

“It’s just a lack of empathy, which is just honestly exhausting” – Engineering Student Experiences with Ableism

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Abstract—This research paper explores the experiences of engineering college students identifying as disabled, the number of which is increasing each year. In the U.S., students with disabilities struggle to navigate university systems to obtain accommodations. In addition to onerous accommodation procedures, additional barriers include the inflexible nature of engineering curricula, many demands on student time for lab and project work, and the attitudes of some faculty. These are examples of how ableism, or the prejudice against those with disabilities, is rooted in engineering culture. It is well documented that disabled STEM students are less likely to access accommodations than their peers with disabilities in other majors. We interviewed 11 disabled undergraduate engineers at a large public university in the Southern United States. Most students felt that engineering instructors lack understanding and compassion about disability. While discussing instructors’ willingness to accommodate, students often described poor practices that only partially fulfilled accommodations and labeled the interactions themselves as “alienating” and “isolating.” Students with minors or second majors stated their non-engineering instructors were not only more enthusiastic about implementing accommodations, but offered support beyond formal accommodations like checking in throughout the semester and asking if there were additional access needs the student needed to succeed. We argue that ableism in engineering instructors is passed down to students and prevents those with disabilities from accepting offered accommodations and advocating for themselves, while lowering their threshold for what they believe qualifies as sufficient accommodation. From these findings we conclude that because engineering culture resists accommodations and lacks compassion, students have lowered their expectations of what proper accommodations means for engineering.

Keywords—Students with disabilities, interviews, accessibility, accommodations

I. INTRODUCTION

The population of disabled¹ college students is rising [1], and disabled voices are significantly lacking in the literature

¹ We define disability broadly as encompassing conditions that may decrease access to any activity, whether that be environmental, educational, or other.

[2]. Thus, it is more important than ever to understand disabled people’s experiences in STEM, a broad field that includes engineering, and that is known to marginalize underrepresented groups [2]. This study asked disabled students about their experience in undergraduate engineering education. More often than not, the stories were laced with discriminatory ableism, and stories of positive experiences were lacking. The title quote of this paper comes from a participant who summarized what many participants expressed. Instances of engineering ableism were often rooted in a fundamental misunderstanding of students with disabilities, and a lack of willingness on the part of instructors to try to know them.

We acknowledge that the experiences of disabled engineering students in higher education are embedded in larger, inequitable cultural, societal and institutional systems. Accommodations processes in U.S. higher education are particularly relevant. To obtain accommodations, students need a formal diagnosis, a letter from their physician validating their diagnosis and explaining how it warrants extra support, and to fill out additional paperwork provided by their school’s disability support office, usually culminating in a meeting with a staff member from the office. After accommodations are granted, students need to request accommodations from the office each semester and talk to every instructor about their accommodations at the beginning of a course. This process has implications for engineering, especially when engineering instructors interpret their obligation to accommodate students differently from those in other disciplines. The focus of this study is to find the barriers students with disabilities (SWD) face in engineering, due to attitudes exhibited by engineering professors, the norms of engineering education, and systemic problems of engineering education.

A. Research Question

From the interviews conducted we addressed the following:

- How do students with disabilities (SWD) describe their experiences of ableism in university engineering programs?

B. Ableism Lens

Simply put, ableism is a prejudice against those with disabilities. Scholars have elaborated on this definition, in which ableism “is a set of beliefs that guide cultural and institutional practices ascribing negative values to individuals with disabilities” [3]. Most extant literature focuses on these systemic practices, and while the current study did identify systemic and instructional instances of ableism, it also revealed how ableism has masqueraded in engineering faculty behaviors as an excuse for fairness, as a pass to make hurtful comments and deny legally granted accommodations, and to discourage students from broaching accommodations discussions with instructors at all. Much like racism and sexism, ableism is discriminatory. Similarly, ableism can be intentional or unintentional, systemic or interpersonal, but nonetheless discriminatory if experienced as such. Often when ableism is expressed unintentionally, it is through microaggressions, or “subtle behaviors or statements that denigrate [people] on account of their race, ethnicity, gender, or other identity” [4].

While systemic and institutional ableism is difficult and slow to address, faculty do have power to correct their own attitudes and actions. True-Funk et al. continues, “Without an intersectional perspective, intragroup diversity is overlooked, increasing the potential to reinforce broad racial and gender stereotypes,” and we argue disability stereotypes, too. This study emphasizes the stories of interpersonal ableism in engineering, including microaggressions, in attempt to provide concrete examples of ableism beyond what already exists in the literature.

