”I can’t see race here”: Pragmatic, theoretical, epistemological, and communicative challenges researchers and instructors have with observing race in engineering classrooms

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"I can't see race here": Pragmatic, theoretical, epistemological, and communicative challenges researchers and instructors have with observing race in engineering classrooms

1. Introduction:

Engineering has historical origins in white supremacy, patriarchy, and classism [1], [2], [3]. Despite efforts to diversify the profession, these systems of power and inequity have largely been perpetuated. While many research efforts document the inequitable outcomes or marginalizing experiences of historically excluded racial groups, there is a pressing need for research on the mechanisms that recreate racial oppression in engineering education. These mechanisms include workplace cultures, institutional policies, and systemic access to education, as well as the differential and inequitable enactment of education for different groups. We contend that engineering classrooms are racialized and are places where racial equity or inequity take place. This contention counteracts the view of the engineering classroom as a technical and impersonal domain, and it is a premise formed by the documenting of racially inequitable outcomes. That is, if over the course of the engineering educational enterprise racial diversity decreases, and the fact that between high school and graduate school or the profession the racial diversity of the engineering field decreases [4], then we can presume that undergraduate engineering education contributes to racial inequity. Although many aspects coincide within undergraduate engineering education, including advising, finances, curriculum, pedagogy, grading, peer groups, etc., we can presume that classroom practice constitutes a bulk of student lives and therefore is a primary place we may expect to find mechanisms of racial inequity.

Methodologically, classroom observations through ethnography or video research are the primary tools for investigating classroom practice and interaction as mechanisms of inequity. While engineering education research has documented insights into mechanisms of gender inequity [5] and ability hierarchies [6], engineering education research and practice is largely not contending with issues of racial equity in everyday engineering educational practice. Much of the research on racial marginalization is on marginalizing experiences [7], microaggressions [8], mental health [9], [10]. The literature on race in engineering classrooms is very limited [11], [12], with little to no research examining mechanisms that create inequity in engineering classroom practices and interactions. Motivated by this literature gap, we are conducting an ongoing study into the pedagogical and interactional mechanisms of racial equity. Our methods include collaborative ethnography where we collect classroom data and reflect on it together with participant faculty. Over the course of our first semester of data collection, noticed certain parallels in confusions or barriers towards the formal observation of racial equity dynamics by the researcher team and the informal observation of racial equity by our faculty participants. In this paper, we seek to uncover barriers to this examination to help motivate the development of further resources for researchers and for faculty.

2. Theoretical Lenses

Working from the premise from cultural production that everyday culture can and does perpetuate inequitable outcomes [13], we draw on tenets and proponents of critical race theory to help attune to the ways that inequity may be recreated in engineering classrooms. First, we note that although race is socially constructed, it is materially constituted and significant [14]. If classroom interactions are racialized and one racial group has more access to class participation or instructor support, this will have a negative impact on the marginalized group. Specifically, we draw on Shah and colleagues' [15] quantifications of equity to help operationalize equity in

terms of proportions of racial representation. While not a simple or perfect measure, this quantification postulates that a starting point for discussion of equity is to look at the proportion of some quantity (talk time, questions answered) that the group receives relative to their proportion in the class. In addition to qualitative descriptions of racialization, we used this quantification approach particularly to help communicate with engineering faculty stakeholders.

Second, we note that racism is normalized [16, p. 794], that is, we anticipate needing to ethnographically "make the familiar strange" in order to find the everyday racism embedded in systems. Perhaps a classroom where a dominant racial group is speaking the most or outnumbers all other students is so ordinary to most constituents, it is difficult to examine. Remembering the inertia towards normalization and the active work it takes to de-normalize proved helpful as theoretical premises. Third, we draw on Bonilla-Silva's frames of colorblind racism to help attune to the theoretical conceptual challenges of focusing on race, as represented in discourse [17]. While it is a US cultural cliché to hear people profess that they "don't see color," Bonilla-Silva's work helped study and identify the specific frames with which people attest to not seeing race while perpetuating racist views and status quo inequitable outcomes. We used this lens to help specify our understanding of colloquial US-based understandings and ontologies of race.

