productive. Amy also mentions that time often gets in the way of her ability to make curricular changes, but also adds that a lack of resources (from the Teaching and Learning Center) has added to this difficulty.

Another structural aspect was the support of the institution or those in higher positions. Amy and Rochelle were both in positions of power and felt that their institutions were supportive in their desire to make changes. They both mentioned that there can be at time either resistance or apathy toward making justice related pedagogical or curricular changes, but that there was support from those in administration. Zoe and Lily mentioned in their narratives that they did not always feel support from their direct supervisors, with Zoe feeling like a "plug" as a TA and Lily discussing how her supervisor did not always value her work around equity. Zoe also mentioned a positive experience with an instructor who did value their input and how that made them feel valued.

DISCUSSION AND IMPLICATIONS

The pathways to social justice work in STEM, as described by our participants, hold several lessons for the science education landscape as we collectively seek to offer students and society a more equity-minded experience. The nuances of participants' responses also highlight how tricky it is to navigate a science education ecosystem that is still figuring out its relationship to the broader concept of social justice. These stories hold three powerful lessons for science education, both in terms of pedagogical practice, and the questions that can potentially shape research agendas on equity in science education.

First, lived experiences, especially of those who were most front facing to social inequities, are critical sources of education for our collective understanding about the persistence of racism and its associated ideas (Lincoln and Stanley, 2021). This is not to diminish the role of higher education, and the crucial role that a more formal introduction to the truth of history plays in elevating our consciousness. But it underscores the fact that didactic learning cannot necessarily replace the deep resonance brought about by experience. In this light, it

is important to listen to and learn from students who may share experiences similar to Rochelle and Zoe. Indeed, one of the core tenets of CRT is the need to centralize the voices of individuals from marginalized backgrounds and embrace the education that comes from listening and learning from their stories (Curtis and Showunmi, 2019). This also reinforces the point that science classrooms need to have curricular content that centers the voices of those who are marginalized and create spaces in which all students can contribute their ideas and experiences.

Second, privilege is a phenomenon that is highly dependent on context. Different contexts can exist within the same person. For example, Zoe, can experience the disadvantage of being a person of color in some circles while simultaneously experiencing some benefits of being considered white-passing. Therefore, in understanding the complex ways that historic oppressive systems have unfolded, it is perhaps less useful to focus on the transgressions of an individual or group of individuals, but rather seek to understand how systems have effectively codified certain physical markers as inherently good and others negative. Elevating our understanding of privilege in this way should result in a shift in our efforts from identifying problematic individuals, to eliminating design features that foreground our more negative cognitive and social biases. This is a core point in understanding interlocking oppressions. Within the science and STEM disciplines, this calls for a deeper look into the practices and policies that may be contributing to structural oppression. For example, all participants mentioned time as a barrier to being able to engage in curricular and pedagogical shifts. In a system that often rewards research productivity over teaching, focusing on classroom content can result in negative financial consequences (choosing to go into the nontenure track route) or negative promotional consequences (risking tenure for not having a high enough research output).

Last but not least, many participants pointed to a particular higher education course they took as their switch moment. This highlights two points. First, historical and present-day topics regarding social justice broadly, and racial justice specifically, are often absent in K-12 curriculum and White people do not discuss racism with their children (Forsythe, 2023). This is often due to purposeful legislation that restricts educators' ability to introduce anti-racist and historically accurate material in their classrooms, as more than 30 states have either introduced or passed legislation that prohibits and penalizes K-12 educators for this type of curriculum. Lily explicitly mentions this when she speaks on how "we need to start teaching our young children how to talk to each other…we forget that not everybody has had the opportunity to have those conversations." This speaks to all three constructs of CWS as White people continue to 1) uphold white supremacy through their "neutrality" in not engaging in conversations around race and racism (white complicity), 2) erase both the contributions of POC and the historic and current day oppressions POC face (epistemologies of ignorance), and 3) continue to engage in white complicity and epistemologies of ignorance because their racial privilege allows them to move through the world without having to think about their whiteness, the way it manifests, and the way it harms (white normativity). Second, this underscores the continued critical role that higher education