Overall, ableism can be a barrier that prevents students from reaching their full potential. In this study, ableism in academia is used as a lens to guide the methodology and analysis.

II. METHODS

A. Positionality

Both authors identify as white disabled women with engineering degrees. The first author is working towards a graduate engineering degree. Her disability mainly affects cognitive function, energy, and mobility, which she disclosed to participants at the beginning of each interview. We were inspired to do this research after the first author struggled for the first several months of graduate study to obtain formal accommodations and support from professors. Our broader motivation is to make engineering education more accessible to all students, especially those with disabilities.

B. Recruitment

We recruited undergraduate students from engineering departments at a southwestern public research university. The study was announced on flyers with a QR code, in engineering academic buildings, department email lists, and by professors sharing the advertisement with their courses. The QR code led

students to a screening survey with an extensive list of gender, sexuality, race, and ethnicities, along with write-in boxes for participants to self-describe. To qualify for an interview, students had to be undergraduate engineering majors with a self-identified disability. To ensure a breadth of disabled student experiences, we chose to recruit students who self-identified as disabled, as opposed to limiting recruitment to those registered with the disability resource center (DRC). This is because a formal diagnosis and other requirements for registering with a DRC are part of the system of barriers in place in higher education for disabled students. These systems create bottlenecks that limit students from accessing support while working through STEM majors [5]. Recruiting from a larger pool of students captures a range of disabled student experiences with ableism.

C. Participants

Ultimately, 11 interviews were conducted. Because not all disabled students obtain accommodations due to various barriers mentioned above, we intentionally chose to interview a mix of students with and without accommodations. When reporting demographic information in the screening survey, participants were allowed to check as many boxes as they needed to best represent themselves. Of 11 participants, 3 were men/male, 7 were woman/female, 2 were non-binary, one was intersex, and 4 participants specifically identified themselves as being cisgender; 4 were straight, 5 were bisexual, one was pansexual, one was asexual, and one selected "other" but did not elaborate; 5 were white, 4 were Asian or Asian American, one was Black or African American, one was Hispanic or Latino/a/e, and one was Middle Eastern. One student selected multiple racial and ethnic identities. One student indicated they were first generation. Seven students were chemical engineering majors and four were mechanical engineering majors. Their first year in college ranged from 2014-2021, with most students in their third (n=6) and fourth years (n=3) at the institution. We present the demographic information this way to protect the identity of the participants and have listed characteristics related to the results in Table 1.

D. Interviews

The first author conducted the interviews and followed a semi structured protocol. Questions covered disability, accommodation status, process and barriers to getting accommodations, and professor and TA interaction. Interviews were recorded, and on average, were 36 minutes. In an intentional effort to be anti-ableist, accessibility informed interview implementation. Due to the ongoing COVID-19 pandemic and our goals of accessibility for our disabled participants, participants were able to choose in person or virtual interviews, with the knowledge that the interviewer would wear a mask to in-person meetings. Participants were also provided the interview questions in advance and asked if they needed accommodations to access the interview. A list of questions was available on the day of the interview, printed

for in person interviews, and screen-shared for virtual interviews.

E. Analysis

Interview recordings were transcribed by GMR Transcription Services and edited by the first author to remove filler words. After reading through the interview transcripts and conducting some initial rounds of coding, the authors agreed to explore a high-level code of ableist experiences for the current paper. After finding all relevant passages about experiencing ableism, the first author further coded these passages into three subcodes: Norms, Attitudes, and Systems. The authors met frequently to discuss emergent findings, and both participated in writing and editing the results.

TABLE I. PARTICIPANTS' DISABILITY AND ACCOMMODATION STATUS.
DISABILITY TERMS WERE CHOSEN BY PARTICIPANTS. TYPE STYLES

Participant	Disclosed Disability	Registered for Accommodations?
1	MS	Yes
2	ADHD, Anxiety, Autism, Clinical Depression	No
3	Anxiety, Depression, OCD	No
4	OCD	No
5	Chronic Neurological Condition	Yes
6	ADHD, MDD	Yes
7	Severe Anxiety, Autism, Borderline Personality Disorder, Chronic Severe Depression, Dyslexia, IBS, PCOS	No
8	ADHD, GAD, MDD	Yes
9	ADHD, Anxiety, POTS	Yes
10	ADHD, GAD	Yes
11	ADHD, ASD	Yes

