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Minoritized Student Audio Narratives to Influence Faculty's Empathic Understanding: Learning from Sophie and Enola

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Abstract

Background: Undergraduate engineering education is a critical moment for student experiences and broadening participation, yet many minoritized students experience it as unwelcoming, unsupportive, or exclusionary. Engineering faculty have a central role and responsibility to play in the creation of inclusive classrooms, yet there is a gap in empathic communication for faculty to better understand their students. Education researchers can play a critical role in addressing this communication and empathy gap, but disseminating research findings in long form papers is not accessible for most engineering faculty.

Purpose: This paper highlights the audio narratives created through the Audio for Inclusion project, an NSF-funded project intended to help faculty become more aware of students' hidden and marginalized identities and impacts of those identities on their engineering education experiences.

Method: We conducted qualitative semi-structured interviews with 22 nationally recruited undergraduate engineering students and turned these into 10 distinct audio narratives. Our narrative analysis focused on constructing a cohesive, concise, and anonymized narrative that would present key content from student interviews in a format that would preserve some of the immediacy and emotionality of student interviews while improving accessibility and coherence for faculty.

Findings: In this paper, we present the scripts and link to audio narratives for two student participants: 1) Sophie, a mixed race (Asian and white) white-passing woman, and 2) Enola, an Indigenous woman. In addition to presenting the written and audio narrative, we comment on the specific lessons we see as valuable for engineering faculty that emerge from each of the audio narratives.

Conclusion: This project highlights lessons learned for faculty in the areas of student support, accommodations, inclusive practice, and student perceptions of classroom practice. We present this project as methodological innovation for qualitative research, and as future work, we intend to keep investigating impact on faculty via faculty focus groups, surveys, and workshops. We also highlight this research as a metaphor for the empathic understanding that each faculty member can gain by listening to students, individually and collectively, and distilling lessons for their practice.

The Need for Innovation in Broadening Participation Research

"Insanity is doing the same thing over and over and expecting different results." [1]
Albert Einstein

With this paper, we join with scholars who have identified stagnation in collective progress on broadening participation in engineering [1]. While knowledge on broadening participation in engineering has been increasing, with the establishment of grant programs and specialized journals, that knowledge has generally not translated to impact [2] [3]. This recognition should prompt those in the engineering education research community who wish to make increasing and actionable impacts on diversity, equity, and inclusion, to reevaluate typical modes of operation, and to seek new models for our research design, dissemination, and partnership with other stakeholders. If what we are doing as researchers is not producing the change we wish to see in the world, we should not keep doing the same thing and expecting different results. We have the tools, the creativity, and the flexibility to create new research modalities

[1] We wanted to include this quote because it is a provocative and succinct summary of the common idea that one should stop repeating patterns that don't lead to the outcomes we want. We recognize that the term "insanity" can be triggering for some individuals and is often considered non-inclusive language, so we have chosen not to use this term outside of a direct quote of this individual, who came from a different historical period.

that can be leveraged to create more impact and assess it. In short, we need innovation in broadening participation research.

A specific place we find stagnation is in the engineering classroom. The research literature is clear about marginalization, inequity, and lack of access in the everyday engineering classroom. Faculty are the key influencers of engineering classroom culture [4], [5]. While faculty are not in control of the many variables shaping inclusion in their classrooms (e.g., demographics and backgrounds of students, curricular constraints, physical classroom location, etc.), they have the most power and responsibility to create inclusive learning environments for all students. Although faculty do not intend to marginalize students, their empathy toward and understanding of students may be limited by their own positionalities, experiences, communication styles, or pragmatic issues such as class size. Without required credentialing of engineering instructors around teaching, faculty development is a key mechanism for this training; however, we find that faculty development workshops tend to focus on pedagogical aspects such as active learning rather than empathic understanding of minoritized students [6].