can play in exposing students to new and provocative lenses through which they can review their own lives and the lives of others. This is an important process to lean in on, particularly at a time when higher education is suffering a simultaneous crisis of confidence (Benson-Greenwald et al., 2023), alongside heated allegations of indoctrination in alignment with a specific political agenda (Tyson and Oreskes, 2022). Institutions of higher education need to make the case more explicitly and more importantly beyond its walls, that the process of education is by definition one that allows us to hold a mirror up to our collective selves and make peace with what we see. Sometimes the reflection, as some of our participants indicate, contains truths about our own myopia that requires some time, patience, guidance, and support to work through. Leveraged and reflected on in a meaningful way, this can be a powerful catalyst in re-energizing individuals, especially those with nonminoritized identities, to become more active in helping create and sustain a socially just world.

From a teaching praxis standpoint, the key takeaway is that discussions around equity-mindedness and social justice are too important to be left as a happenstance encounter for some students in their academic journey. Too often, especially in STEM classrooms, assumptions are made that the more critical aspects of social justice conversations are best left to the non-STEM spaces on a college campus, both in and outside of classrooms (Hoffman and Mitchell, 2016). First, this communicates the unfortunate message that issues of social justice are by definition external to STEM culture. Second, it places the entire burden of responsibility of this crucial conversation on a narrow space in the student's higher education experience, that they may or may not confront as they matriculate.

In the context of the discipline of science specifically, the field is currently grappling with the idea that science is indeed not objective, as it is done through subjective individuals. As mentioned before, Callwood et al. (2022) described how all tenets of white supremacy described by Jones and Okun (2001) were also found within science. This grappling also plays out within the science classroom as decisions are made by instructors on what to include and not include in curricula, and we highlight several specific examples from the life sciences and allied fields. For example, Forsythe (2023) found that undergraduate and graduate students in the life sciences were rarely exposed to topics concerning racial justice within their STEM coursework. While there are examples of instructors pushing back against a curriculum that separates science from society, and instead choosing to infuse social contexts within the coursework (e.g., Wald et al., 2019; Grover, 2020; Morales et al., 2020; Bratman and DeLince, 2022, all situated within the context of the life and natural sciences and allied fields), these examples remain few and far between. In the context of our current study, our participants often experienced a learning moment in a course outside of STEM and/or far into their academic journeys. For our White participants especially, this could have delayed their ability to connect their justice identity and their science identity, and therefore their ability to challenge interlocking oppressions within their own classrooms.

Following through on this deliberate call for social justice discussions in science classrooms means that instructors in these spaces must understand the ways in which to

incorporate these discussions into their curricula. A full description of that process is beyond the scope of this essay, but several authors (e.g., Dewsbury and Brame, 2019; Dewsbury, 2020; McNair *et al.*, 2020; Sathy and Hogan 2022) have provided useful starting points, practical examples, and ideas for structural support for instructors at various stages of their journey. This approach to teaching STEM requires skills that transcend subject matter expertise. It includes the ability to create spaces where students and instructors can practice active listening, to explore not just the beauty of STEM, but also how STEM intersects with social structures and power in ways that have been both deleterious and beneficial. In other words, STEM classrooms can be a space where students explore both the beauty of content, *and* the origins of our discontent. Understanding both is what can effectively reintegrate STEM disciplines into our collective work as institutions of higher education and by extension society into the work of making a more socially just democracy.