3. Paper context and purpose:

This paper highlights methodological challenges and insights gained from the first two semesters of a collaborative education research and practice study, which embedded ethnographic observations in engineering classrooms while sharing classroom data and holding collaborative discussions with the faculty instructors. As we conducted our research team meetings to ensure preparation and consistency of the research approach across the researchers (including PI professor, postdoc, and two graduate assistants), we learned firsthand about what made observing race in the classrooms challenging. In parallel, we talked with and presented our data to the participating professors and met with resistance or confusion regarding how to look at and examine race in their own classrooms. We found parallels between what made race challenging for researchers to observe empirically and what made it challenging for professors to understand or see in everyday classroom practice. Thus, we set about to explore and delineate the challenges with observation (pragmatic and ontological challenges) and the challenges with conceptualization (theoretical and epistemological challenges) regarding race in engineering classrooms. In addition to the challenges, we also reflected on what helped with learning or understanding in these areas.

4. Method:

The broad research method for the project was collaborative ethnography with a focus on racial equity. The project embeds in one institutional context per semester and engages three faculty regarding their engineering teaching for one engineering classroom. The research team embeds in the classroom to observe most class sessions (allowing for schedule conflicts or skipping less useful content) to track patterns and shifts in racial equity and observe the class culture holistically. Members of the research team regularly meet with the professor instructors to understand their intentions and constraints regarding their teaching, to provide instruction and advice regarding pedagogy and racial equity, and to present regular data and feedback regarding the classroom observations. This feedback presents an adaptation of traditional ethnography which aims to create and study the process of creating positive change regarding a social challenge (racial inequity) in real time, without waiting to "leave the field" to provide feedback.

As we conducted the observational and faculty group engagement study, we noted that our own observational methodological challenges sometimes mirrored the real-life challenges of our faculty participants. The claim by some faculty that they "couldn't see race here" or didn't know the races of their students sounded more legitimate and less cliché when our own research team felt the same way. We aimed to reflect as a research team across the entire dataset so far to examine the ways that racial equity proved difficult to study and to generate strategies and insights for both researchers and instructors hoping to notice and impact racial issues.

Our method for this paper is collaborative inquiry [18]. We reflected together around four orienting questions (see Appendix). As first author, Secules took notes while the coauthor researchers (Halkiyo, Kali, and Kumar) reflected on their practice (as they more often observed in the field). Secules then synthesized the reflections into a series of insights that represent the narrative of the collective within 4 overarching categories. Where positionality was a particular factor (we have US-born and international researchers on the team, as well as a range of expertise with observational methods and critical race theory) we note the coauthor positionality that influenced the perspective. We also draw parallels between faculty participant experiences and our own.

5. Findings

First, we restate an overarching finding that: *Difficulties with "seeing" and understanding race in research observations mirror difficulties for some instructors*. For researchers, the difficulties surfaced as we met to compare notes on how the research observations were going and help each other. For instructors, the difficulties surfaced when we brought classroom data for discussion and asked faculty participants to consider and compare interpretations regarding racial equity.

Our research team included positionalities that paralleled some research participants. Kali and Kumar (Authors 3 and 4) are South Asian women, as was our faculty participant, Shruti. Secules is a United States-born man as was Thomas, a faculty participant. Early on we noticed a parallel between the ways Kali and Kumar would say they were struggling to observe race and Shruti who said consistently she "can't see race here" when classroom data was brought for discussion. In contrast, the non-United States-born researchers noticed that Thomas had a circular way of talking—politely and inclusively but philosophically and abstractly, whereas Secules was perhaps more familiar with this circular way of speaking particularly around subjects of race.

This parallel between research and practice, informed by positionality, led to the investigation at hand. We summarized all of these difficulties as, in effect, expressing colorblindness. We explored these parallel challenges to observe and understand racial equity, investigated the ways that these difficulties were limiting progress on racial equity, and surfaced any strategies to overcome them. To show the parallels, we expand on each topic with a blended narrative that accounts for methodological challenges with quotes, paraphrased insights, and examples from faculty participants.

5.1. Pragmatic Observational Challenges:

We noted pragmatic challenges with observing race, while noting that naming pragmatic difficulties could be a way of avoiding seeing race or could be worthy of strategies to overcome.