As education researchers seeking innovation towards greater impact, we saw an opportunity to create broadening participation research products that are accessible to faculty and useful for faculty developers. When we conduct qualitative broadening participation research (i.e., interviews with student participants), we tend to gain a rich empathic understanding of our student participants that can translate to our understanding of students more generally, including in our teaching. We define empathic understanding as a coupled combination of both empathy and understanding, and an empathy that is curious and interested in learning about and understanding more about people's experience. We also see empathic understanding as rooted in perspective-building or perspective-taking and being able to understand the experience of another. We saw a gap between this rich empathic understanding available in qualitative research and the typical understanding an engineering professor holds of their students. Meanwhile, faculty tend not to read long broadening participation papers, so the more nuanced empathic understandings of students that could be gained from that literature are not being translated into an accessible format for faculty. Figure 1 summarizes the idea of two parallel communication gaps—a gap of empathic understanding between faculty and student, and a gap of dissemination between researcher and faculty understandings. Acting as researchers, we hope to create resources that help bridge the gap between student and faculty understandings.

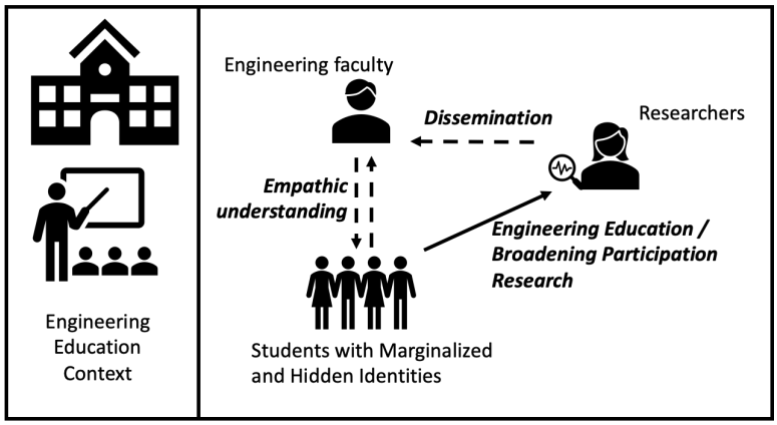

Figure 1: Identifying communication pathways and gaps existing in broadening participation research focused on engineering education (dashed arrows represent areas of communication gap)

Out of these insights we formed Audio for Inclusion, an NSF-funded project focused on translating student insights into accessible audio narratives as a resource for engineering faculty and faculty developers. We join other researchers engaged in methodological activism [7] who are using their research to promote change. We purposefully designed our research to empower individuals who are

minoritized and present our findings in unique ways that are respectful of their lived experiences. This paper presents text and audio narratives that highlight our methodological approach and the lessons learned we see for engineering faculty.

Methods

In this section, we overview the novel audio-based project methodology.

Methodological and Theoretical Traditions

We integrate the following theoretical frameworks to help inform our work. First, we conceptualize our project by considering the culture, identity, and agency of students in the engineering classroom through the framework of cultural worlds or figured worlds [8]. The engineering classroom culture structures the world in ways that intersect engineering educational cultural norms and broader societal discourses. Engineering educational cultural norms could include the relatively de-personalized educational context of most engineering classrooms noted in the prior section. It will also carry discourses of demographic identities associated with systems of oppression. These figured worlds integrate with engineering classroom discourse, such that certain identities are expected/normative or unexpected/non-normative [9]. Within a figured world, these cultural norms tend to structure the identities available for participation. Nevertheless, agency allows participants within the figured world to improvise beyond those available identities and structured norms. When conceiving of the engineering classroom, we see these norms as shaping student and faculty perceptions such that certain student identities and experiences are more apparent to engineering professors while others are more hidden. In order to create more inclusion for students, we think intentionally about partnering with these students to reveal some of their hidden stories of marginalized identities and experiences in engineering.

Second, when thinking about how to support the agency of engineering students within a marginalizing culture, we draw on frameworks of narrative and critical theorizing to conceive of one form of student agency: the power to tell one's own story [10], [11]. Narrative methods and counterstory have increasingly highlighted student voice as a form of agency [12]. The exact meaning of narrative, student/participant voice, and counter story has been somewhat ambiguous [13] in the engineering education literature and beyond, with many papers claiming these methodological and theoretical groundings appearing to conduct and present fairly ordinary qualitative research—reporting out qualitative themes and quotes. There are perhaps several barriers or norms for our research that tend to keep the utilization of student voice limited: the prioritization of journal and conference publications in academia, the ease with which written work can be disseminated, IRB rules and the protection of student participants, and the skill required to present work in multimedia [3]. Nevertheless, the extent to which we hear from the student voice or truly counter a story is limited. In this paper, we pose one possible instantiation of a narrative and participant voice methodology that brings forth student voices while resolving some of these methodological and practical challenges.