Limitations and Future Directions

We recognize several limitations of our work. First, our research centered on the journeys of five faculty in STEM, and we recognize that our participants' experiences do not capture the full diversity of perspectives and pathways to social justice within STEM. While we were able to represent their experiences, perspectives, and paths to justice through our textural descriptions, future work is needed to continue examining other instructors' pathways to social justice and determine whether there are additional salient themes not captured in our work. Additionally, we recognize that our choice of participants known to the authors is both a strength and a potential limitation. Our participant selection strategy allowed for deep vulnerability in the sharing of participants' journeys toward justice. However, we recognize that our sampling strategy means our results may not be generalizable, and future work is needed to explore the journeys of other instructors who identify as committed to social justice. We hope that our participants' stories allow the STEM education community to craft new interview questions and spark future research with a wider net of participants. Similarly, we acknowledge that our use of postintentional phenomenology focuses our work on the phenomenon of *how* STEM instructors became committed to social justice and their perspectives on the impact of this journey. We did not directly examine the impact of this journey on participants' teaching, and future work that directly examines instructors' pedagogical approaches and curriculum throughout this journey will provide additional insight into how individual instructors' journeys to social justice influence their teaching. Finally, we recognize that our work only centers the voices of people who self-describe as being fully committed to social justice. Future work that includes instructors who are earlier in the process, or who are not yet aware of the need for social justice, will broaden our understanding of these journeys as well as motivations and barriers for becoming committed to social justice. Despite these limitations, our work presents one of the first direct examinations of STEM instructors' journeys into social justice and how this journey impacts their pedagogy. By examining their journeys and the impact of their journeys through their own words and lived experiences, we provide new insight into how faculty become aware of this need and how we can continue catalyzing those in STEM to this realization.

REFERENCES

Åkerlind, G. S. (2005). Variation and commonality in phenomenographic research methods. *Higher Education Research & Development*, *24*(4), 321–334.

Anderson, C. (2016). *White Rage: The Unspoken Truth of Our Racial Divide*. Bloomsbury, USA.

Applebaum, B. (2010). *Being White, Being Good: White Complicity, White Moral Responsibility, and Social Justice Pedagogy*. Lanham, Mayland: Lexington Books.

Bartholomew, T. T., Joy, E. E., Kang, E., & Brown, J. (2021). A choir or cacophony? Sample sizes and quality of conveying participants' voices in phenomenological research. *Methodological Innovations*, *14*(2), 1–14. https://doi.org/10.1177/20597991211040063

Benson-Greenwald, T. M., Trujillo, A., White, A. D., & Diekman, A. B. (2023). Science for others or the self? Presumed motives for science shape public trust in science. *Personality and Social Psychology Bulletin*, *49*(3), 344–360.

Bettencourt, G., Kimball, E., & Wells, R. S. (2018). Disability in postsecondary STEM learning environments: What faculty focus groups reveal about definitions and obstacles to effective support. *Journal of Postsecondary Education and Disability*, *31*(4), 383–396.

Binkerd, C. L., & Moore, M. D. (2002). Women/minorities in computer science: Where are they? No attention, no retention. *Journal of Computing Sciences in Colleges*, *17*(5), 8–12.

Bratman, E. Z., & DeLince, W. P. (2022). Dismantling white supremacy in environmental studies and sciences: An argument for anti-racist and decolonizing pedagogies. *Journal of Environmental Studies and Sciences*, *12*(2), 193–203. https://doi.org/10.1007/s13412-021-00739-5

Callwood, K. A., Weiss, M., Hendricks, R., & Taylor, T. G. (2022). Acknowledging and supplanting white supremacy culture in science communication and STEM: The role of science communication trainers. *Frontiers in Communication*, *7*, 787750. Retrieved from https://10.3389/fcomm.2022.787750

Casad, B. J., Franks, J. E., Garasky, C. E., Kittleman, M. M., Roesler, A. C., Hall, D. Y., & Petzel, Z. W. (2021). Gender inequality in academia: Problems and solutions for women faculty in STEM. *Journal of Neuroscience Research*, *99*(1), 13–23.

Cilesiz, S. (2009). Educational computer use in leisure contexts: A phenomenological study of adolescents' experiences at Internet cafes. *American Educational Research Journal*, *46*(1), 232–274.

Collins, P. H. (1990). Black feminist thought in the matrix of domination. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment*, 221–238, Abingdon, Oxfordshire: Routledge.

Combahee River Collective. (1995). Combahee river collective statement. In: B. Guy-Sheftall (Ed.), *Words of Fire: An Anthology of African American Feminist Thought*, (pp. 232–240). NYC, NY: New Press. (Original work published 1977)

Combahee River Collective. (1983). The Combahee river collective statement. In: B. Smith (Ed.), *Home girls: A black feminist anthology*, (pp. 264–274). Rutgers University Press.

Crenshaw, K. (1991). Mapping the margins: Identity politics, intersectionality, and violence against women. *Stanford Law Review*, *43*(6), 1241–1299.