5.1.1. Race is an individual identity we can observe or guess at socially. While we knew it in theory and definitionally, we saw in our study how the pragmatic reality that race is an individual identity that is socially, interactionally, and culturally constructed coincided with a cultural taboo

against guessing at individuals' races. We learned in our pre-interviews that many professors do not know how to begin discussing racial diversity or equity because they feel or claim they do not know their students' racial identities. Some discussed how race information is not listed on their course rosters. As a research team, we identified this as something of an appeal to extremes logical fallacy, since a working understanding of a classroom's racial in/equity would not require absolute roster information on each individual identity in the room. We analyzed this faculty claim as a self-limiting pragmatic excuse and a form of abstract liberalism (appearing to be liberal while upholding inequitable status quo) and colorblind racism. Meanwhile, in our observational work, we concluded that while it is typically culturally inappropriate to guess at someone's race, it is also a reality of human social interactions. As a research team, we decided that a shorthand was fine for observational notes—we would write down "student who presents as Black" and work later to find out the accuracy of our interpretations. Yet, the research team encountered our own challenges with observing the races of individuals in the class. We had planned to and did conduct a survey to ascertain individual racial identities, but then in a class of 50+ it was typically difficult to ascertain exact names and seating positions to triangulate this information. The inclusion of name and race details in our classroom survey sometimes made professors or students more nervous about the survey. As a pragmatic step, a picture (where allowed by Ferpa regulations and participants) would sometimes help triangulate our impressions of the racialized social interaction without presuming individual identities.

5.1.2. Race has visual markers, so it is hard when listening to classroom discourse to determine the race of individuals who speak. We came to this realization by accident at Site 1 (semester 1), when two out of three of our chosen faculty participants' classroom setting were computer labs, without raked seating, with extremely limited visibility between rows of students. We had this further confirmed in larger lecture rooms at Site 2 (semester 2), where in rooms of 40-70 students we would typically sit in the back and see backs of heads. In these settings, when people called out answers, it was difficult to guess at their race from their voice alone. While perhaps problematic, it would have been easier to guess at gender (presuming binary gender and typical male / female voice pitch). The best classroom setup for observing race was a more participatory group project classroom, which also enabled video recording (so we could triangulate exactly which students were speaking and in which groups). In these lecture halls and computer labs, our observations of racialized events were typically limited to bigger events such as raised hands, being called on, and being invited up to the chalkboard. In classes without much class participation, this left a lot of the class content without a clear racial equity marker. The research team members sometimes doubted whether they were capturing racial equity effectively, when they weren't able to quickly capture races of who was speaking and for how long.

5.2. Theoretical / Definitional Challenges:

Next, we noted challenges that were more theoretical and definitional than practical as the collaborators came together to clarify the meaning of racial equity in these classrooms.

5.2.1. Operationalizing nuanced theoretical definitions for equity. We always aimed to approach equity with theoretically, empirically, and pragmatically meaningful definitions. As mentioned, we drew on theoretical operationalizations of equity that included mathematical representative dimensions (i.e., those who identify as each racial group are able to speak, answer questions, in proportion to their representative in a room) and nuanced interactional dynamics (i.e., where qualitative interpretations of dominance or inequity would supplement a mathematical representation). One researcher brought up the classroom dynamics that 1) professors would ask

a question and no one would answer and he would move on or 2) professors would ask a question and after a pause students mostly from dominant racial groups would raise their hands to answer and be called on. Regarding the silence, we concluded this may be technically equal as a classroom dynamic, but in such a way that everyone is missing out on the educational quality that comes from a more interactive dynamic. Regarding the dominant groups, we concluded this pattern did not indicate any individual intentional racism on anyone's part, but as it could still result in inequitable outcomes for class participation, was worth noting and disrupting. Further equity questions came up in more interactive classes where Thomas and Shruti had their students work in groups or pairs. We noted instances where racially dominant individuals on a team seemed to take over group work, as a working definition of racial inequity in these settings, yet it was hard to be delineate dominance from an agreed upon work delegation. In general, the research team sometimes felt uncertain about how to look for these subtle, local, and interactional markers of inequity and to be sure of our conclusions about them.

5.2.2. Clashes with colloquial definitions of equity. Our findings on racial equity would come up against more colloquial definitions of equity when bringing the findings to faculty participants. Professors brought their own colloquial definitions of equity to our discussions, such as resisting the idea that there could be any issues with racial equity because either the classroom was racially diverse or the classroom did not contain enough racial diversity. This seeming confusion or lack of a shared technical definition sometimes raised the scrutiny on the research team's observations, although sharing examples of racial inequity seemed like a good way of coming to a shared definition. In spite of our attempts to clarify, this relative level of equity expertise tended to limit our progress with certain individuals who would seem to resist the observational findings and pedagogical feedback, perhaps out of a fear of being labeled racist, a belief that their classroom was already racially diverse, and/or a lack of a shared definition of racial equity.