Data Collection

We described the process we took to pilot the data collection in prior papers [2], [14]; here we review it again briefly and provide updates to the current process. We conducted a national participant recruitment effort through university offices that support marginalized students (e.g., campus diversity and international student centers, disability resource centers, LGBTQ organizations, etc.) and social media accounts for student organizations and chapters (e.g., National Society of Black Engineers, Society of Hispanic Professional Engineers, Out in STEM, Society of Women Engineers). With help from stakeholders identified in each of these offices, we distributed a recruitment survey that asked students their contact information and open-ended response questions on their salient, marginalized, and/or hidden identities within the engineering classroom and anything they thought their professors might not understand about those identities. We strategically sampled across participants for students with

contrasting salient identities and for students with the clearest sense of a story and critique to share back with engineering faculty.

Our semi-structured Zoom interviews contained three major parts with some sub-sections and strategies for follow up questions. First, we had student participants talk about their salient identities, across their lifetime and specifically within their engineering classrooms. To facilitate discussion, we incorporated a few visual aids (shared via Zoom screen-sharing). These aids included: 1) an identity helix, adapted from the Model of Multiple dimensions of identity by Jones and McEwen [15] to help students think about identity categories (race, gender, ethnicity, disability, sexual orientation, socioeconomic status, first generation status, etc.) in case identity was a new concept for them and to prompt a more intersectional account of their identities; and 2) an iceberg graphic of typically hidden and apparent identities (while acknowledging which items fall into the category of hidden or apparent is dependent on the individual and the situation) to help students unpack their experiences. Second, we asked student participants to discuss their experience in engineering education with a particular focus on making connections with their previously-identified salient identities. The prompts in this section included questions such as, "what's one thing you would change about engineering education?" (to focus on normative engineering educational culture with a critical lens) as well as follow-up prompts to garner specific examples if needed. Third, we asked student participants to provide feedback to engineering faculty or other stakeholders. Students were asked directly what they would tell engineering faculty about their experiences if they had a chance. Sometimes, this was a relative dead-end for the interview, since the engineering students did not think engineering faculty would care and/or could not conceive of talking to them about their identity-related experiences. In these cases, we had a follow up chat about why they would choose not to discuss their experiences with engineering faculty in the first place, as this topic of discussion seemed to provide useful critical feedback for professors anyway. We also asked if the student participants had any advice for other students like them with these experiences in the future, as this provided a different way to conclude the interview and narrative arc.

Narrative analysis and construction

Our narrative analysis process began by checking transcripts for accuracy and content logging the data to consider where relevant themes and topics came up. Initial narratives were constructed following the approaches outlined in Kellam et al. [16] . We decided that a dialogic narrative structure that mirrored the same primary interview prompts and sections would be the most effective and would help explain narrative transitions that happened as a result of the interview. Thus, the three primary sections of the constructed narratives answered: 1) How do you identify personally and in engineering contexts?, 2) What are some identity-based experiences in engineering education?, 3) What would you tell an engineering professor about these issues if you had a chance? (and/or) What advice would you give a student like you experiencing these issues in the future?

We assembled long form direct text excerpts relevant to each of the three main sections, including timestamps to preserve and easily return to corresponding interview sections. We iteratively revised the narratives to seek anonymity of personal details, narrative coherence, and succinctness (i.e., aiming for a 5-10 minute narrative when read aloud). The iterations and final versions of the narratives were saved on a shared drive. The narrative iteration process tended to require group discussion across the research team to make choices that accurately interpreted and preserved the students' meaning within the identified constraints. When choices about narrative construction needed to be made, for example, whether to split a participant's interview into two sub-stories or to combine them into a longer, more complex story, we discussed the options as a research group. We contacted the participants and shared the finalized narratives with them prior to beginning the audio recording process so they could express any comments, thoughts, or concerns they may have had about the resulting narrative. To date, all constructed narratives have been member-checked with participants with no changes.