Curtis, S., & Showunmi, V. (2019). Black women leaders: Intersectional and present in the field of education 'hear our voice'. *Race, Education, and Educational Leadership in England: An Integrated Analysis*, 261–286, Bloomsbury Publishing.

Dahlberg, H., & Dahlberg, K. (2003). To make definite what is indefinite: A phenomenological analysis of perception and its epistemological consequences. *Journal of the Humanistic Psychologist*, *31*(4), 34–50. https://doi.org/10.1080/08873267.2003.9986933

Delgado, R., & Stefancic, J. (2023). *Critical Race Theory: An Introduction*, (4th ed.), NYC NY: NyU press.

Dewsbury, B. M. (2020). Deep teaching in a college STEM classroom. *Cultural Studies of Science Education*, *15*(1), 169–191.

Dewsbury, B., & Brame, C. J. (2019). Inclusive teaching. *CBE—Life Sciences Education*, *18*(2), p.fe2.

Dolmage, J. T. (2017). *Academic Ableism: Disability and Higher Education*, 244. Ann Arbor, MI: University of Michigan Press.

Dortch, D., & Patel, C. (2017). Black undergraduate women and their sense of belonging in STEM at predominantly White institutions. *NASPA Journal About Women in Higher Education*, *10*(2), 202–215. https://doi.org/10.1080/19407882.2017.1331854

Duran, A., & Jones, S. R. (2020). Intersectionality. *Encyclopedia of Critical Whiteness Studies in Education*, 310–320. Leiden, Netherland: Brill.

Eaton, A. A., Saunders, J. F., Jacobson, R. K., & West, K. (2020). How gender and race stereotypes impact the advancement of scholars in STEM: Professors' biased evaluations of physics and biology post-doctoral candidates. *Sex Roles*, *82*, 127–141.

Estrada, F., & Matthews, G. (2016). Perceived culpability in critical multicultural education: Understanding and responding to race informed guilt and shame to further learning outcomes among White American college students. *International Journal of Teaching and Learning in Higher Education*, *28*(3), 314–325.

Forsythe, D. (2023). Committing to racial justice as a White woman in STEM: Using constructivist grounded theory to explore White activism. *The Journal of Higher Education*, *95*(7), 942–967.

Foste, Z., & Irwin, L. (2020). Applying critical whiteness studies in college student development theory and research. *Journal of College Student Development*, *61*(4), 439–455. 10.1353/csd.2020.0050

Foste, Z., & Jones, S. R. (2020). Narrating whiteness: A qualitative exploration of how white college students construct and give meaning to their racial location. *Journal of College Student Development*, *61*(2), 171–188. https://doi.org/10.1353/csd.2020.0016

Frankenberg, R. (1993). *White Women, Race Matters: The Social Construction of Whiteness*. Minn: University of Minnesota Press.

Giorgi, A. (2009). *The Descriptive Phenomenological Method in Psychology: A Modified Husserlian Approach*. Pittsburgh, PA: Duquesne University Press.

Greathouse, M., Brckalorenz, A., Hoban, M., Huesman, R., Rankin, S., & Stolzenberg, E. B. (2018). Queer-spectrum and trans-spectrum student experiences in American higher education: The analyses of national survey findings.

Green, M. J., Sonn, C. C., & Matsebula, J. (2007). Reviewing whiteness: Theory, research, and possibilities. *South African Journal of Psychology*, *37*(3), 389–419.

Grover, N. (2020). An anti-racist classroom in the natural sciences. *The FASEB Journal*, *34*(S1), 1–1. https://doi.org/10.1096/fasebj.2020.34.s1.06718

Hales, K. G. (2020). Signaling inclusivity in undergraduate biology courses through deliberate framing of genetics topics relevant to gender identity, disability, and race. *CBE—Life Sciences Education*, *19*(2), es2.

Harper, S. R. (2012). Race without racism: How higher education researchers minimize racist institutional norms. *The Review of Higher Education*, *36*(1), 9–29.

Harries, B. (2014). We need to talk about race. *Sociology*, *48*(6), 1107–1122.