5.2.3. Racial groups go beyond the Black/white binary and complicate simple mathematical definitions of equity. We often noted and discussed comparisons with gender equity. Observing gender was not off limits for researchers or participants, we incorporated intersectionality into our discussions and observations whenever relevant. Gender is often simplified as a binary, so we at least have a baseline understanding that something that is balanced in gender should involve equal numbers of men and women (in representation, in talk time, in leadership, etc.). Since racial categorizations are much more complex than a binary, people do not have a working expectation or shared definition for racial equity. We might have tried to summarize racial equity findings in terms of a binary for simplicity (e.g., white people versus people of color), yet each choice for grouping students did not seem to speak to the differential racialization of Asian students, Latinx students, Black students, and students who fell outside of these categories.

5.2.4. Race as a layer of interpretive meaning on human interactions. If races are always present in all human interaction, when do we decide to notice and name race in our interpretations? Our research process intersected colloquial and empirical understandings of race, and thus this layer of racialized interaction was often the topic of discussion. Although the research team concluded that certain group interactions had centered dominant racial groups and excluded a Black woman, Shruti consistently claimed she "can't see race here… gender maybe, but not race." This consistent reaction to our findings confused us, as we had all agreed that race was the focus of our study, and the racialized centering seemed apparent and factual. We concluded that portions of Shruti's resistance likely came from: inexperience with naming racialized dynamics as one layer of interpretation (without concluding racism is the only driving dynamic), a colloquial

misunderstanding that racial inequity always requires racist intention (on the part of the dominant racial students and/or the professor), and/or a lack of familiarity with the typical patterns and outcomes of US racial inequity (as Shruti noted, she had significant familiarity with gender inequity and male dominance as these are cross cultural phenomenon). Considering the way intersectionality is always present and open to theoretical interrogation and our relative familiarity and comfort culturally with discussing gender over race, we can understand Shruti's comment as representing how for many in our society it would be harder to see a marginalization of a Black woman as about race than about gender.

5.2.5. Race is a structure, and it's hard to see the structures. Theoretically, we knew we were looking for the patterns, pedagogical features, and classroom dynamics that would recreate inequities in micro-moments and lead to broader societal inequities. We agreed as a team that an operationalization of this theoretical lens was to look at structures (which could encompass patterns of interactions, cultural norms, discursive frames) that reproduce inequity, rather than individual intentions, idiosyncracies, or experiences. Yet, it is hard to know, in situ, whether something is a pattern or a class dynamic that rises to the level of a structure. And it is hard to communicate about structures with professors who are taking a colloquial individual lens to racism. There was also the risk of structural reasoning becoming overly deterministic, concluding that all the dominant racial groups are always dominating, that all of their actions reproduce inequity, etc. For our goals there was a need to work towards structural claims alongside contextual nuances that lend the structural claims realism and credibility. Consistent with ethnographic methodology, we favored long engagement to help us establish that certain dynamics were a pattern, to account for the nuances of context, to consider and triangulate with multiple interpretations, and to help provide that understanding to faculty participants.

5.2.6. Race and racial equity are differently understood in different institutional contexts. This study was conducted across contrasting institutional contexts semester by semester, with the first site at a large public Hispanic Serving Institution and the second site at a smaller private Predominantly White Institution. We learned that faculty at the HSI tended to engage on topics of race and see it as part of their job (we had a high response rate to the initial recruitment effort); yet faculty participants and researchers both struggled to defined racial equity in classrooms where the demographics were majority Latinx. Did Latinx students constitute a racially marginalized or a racially dominant demographic group? We determined for our purposes our answer was "both," as nationally Latinx students are underrepresented and historically excluded, but in the local institutional and geographic context they are the majority and are not "minoritized." Yet, even this answer was complicated as our faculty participants all racially identified as white or Asian, and this was representative of the larger faculty makeup at the university; further, engineering as a discipline has not culturally centered Latinx individuals. While a Latinx individual might be dominant at the local grocery store, they may not be culturally dominant in an engineering class with an Asian professor. We attempted to conduct our observations while remaining agnostic and curious as to the exact dynamic of domination, yet we noticed that some of our faculty had a harder time reasoning about racial inequity in classes which were already considered racially diverse. That is, if a class is racially diverse, perhaps racial equity is a moot point. On the contrary, faculty at the Predominantly White Institution were more resistant to participation (fewer responses to our recruitment) and more likely to see race as something important but potentially irrelevant because nearly all their students were conventionally racially dominant (white or Asian, in STEM classes). One researcher pointed out that these faculty are simply not engaged in a shared dialogue on broadening participation the