Re-recording process and Focus groups

We re-recorded the written versions of the narratives with student actors who were paid with Amazon gift cards funded by the grant. Student actors selected for each recording were those who approximately matched the student interviewee in most categories of gender, age, race, and any discernible accent. This matching was conducted as a result of prior feedback from faculty. We conducted a short audition with student actors to cast them for our available roles. We aimed to work with the student actors to match the emotional delivery of the student interviewee, and therefore, it was useful to have the timestamps from prior iterations of the narrative construction process at the ready. The equipment for the process is provided in more detail in our prior publication [2].

This paper comes at a stage where most of the student narratives are finalized and ready to be shared. In ongoing work, we are conducting faculty focus groups to showcase these audio narratives and analyze faculty reactions. In preparation for that ongoing phase, we focus our analytical commentary in this paper on identifying the lessons for faculty in these narratives and anticipating what is most important for them to hear, know, and recognize about the student experience. We consider ways the audio narrative may expand faculty empathic understandings.

Positionality

The first and third author are engineering faculty, Principal Investigators of the Audio for Inclusion research project, and primarily qualitative researchers. The second and fourth authors are graduate assistants on the project and current engineering education graduate students. Our demographic identities on our author team include both men and women and white US and a person of color international ethnicity / national background. These professional and personal positionalities often informed how we spoke to student participants and listened back to their interview data to decide what was the most relevant and concise story to share. Our professional identities as engineering faculty or graduate students (and more recently engineering students) were often influential in what stood out, where the students on our team would often empathize and resonate with content shared by student participants. The faculty on our team would be thinking more often from the perspective of what is useful, important, interesting, or surprising from a faculty member's viewpoint. Both positionalities were instrumental in conceptualizing our audio narrative methodology to address the student/faculty communication gap.

Findings

In this section we present two contrasting narratives in their entirety. First, we present the narrative of Sophie, a mixed-race (Asian and white) white-passing woman in her third year of biomedical engineering at a PWI. Then we share the narrative of Enola, an Indigenous woman in her third year studying Chemical Engineering at a PWI. The narratives are presented in a dialogic structure, incorporating interview questions into the narrative structure to give more context to the way students told their stories in the interviews. That is, since the narrative content was produced in dialogue, a dialogue was preserved in the final presentation. This choice helped contextualize certain topical shifts in the way students spoke without inserting more words into the student narrative (i.e., words the student did not say) to explain it.

We include a link to an audio (YouTube) version of the narrative and encourage readers to click the audio link instead of or in parallel to reading in text—our experiment with novel audio methods also involves experimenting with how to disseminate the project findings through traditional and non-traditional media. We include a cartoon avatar of the student we developed for the YouTube version of the narrative, since we found in pilot focus groups that it was helpful for people to have something to look at, but that focusing on a physical human actor could invite more scrutiny of the visuals than we intended. Finally, we provide a commentary after each participant to highlight lessons for faculty we take from their narrative.

Sophie's Narrative

To listen to an audio version of Sophie's narrative visit:
https://youtu.be/ZuzMpJ30zg4?si=7KKzVuJKE_MQH-0K

Q1: How do you identify personally and in engineering contexts?

The aspects of my identity that I associate with the most are being mixed race, Asian and white, and female. In my opinion or my experience, I'm white-passing enough that none of my racial identity seems to affect me in engineering. Being a woman, though, it comes up so many times. In terms of being a woman in engineering, you have to be smarter because people just default think that I'm stupid. Like there are a lot of explanations that are unneeded or weren't asked for, or people just kind of underestimate what you know, or what you can understand. So then it feels like you have to really ace your classes, or else you don't get to be here.

Q2: What are some identity-related challenges you have experienced in engineering?

Usually, the biomedical engineering classes are super collaborative, and those settings are generally pretty fun. But those are also the ones where I mostly would see people not really taking me seriously. Like when you work in teams with people, or you're working on homework, you notice that they treat you differently than they treat the other men. I have had a weird amount of experiences where men just give offhanded comments, like they're explaining things that I never asked for.