Harro, B. (2000). The cycle of liberation. In: M. Adams, W. J. Blumenfeld, R. Castañeda, H. W. Hackman, M. L. Peters, and X. Zúñiga (Eds.), *Readings for Diversity and Social Justice*, (pp. 463–469). Abingdon, Oxfordshire: Routledge.

Hoffman, G. D., & Mitchell, T. D. (2016). Making diversity "everyone's business": A discourse analysis of institutional responses to student activism for equity and inclusion. *Journal of Diversity in Higher Education*, *9*(3), 277–289.

Hughey, M. W. (2022). Superposition strategies: How and why White people say contradictory things about race. *Proceedings of the National Academy of Sciences*, *119*(9), e2116306119. https://doi.org/10.1073/pnas.2116306119

Jackson, C., & Sundaram, V. (2020). *Lad Culture in Higher Education: Sexism, Sexual Harassment and Violence*. Abingdon, Oxfordshire: Routledge.

Jackson, J. F. (2004). An emerging engagement, retention, and advancement (ERA) model for African American administrators at predominantly White institutions. *A Long Way to Go: Conversations About Race by African American Faculty and Graduate Students in Higher Education*, 211–222.

Jones, K., & Okun, T. (2001). White supremacy culture. *Dismantling racism: A workbook for social change groups* 28–35.

Jones, S. R., Torres, V., & Arminio, J. (2014). *Negotiating the Complexities of Qualitative Research in Higher Education: Fundamental Elements and Issues*, 2nd ed., Abingdon, Oxfordshire: Routledge.

Ladson-Billings, G., & Tate, W. F. (1995). Toward a critical race theory of education. *Teachers College Record*, *97*(1), 47–68.

Le, P. T., & Matias, C. E. (2019). Towards a truer multicultural science education: How whiteness impacts science education. *Cultural Studies of Science Education*, *14*, 15–31. https://doi.org/10.1007/s11422-017-9854-9

Lincoln, Y. S., & Stanley, C. A. (2021). The faces of institutionalized discrimination and systemic oppression in higher education: Uncovering the lived experience of bias and procedural inequity. *Qualitative Inquiry*, *27*(10), 1233–1245.

Linder, C. (2015). Navigating guilt, shame, and fear of appearing racist: A conceptual model of antiracist white feminist identity development. *Journal of College Student Development*, *56*(6), 535–550.

Malcom, S. M., Brown, J. W.and Hall, P. Q. (1976). *The Double Bind: The price of being a minority woman in science: Report of a conference of minority women scientists, Airlie House, Warrenton, Virginia, December 1975*. AAAS Publication, 76-R-3. Washington, DC: American Association for the Advancement of Science.

McGee, E. O. (2021). *Black, Brown, Bruised: How Racialized STEM Education Stifles Innovation*. Cambridge, MA: Harvard Education Press.

McNair, T. B., Bensimon, E. M., & Malcom-Piqueux, L. (2020). *From Equity Talk to Equity Walk: Expanding Practitioner Knowledge for Racial Justice in Higher Education*. Hoboken, New Jersey: John Wiley & Sons.

McNeill, R. T., Leyva, L. A., & Marshall, B. (2022). "They're just students. There's no clear distinction": A critical discourse analysis of color-evasive, gender-neutral faculty discourses in undergraduate calculus instruction. *Journal of the Learning Sciences*, *31*(4-5), 630–672.

Miller, R. A., Vaccaro, A., Kimball, E. W., & Forester, R. (2021). "It's dude culture": Students with minoritized identities of sexuality and/or gender navigating STEM majors. *Journal of Diversity in Higher Education*, *14*(3), 340.

Mills, C. (1997). *The Racial Contract*. Ithaca: Cornell University Press.

Morales, N., Bisbee O'Connell, K., McNulty, S., Berkowitz, A., Bowser, G., Giamellaro, M., & Miriti, M. N. (2020). Promoting inclusion in ecological field experiences: Examining and overcoming barriers to a professional rite of passage. *The Bulletin of the Ecological Society of America*, *101*(4), e01742. https://doi.org/10.1002/bes2.1742

Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences*, *109*(41), 16474–16479. https://doi.org/10.1073/pnas.1211286109

Moustakas, C. (1994). *Phenomenological Research Methods*. Thousand Oaks, CA: Sage Publications.