way the HSI faculty were. Thus, having encountered similar barriers to reasoning in Minority Serving Institutions with more diverse classrooms and Predominantly White Institutions with less diverse classrooms, we have come to the tentative conclusion that *all institutional contexts become a barrier to reasoning about race*. Returning to the structural idea that our study is about the way everyday educational patterns create broader societal inequities, we must continually reattune ourselves to the insufficiency of claiming that pattern is not taking place at our university because of its institutional characteristics. At the very least, we can remain open to, curious about, and vigilant in our appraisal of the local racial in/equity, with the knowledge that each local pattern is contributing to something broader.

5.3. Epistemological Socialization and Positionality Challenges

We encountered a broad swath of epistemological and cultural challenges with talking about and reasoning about race. Epistemological challenges depended on the person and, often, on their positionality, whether they were already familiar with race through US cultural experiential knowledge.

5.3.1. White US-born people are culturally practiced at avoiding race. Consistent with the findings of critical race scholars, we found that our white participants were often adept at reasoning about their pedagogy inclusively, but they avoided naming specific demographic groups and racialized patterns in their reasoning. To date, our white participant faculty have been progressive and inclusive-minded white men who speak philosophically and abstractly about racial patterns. This is perhaps familiar to the Secules (a US-born progressive white man), but seemed more confusing or filibustering to the international research team members. While Secules enjoyed philosophically unpacking these faculty's perspective, it was in fact a goal of ours to push towards specificity of discussion and reasoning about racialized phenomenon. So, as a team we would collectively strategize about the ways to push for that specificity, particularly among the white and US-born participants. This specificity required overcoming some cultural tension, as for US-born people race is a third-rail topic and abstract liberalism [17] is perhaps the most polite form of engagement.

5.3.2. Engineers are embedded in positivism, not adept at dealing with social issues, and not pedagogically trained. Consistent with the idea of race as a layer of interpretive meaning, we think that many engineers are not as adept at reasoning about complex social and educational issues with multiple possible interpretations and with critical perspectives to challenge inequity. Thomas, who conducts research on epistemological aspects of uncertainty calculations, once stayed on the call after a particularly confusing disagreement with Shruti ("I can't see race here") to opine that it might not be racism underlying the disagreement, but positivism. If Shruti was more familiar with linear topics and conclusions drawn from engineering data, with one correct answer, she may be borrowing that logic here or may be unfamiliar with more complex epistemological reasoning such as social constructivism and critical frameworks (which the research team is incorporating and which are most appropriate to the racialized social interactions we are studying). Thus, when we offer an observation of a racialized interaction we are only beginning to build a case of a structural pattern, opening up to multiple perspectives and interpretations of all constituents, and aiming not to assign blame but to collectively strategize on root causes and shifts. When Shruti hears this, she may more linearly think (in spite of our counterarguments) that racial inequities are caused by racist action driven by racist intent, and that the claims of racialized inequities mean that someone (a student, but ultimately, the professor) is to blame. Thus, we are tentatively concluding that the gap between our collective

engineering education researcher socialization in epistemological reasoning, critical social analysis, and pedagogical reasoning and the engineering professor's typically opposite socialization (in positivistic engineering analysis) may be a root cause limiting our arguments about racial equity from landing and limiting engineering professors from continuing their own development and engagement with racial equity in their own classrooms.