For example, I was in a BME class, and I knew I was good at Systems Physiology. So when I would say something and do it, my peers would immediately doubt it, then they would ask a TA, and the TA would confirm what I said. That really frustrated me because like I was very confident, and they had not known me long enough to be doubting me.

Also, one time I worked in a group with like two electrical engineers, and I am a biomedical engineer, and we were working on our presentation. I asked them to explain a part that they worked on because I had to present it, and this man looked me dead in the face and goes, 'you wouldn't understand it anyway.' And then laughs. And I was like, uh, what? Like you're not going to try? I mean, these weird experiences have been happening for so long that I kind of expect them, right? There could be a million reasons why they're saying that to me, could be because I am BME, or it could be because I'm a woman. It could be because maybe I say things that are dumb in team settings, and they think that it's something that I wouldn't end up understanding. When it's women, I assume, I might just give off some spacier sort of vibe. But when it's men, I'm usually like, 'okay, this is probably a little something else mixed in there.'

Q3: Do you go to your professors for support on these issues?

I haven't actually discussed these weird experiences with professors. I am trying to think why.Let's say, a situation in which you're working in a team of four, and then the professor's like, 'hey, I noticed that you're treating this one person a little differently.' Even if the professor doesn't say, who told them, I think everyone knows who talked to the professor, and then you kind of have, like, a bit of a reputation as like, 'oh, you can't have fun around her, can't talk openly around her'. Also, it's not like, there's, enough proof, or anything solid that says, I could complain. And it's essentially just like, I don't want the professors to ask me any follow-up questions or anything or confront anybody because that's definitely getting led back to me. I don't really have a strong case to go to anyone, and I don't really know what they would do about it. In my opinion, mansplaining issues, are small enough, that there's nothing that can really be done to address them-- It's a society thing, not like a school thing. It's easier just to move on and not be in the group next time. So, in short, it's big enough that I find it frustrating or annoying, but it's small enough that I would rather not have to take it up any ladders.

Analytical Commentary on Insights for Faculty

Sophie begins her narrative by highlighting both race and gender as most salient, but articulates gender as more salient to her experience in engineering. Much of Sophie's experience could be understood as highlighting gendered microaggressions or other gendered cultural norms, such as mansplaining or stereotyping women as incapable. These might be seen as small, isolated incidents (i.e., the definition of microaggression) but they are memorable, build up over time to have a collective impact, and affect her participation on her team and in the course. She has her own names for these phenomena, for example, "explaining things I never asked for" is a succinct description of mansplaining. After a microaggression based on belittling her understanding in a group project (e.g., "you wouldn't understand it anyway"), we see Sophie weighs the connotations of the comment in context as directly having something to do with gender or not. The comment functions to remind Sophie of the gendered stereotype and the possibility of gendered discrimination in engineering. As the literature documents, the ways that stereotype threat and discrimination can take mental bandwidth (e.g., Peggy Macintosh's invisible knapsack definition for privilege included not having to wonder whether a setback had occurred as a result of racial or gender discrimination [17]), we can see Sophie's wondering out loud as a form of the cognitive load placed on minoritized students in engineering culture.

So what should faculty know about mansplaining and gendered microaggressions? For a start, it is helpful to know that these things do commonly exist, but they may often happen out of sight of the classroom and instructor. With the knowledge of a landscape for possible gendered microaggressions, faculty could develop curiosity towards finding out how often these issues occur in their own classroom and develop more proactive forms to establish and support teams (e.g., considerations of gender in team pairing, use of team contracts, articulating teaming expectations). They can also proactively express disapproval of and provide examples of gendered (or other) microaggressions, and they can proactively offer support and a listening ear to anyone experiencing them.