Nash, J. C. (2017). Intersectionality and Its Discontents. *American Quarterly*, *69*(1), 117–129. Retrieved from http://www.jstor.org/stable/26360804D

Nayak, A. (2007). Critical whiteness studies. *Sociology Compass*, *1*(2), 737–755.

Niemonen, J. (2007). Antiracist education in theory and practice: A critical assessment. *The American Sociologist*, *38*, 159–177. https://doi.org/10.1007/s12108-007-9006-x

Rubin, H. J., & Rubin, I. S. (2011). *Qualitative Interviewing: The Art of Hearing Data*. Thousand Oaks, CA: Sage.

Russo-Tait, T. (2023). Science faculty conceptions of equity and their association to teaching practices. *Science Education*, *107*(2), 427–458.

Sathy, V., & Hogan, K. A. (2022). *Inclusive Teaching: Strategies for Promoting Equity in the College Classroom*. Morgantown, West Virginia: West Virginia University Press.

Seidman, I. (2006). *Interviewing as Qualitative Research: A Guide for Researchers in Education and the Social Sciences*. NYC, NY: Teachers College Press.

Sokolowski, R. (2000). *Introduction to Phenomenology*. Cambridge, MA: Cambridge University Press.

Solorzano, D., & Yosso, T. (2000). Toward a critical race theory of Chicana and Chicano education. *Charting New Terrains of Chicana (o)/Latina (o) Education*, 35–65, Hampton Press.

Solórzano, D. G., & Yosso, T. J. (2016). Critical race methodology: Counter-storytelling as an analytical framework for educational research. In: E. Taylor, D. Gillborn, and G. Ladson Billings (Eds.), *Foundations of Critical Race Theory in Education*, (pp. 127–142). Abingdon, Oxfordshire: Routledge.

Sue, D. W. (2016). *Race Talk and the Conspiracy of Silence: Understanding and Facilitating Difficult Dialogues on Race*. hoboken, NJ: John Wiley & Sons.

Suri, H. (2011). Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal*, *11*(2), 63–75.

Taylor, K. Y. (2016). *From# BlackLivesMatter to Black liberation*. Chicago, IL: Haymarket Books.

Taylor, K. Y. (2017). *How We Get Free: Black Feminism and the Combahee River Collective*. Chicago, IL: Haymarket Books.

Tyson, C., & Oreskes, N. (2022). *The American University, the Politics of Professors, and the Narrative of 'Liberal Bias'. The Social Production of Knowledge in a Neoliberal Age: Debating the Challenges Facing Higher Education*, 79, Rowman and Littlefield.

Vaccaro, A., Russell, E. A., & Koob, R. M. (2015). Students with minoritized identities of sexuality and gender in campus contexts: An emergent model. *New Directions for Student Services*, *2015*(152), 25–39.

Vagle, M. D. (2009). Validity as intended: 'bursting forth toward' bridling in phenomenological research. *International Journal of Qualitative Studies in Education*, *22*(5), 585–605. https://doi.org/10.1080/09518390903048784

Vagle, M. D. (2018). *Crafting Phenomenological Research*. Abingdon, Oxfordshire: Routledge.

Wald, S. D., Vázquez, D. J., Ybarra, P. S., Ray, S. J., Pulido, L., & Alaimo, S. (2019). *Latinx Environmentalisms: Place, Justice, and the Decolonial*. Philadelphia, Pennsylvania: Temple University Press.

Wilkins-Yel, K. G., Arnold, A., Bekki, J., Natarajan, M., Bernstein, B., & Randall, A. K. (2022). "I can't push off my own mental health": Chilly STEM climates, mental health, and STEM persistence among Black, Latina, and White graduate women. *Sex Roles*, *86*(3-4), 208–232.

Yancy, G. (2018). Moral forfeiture and racism: Why we must talk about race. *Educational Philosophy and Theory*, *50*(13), 1293–1295.

Yoder, J. B., & Mattheis, A. (2016). Queer in STEM: Workplace experiences reported in a national survey of LGBTQA individuals in science, technology, engineering, and mathematics careers. *Journal of Homosexuality*, *63*(1), 1–27.