5.3.3. Many international faculty and international graduate students are newly learning about race as arbitrarily defined and socially constructed in the US. While we in the critical scholarly community in the US tend to repeat the idea that race is socially constructed yet materially significant, we sometimes take for granted just how arbitrary and specific our US formulation of race is for the rest of the world. With increasing globalization, nearly all societies experience some form of colorism and race-based colonization; yet, many people grew up far removed from the specific racial categories, stereotypes, narratives, patterns, outcomes, and discourses of the US. The international research team members reminded us all of this important aspect; while they are all racialized as scholars of color in the US, they are still learning all aspects of US culture, and race is particularly culturally formulated. It helped to have regular group discussions and compared fieldnotes to help cohere our approach to interrogating race, with the positionality of white US-born researchers complementing the positionality of non-US-born scholars of color. Kumar (Author 4) mentioned feeling alignment with the way Shruti resisted racial understanding, as both are from South Asia and gender alongside intersections of religion, caste, colorism, and classism were the primary drivers of inequity in their home regions. Kumar describes seeing in Shruti a woman who has bought into shared meritocratic narratives of upper caste South Asian and white masculine US engineering culture; a woman who has overcome the odds of a competitive masculine-dominated field to become a full professor in engineering. As a female "model minority" in the US, Shruti is incentivized not to see race and inequity, it is hard for her to digest a new layer of complexity in global and local inequities, and hard for her to admit that the way she organized her life may have been based on flawed logic. Kumar mentioned needing an intervention from her prior way of thinking to help understand US-based inequities alongside South Asian, and that her PhD coursework had been that intervention. Shruti mentioned "adding one more variable to my model" (variable = race) and Kumar resonated with that statement regarding her PhD work as well as more tangible practice observing racial equity in this study. We find that regarding international engineering professors and engineering education scholars: (1) it is understandable that they are initially confused by or resistant to US-based racialization and racial inequity, (2) there is an incumbent responsibility over time to understand more about US-based racialization, as it factors into educational processes, and (3) supporting and intervening to create this new understanding is an important process in the progress of racial understanding for this group.

5.4. Communicative and Interactional Challenges

5.4.1. The importance of individual reflection and processing. While the above positionalities are guiding the engagement or lack thereof with racial equity reasoning, it is only through personal reflection that we can come to clarity about our positionality. We tried to prompt reflection through Community of Practice-style faculty engagement meetings, where a culture of sharing, insight, reflection, intention, and feedback was fostered week by week. We think we were moderately successful in prompting reflection, although sometimes disagreement or debate would seem to preempt that reflection. Further, one researcher noted that it seemed that the presence of perceived experts (Secules and secondarily Hakiyo) on pedagogy and equity may

have preempted further reflection and individual processing among the faculty participants. It was sometimes hard to foster a dynamic where each faculty participant was able to offer advice to each other and freely (not defensively) reason and reflect on the findings of the research team. Sometimes the dynamic appeared more as waiting for the expert to weigh in. In this way, perhaps expertise on equity becomes a barrier to each individual reasoning and reflecting on it.

5.4.2. Communicative burden to prove the case of inequity. Finally, we found that the task of bringing equity findings from the classroom to faculty sometimes seemed like a communicative burden to prove that case. Not only did faculty and researchers lack a shared vocabulary or framework for these phenomenon, the positionality of the postdoctoral researcher (Halkiyo) as a more junior scholar than the faculty and a Black man felt like an additional burden on each analysis claim he made. Thus, over time we would intentionally trade the types of claims made by the Black man postdoctoral scholar and the white man Principal Investigator, to help the research team feel comfortable and help our ideas be shared. Secules often leaned into his relative perceived expertise on pedagogy and equity to help provide analysis, interpretation, and recommendation; Halkiyo often presented data and patterns (but conferred privately with Secules to agree on analysis, interpretations, and recommendations). While this seemed to alleviate some of the stress, there was still a feeling that some dynamics of the conversation and the burden of proof were themselves racialized (i.e., should we trust the Black man who was n the classroom or do we need to wait for the white man "expert" to weigh in) and difficult to navigate.

6. Discussion

Having surfaced the aforementioned challenges, we now consider what they mean: Which of these challenges are real? Which are ways of avoiding dealing with race?

The pragmatic difficulties with observing race are compellingly real, since our team has genuinely struggled with certain of these practical aspects. While some faculty may be protesting too much in their inability to know the races of their students (i.e., a way of avoiding race), we do recognize their many other responsibilities simultaneous responsibilities and cognitive load while teaching, lack of vocabulary and framework, etc. Pragmatic support could help faculty at least know the races of their students, reminding faculty it is legal in the US (different from Europe) and a welcome first step towards racial inclusivity. Additional support for faculty could be developed on how to conceptualize racial equity in light of a specific institutional context, classroom makeup, more-than-binary racial identifications, and other social complexities.