Perhaps the most important aspect of Sophie's narrative is the insight it provides into the phenomenon that some gendered microaggressions will happen but remain hidden to faculty. Sophie highlights reasons why for her and other students experiencing similar microaggressions, they may choose to stay silent: definitively gendered and problematic, they may fear retaliation from or worsening relations with fellow teammates. She also notes that gendered microaggressions are "a society thing, not like a school thing." If we consider how engineering professors might typically relate to gendered microaggressions – to assume they are not happening (out of sight out of mind), to worry whether they themselves are committing any, to push blame to students, etc. – we can draw on Sophie's comment about this societal problem happening in a classroom space to form a new perspective for faculty. Faculty do not need to feel defensive or directly to blame for a student-to-student gendered microaggression; as Sophie notes, gendered microaggressions are both predictable and societal. But, as they do cause cumulative harm, engineering faculty can take *responsibility*, rather than blame, for the gendered inequities perpetuated in their classroom.

Enola's Narrative

To listen to an audio version of Enola's narrative visit: https://youtu.be/avRvnPuAFNU?si=-laP1PSfziktO0zY

Q1: How do you identify personally and in engineering contexts?

I identify as an Indigenous woman, but I also have Hispanic ancestry; my grandfather is from Mexico. Being Indigenous has always been a part of my life, but it wasn't until I got to college that I realized that, "oh, it is actually really important." Back home, everyone I knew was from a tribe, but now that I'm at college, everyone is confused, and they don't really know a lot about Indigenous people. So people are always asking me, where are you from, like the stuff about me. In some spaces, I feel like I'm acting as a spokesperson for all Indigenous people. So that kind of prompts me to think about, "OK, well, who exactly am I? and how is it different, and how does that affect the way I think of my career goals?" and also to learn about other tribes and try to distill my identity and understand different parts of it to help explain that to somebody else.

Q2: What are some identity-related challenges you have experienced in engineering?

So when I chose engineering, I wanted to focus on the environment or energy. I grew up with a big focus on the community, giving back to the community as well as making sure I honor and respect nature, the earth and water, and stuff like that. That's very important to me.

Usually, all of my classes are very scientific, and in big lecture halls and my STEM classes, there is not a lot of room for me to express something that connects with my native identity. So usually, I don't bring it up. Whereas in my French conversation class, I might talk about indigenous tribes or something when I'm presenting in French. More recently, I was sitting in a class on the environment, so I did have the ability 'cause we had a lot of discussions in my class, and that's when it was very easy to bring my identity up and be like, "yes, you know, some of the techniques they use for environmental sustainability and engineering is similar to like what tribes use." So, I think it's not until I actually have a conversation with the professor or peers that they realize that I'm a Native American or I'm indigenous. But it's not really an issue for me; I don't feel I'm being left out at any point.

The one time being indigenous was kind of an issue when I was a resident assistant last year, and we had a de-stress event where the students could smash watermelons. And so I had an issue with that. I talked to my supervisor about it and explained that I thought it was ironic because that very day, we had a discussion on food insecurity. And yet we have these events where we smash, and we destroy food. So is there not a more productive way to, you know, just de-stress? And I also explained that to me, in particular, watermelon is important because, in my culture, I'm supposed to fast from it for the majority of the year. And so, for me, whenever I get to eat watermelon, I'm really grateful to have the opportunity to eat it. So, I was like, "I guess, in my opinion, I don't think it's a great idea, and I think that's something you should consider in the future."

Also, during COVID, I had a very rough time; my mental health was very poor, and I think a lot of people from my background, being indigenous and Hispanic, have a lot of not only trauma they might have from their present family circumstances, but also intergenerational trauma that comes from assimilation or genocide, and it kind of like passes on through each generation. For me, COVID was very stressful because a lot of my elders in my tribe were passing away. And it gave me a lot more anxiety because not only are they passing away but also all of the language, the culture, and all the stories they have, are disappearing with them, which is a problem because a lot of indigenous tribes don't have a written language. Usually, Professors talk about like, "if you have mental health issues, go to psychological services, like tell us about it." But then it's like, yeah, you can tell the Professor that you're not feeling good and you're having a really hard time, but that doesn't really mean anything to them. It's like, "well, you know that's too bad– the homework is still due at this time." So, there's not really a lot of action or accommodation around it. I think, in the way it's written in the syllabi, they kind of assume that "Yeah,

you should be OK, now that you went to the counseling center once. You should be good." Which is like the exact opposite: it takes a *lot* of time.

Q3: What would you say to a professor about these issues if you had a chance?

I think it would be important if professors are required to learn a bit more about their students' backgrounds. To give some examples, so I understand that Muslims, during Ramadan, are supposed to fast, and that can really affect their ability to go to school for that whole month. And so I think if Professors are talking to a student, and maybe they might not understand what students are going through, that they're fasting, why they're not getting the assignment done on time. Maybe the professor has snacks in their classroom and is giving everyone snacks, and that's not very inclusive for the person who's fasting right now; so, similar to that watermelon smashing event, I think just those things where professors can be mindful about peoples' cultures and being like, "OK, how can I accommodate them? Is there a way that I can make them feel more welcome in my classroom?"

One other thing I think would be beneficial is if there were some sort of land acknowledgment or requirement to understand the background of the land you're on. Or a way that different courses could include the deeper context of engineering like how it applies to other people and incorporate learning about other cultures and understanding how that might affect your job as an engineer. One thing I really enjoyed with one engineering class was that we had this cross-cultural learning assignment as part of it, where we would learn something about a different culture than yours. I think if more classes had that kind of assignment, maybe every semester, every year, that would be very beneficial because it requires you to consistently and constantly learn about other cultures and make sure that whatever you're doing, you're considering multiple aspects.

Recently I've been thinking about my tribe and the community I'm from and the issues they're facing, and just wondering how exactly the courses I'm taking right now are gonna benefit them. I'm just like, 'how is thermodynamics going to save my people from all these problems they are facing?' That's one reason why I want to do research 'cause I was like, maybe I can, research alternate energy or more sustainable energy and learn more about it and present that to my people. Once I was a part of this organization that does community service projects on reservations to help try and address different local problems. It was nice for me to be part of that team because it helped me figure out what it is that I can do for not only my own tribe but for other tribes using my engineering experience and knowledge.

Analytical Commentary on Insights for Faculty

While Sophie recounted an experience often hidden from professors, Enola focuses her narrative on a hidden identity. She is Indigenous, but many professors and peers do not realize that until and unless she discloses it [18]. The relative and selective invisibility of Indigenous students may interrelate with a dominant, non-Indigenous narrative that positions Indigenous peoples as in the past, on reservations, or otherwise readily identifiable by specific dress and cultural practice. This relative invisibility doesn't seem to bother Enola particularly, but it may be worthwhile for professors to be aware/gain awareness of how often they could have Indigenous students in their classrooms.

Why does knowledge of or an awareness of Indigenous students matter for engineering faculty? Enola brings up what is probably a surprising set of examples around food, the specific meanings Indigenous people and her tribe attach to food, and how activities that destroy food (e.g., watermelon smashing) or distribute food outside of the seasonal harvest (e.g., eating strawberries in the winter) could cause unforeseen discomfort and be insensitive towards Indigenous students. Enola also highlights parallels with Muslim students who have to fast during Ramadan, that they may have hidden reasons that are non-deficit and/or asset-based for a lack of course engagement during periods of fasting. Through this comparison Enola helps demonstrate how inclusion and understanding does not always diverge into an impossible list of specific identities and needs, but sometimes a simple understanding or change (e.g., regarding snacks or activities) could be inclusive for multiple groups. We presume that Enola's example

is both important, and not the only singular example to take away regarding supporting Indigenous students. Rather, we suggest a curiosity towards student identities and ways to support them that could involve formally requesting students declare any dietary or activity restrictions in order to accommodate them.

Regarding mental health, Enola highlights that although it is well-intentioned, simply stating support in a syllabus is not perceived as substantial or outward support for students. We think this sentiment could be usefully surprising for professors, as we might think the syllabus language is good/enough, if we even remember to put it in the syllabus. She notes that some characterizations of counseling and mental health support makes it sound like they can be solved with a single visit to the counseling center, but this is often not the case. Professors could take away from this narrative that students may really appreciate more regular and affirmative expressions of support for students' mental health, and a characterization that is in line with the gravity and hard work associated with addressing such issues.