We find the challenges that parallel our own research team and the faculty participants are particularly compelling as real. The positionality of international scholars and the need for an intervention towards learning about US-based racial oppression is particularly clear to us and may guide future faculty development efforts. The positionality of progressive, white US-born scholars to obfuscate and philosophize about inclusivity could also be approached in a targeted faculty development. We think the influence of positivism is also a particularly compelling finding and likely influence; we had never conceived of epistemology as a key component of the learning progression for engineering faculty on racial equity, but it seems finding accessible ways to discuss causality, social dynamics, and interpretive complexity would also be helpful.

Finally, the interactional challenges with fostering reflection, the burden of communicative proof, and the limitations that can emerge regarding equity as a domain of expertise are all genuine research challenges that also parallel programmatic and practical challenges with influencing faculty. The need for researchers to establish expertise may come at the expense of

participants looking to themselves as sources of expertise. The need to prove and demonstrate situations of inequity may invoke defensiveness and preclude reflection in some individuals. We see these as worthy areas of experimentation for both empirical and faculty development efforts.

7. Recommendations and Conclusion:

As we aimed to observe race and surfaced a number of challenges, we conclude with the following recommended points to emphasize in research methods and researcher training:

1. Race is individual but enacted in social interaction. Consider allowing a shorthand for observation or a simple survey to know races, names, and seating positions to help supplement a classroom observation.
2. Race is hard to "hear." Consider intersections with classroom seating position which may be easier to map out and then listen for while taking fieldnotes. Even tracking that the front rows or back rows are speaking could help map back to racialized dynamics.
3. When studying race, consider careful but open ended and iterative operationalization. Make the goal of the research method to figure out what racial equity will mean. This will be particularly important when considering the institutional context. Expect to hear "oh racial equity, but we don't have many X students here."
4. Remember intersectionality when considering which observations are "about race." It may be tempting to revert from a discussion of race to gender, personality, ability, grade level, etc.
5. Remember interpretivism / constructivism when conducting observations and explaining them to others. When claiming a racialized interaction, understand that others may presume this means race is the *only* explanation and race = racism.
6. Remember international students will need more support in understanding what race means and how you could look for racial equity.

For faculty development efforts, we see the following as future areas of innovation:

1. Understand and expand faculty reasoning about classroom events to include multiple interpretations and even epistemologies.
2. Help faculty reason about whether something is about race or gender. What is important instructionally is thinking about what to notice and how to disrupt any problems. If we are avoiding thinking about race at all, then that's a problem. Ultimately if we notice a problem and there are multiple interpretations it's not as important to have the 1 correct interpretation as it is to decide how to act. (See Bystander Intervention theater [19], [20], [21], [22] for more ideas here.)
3. Recognize the need for education for international faculty about race. Remember race is a social construction and arbitrary and there can be valid first impulse reasons for thinking if I don't talk or pay attention to race that is better than examining it. Some education on how a system of oppression works and some analogy to a system the international faculty are more familiar with (e.g., gender or caste) could help.
4. Recognize the possibility that US faculty could directly avoid discussions of race or could sound and talk inclusively without internalizing much or taking particular action. This is a challenge in a faculty development workshop and in our everyday departments. For those familiar with race, we may have good strategies for appearing like a good person with or without really taking important steps. Parse through to underlying meaning, clarify with direct questions, and interrogate the way the classroom is working.

We have known for years that the everyday process of undergraduate engineering education is reducing, not expanding, racial diversity. We must turn our attention to the engineering classroom, to the mechanisms that recreate inequity, and to the socially constructed system of race. The first step towards understanding race is to start to see it and to talk about this third-rail taboo US social construction. We need to stop turning away from it, and hopefully this paper has helped offer some ideas on how to start.

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Appendix:

Collaborative Inquiry reflection questions:

1. What makes observing or studying racial equity in this project hard? (Secules shared an initial list, then asked others to expand on it.)
2. What are examples you remember of your own difficulties with observing or studying racial equity? (E.g., what was hard or confusing, any specific times or experiences)
3. What are examples you remember of your own learning to observe or study racial equity? (E.g., what helped you learn, what explanations or discussions worked)
4. What are examples you remember when you felt you were successful at studying racial equity? (E.g., a classroom fieldnote where things clicked)