Finally, Enola showcases her thinking about the ways that engineering curriculum connects to her background, interests, and identity. While she experiences some disconnect with imagining the engineering classroom as being able to connect to her indigenous identity, she clearly articulates ways that environmental engineering, as an engineering sub-discipline, is both consistent with and limited compared to Indigenous practices. There may be ways to more formally draw on Enola's insights so that both the classroom curriculum and Enola's experiences are enhanced. Enola mentions other types of assignments that have helped connect engineering concepts to different aspects of themselves and others; for example, she found a cross-cultural assignment particularly helpful to think about cultures other than her own. She is also exploring more connections between her Indigenous identity and engineering by connecting to more projects in the local Indigenous communities, and she is actively wondering about how she can leverage her learning to help her community and her people. If we think of a student on a developmental journey towards a fuller understanding of self as an engineer within society, we can think about scaffolding understanding in ways that integrate all aspects of self within classroom contexts. We note here that Enola's own viewpoint on engineering education is less integrative of identity at the moment, so even if her professors asked her how they could change the curriculum to be more culturally responsive to her, she may not have a clear answer. Once again, we suggest thinking about this not as a blame for specific professors involved, but as a responsibility professors have to try to understand, scaffold, and structure class to support her development as an Indigenous student within engineering and all that entails.

Implications for Broadening Participation Research

As we reflect on the novel methodology incorporated in this study, we suggest the following implications for broadening participation research.

First, we offer our specific contribution as a possible augmentation to any qualitative broadening participation research out there. We think this paper has demonstrated the wealth of insights available in listening to a single participant, even just for a one-hour interview. Qualitative researchers could consider investing in simple audio equipment and learning techniques for re-recording interview content to help disseminate in podcast, YouTube, website, and faculty development sessions. We note that this could be a relatively simple and fruitful form of secondary data analysis for the many Broadening Participation in Engineering grants with a qualitative interview methodology.

Second, we consider the theoretical aspects and limitations of our work and that of other broadening participation researchers. In this study, we have simulated the student voice in a specific way. We chose to protect the student voice and details of the student experience and identity from actual dissemination, but we simulated the student voice through student actors to try to convey the power and meaning behind

the original interview. Other qualitative research tends to use the concept of voice in a more traditional, passive, text-based way. We suggest that the community consider the tradeoffs between our own and others' approaches, and that we all continue to consider the possibilities and limitations associated with uplifting the student voice to counter systems of oppression. We also note how our focus on the students' salient identities and their narration of the figured world of engineering education can provide a partial or limited viewpoint, that is nevertheless important.

Third, we consider the power and limitations inherent within qualitative research. We do not apologize for qualitative research as "non-generalizable" as this defines qualitative research in terms of what it is not - that is, quantitative research. Rather, we position qualitative research as widely applicable and understandable by a wide audience, particularly if it is made accessible. However, we caution against the risk of generalizing or essentializing based on single interviews to understand wide demographic groups or specific other individuals. We hope to invite reflection and curiosity among listeners/readers to consider whether and how they might find out if the stories we have shared are similar to any students in their own lives.

Fourth, we highlight empathic understanding, particularly among faculty regarding their students, as a phenomenon worth exploring for broadening participation researchers. When looking for evidence of expansion in faculty empathic understanding, we situate it as combined cognitive and affective responses (e.g., surprise at learning what happened to Sophie, sadness in learning the mental load Enola has been under as her elders and community pass away) that may be the immediate reactions and instantiations to these narratives. A cognitive/affective response that indicates a change (i.e., not boredom or indifference) could foster reflection and curiosity to catalyze empathic understanding. We note how this curiosity may be an important foundation for empathic understanding and how accounts from students that showcase their perspective or problematize preconceived ideas about them could help foster that curiosity.

Finally, we encourage broadening participation researchers to expand beyond traditional research designs and traditional dissemination to center impact with the specific audiences, dimensions of intersectionality, and standpoint with the broader engineering education ecosystem in mind. We do not need to abandon research, or theory, or qualitative interviewing in order to have impact. But we do need to ask ourselves why we are conducting this specific research, who it is going to benefit, how it will benefit them, and whether or not it has benefitted them once we are finished. We need more innovation and more accountability towards impact in order to truly 'move the needle' of broadening participation in engineering.

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