ADHD = Attention-Deficit/Hyperactivity Disorder

ASD = Autism Spectrum Disorder

GAD = Generalized Anxiety Disorder

IBS = Irritable Bowel Syndrome

MDD = Major Depressive Disorder

MS = Multiple Sclerosis

OCD = Obsessive Compulsive Disorder

PCOS = Polycystic Ovary Syndrome

POTS = Postural Orthostatic Tachycardia Syndrome

III. RESULTS

A. Norms

Norms describe the general experience in engineering that contributes to difficulties SWD faced. This includes course

rigor, curriculum rigidity, attendance – both policies and ability to attend – and access to course materials.

1) *Rigor and Inflexibility*: Participant 9 said that the problem is “engineering in general...but it’s especially harder for people with disabilities.” She felt/said that some professors make things “unnecessarily hard,” which doesn’t reflect “how the real world is gonna work, and that’s not the culture that we should be trying to create in engineering.” Multiple students without accommodations discussed how the unrelenting pace of engineering courses impacted them. Participant 4 said “I think that the most difficult thing that professors do is just move too quickly,” and because of that, Participant 4 is “pretty uncomfortable skipping class, just because I feel like I’m going to miss something.” This participant’s mental health diagnosis can cause a variety of symptoms that may prevent a student from attending class such as difficulty focusing or getting out of bed or physical symptoms like nausea and dizziness.

The rigidity of engineering curricula also impacts how disabled students progress through their degrees. Participant 8 explained that she is “doing the fifth year because of my failing two key classes” and explained that in chemical engineering there are long prerequisite chains that don’t have flexibility for retaking courses. When asked how professors can support SWD, or any students, regardless of accommodations, Participant 7 told us that “if there’s people who can’t access it, then it’s not accessible, so we should change it so...as many people can access it.”

Inflexibility in the classroom also encompasses teaching modalities (i.e., hybrid or recordings) and few options or variety for students to demonstrate their understanding (e.g., exams, quizzes, presentations). When discussing all of these areas, Participant 3 said she feels there is “just a lot of not giving students enough options, or not giving me enough options” in engineering courses.

2) *Attendance & Course Materials*: Professors have strict attendance policies which clash with disabled students’ needs, especially those without formal accommodations. Participant 3 explained that when she was very sick with a midterm the next day, she reached out to the professor, and he said he would need a doctor's note. She thought to herself, “what doctor am I able to go to? I can’t get out of bed. I’m legitimately sick.” Participant 9 also explained attendance policies are “kind of inherently ableist as well.” Some professors allow for a small number of absences before it affects a student’s attendance grade, and then imply that this should be sufficient for students with disabilities. Professors have said to Participant 6, whose formal accommodation list includes flexible attendance, “‘Oh, we already have two drops included for this class, so do you need more than that?’” And she feels “obligated to say, ‘No, I don’t need more than two drops.’”

Regardless of accommodation status, participants explained how their disabilities impact their class attendance. Lack of access to course material prevents them from learning what they missed and increases their stress around missing class. Participant 3 said “you know engineering students, you can’t really miss a day of lectures” but due to her disabilities, she misses “quite a bit of class.” She then described that when professors “don’t have any sort of like digital option at all,” such as a recording of class or posting lecture notes or slides, she struggles to learn the content. Even when professors do share course materials, her work “gets piled up to the end of the week, because the professors will release stuff at the end of the week.” This prevents students from distributing their workload and increases their stress around missing classes, which students described they need to do sometimes for their disability.

The last-minute nature of publishing course content proves problematic not only for those making up missed work. One student mentioned how certain habits of professors, like finalizing exams within hours of the exam time, are at odds with implementation of accommodations through a campus testing center. Participant 10 paraphrased what a professor told him:

I really don’t like having to submit my essay – or, my exams like a week ahead of time – or a quiz a week ahead of time...because I’m not even sure about the stuff I’m gonna put on the exam the day before. (Participant 10)

Further, this habit impacts students, regardless of accommodations, by preventing clear expectations for exams.

B. Attitudes

Instructor attitudes was by far the most talked about, and emotionally charged, topic in the interviews. It focused on interactions with other people, mostly professors, and included direct experiences, overheard instructor interactions with other students, and behaviors that were rooted in ableism and misunderstanding of SWD.

1) Poor Attitude about and Lax Implementation of Accommodations: Participants perceived that their engineering professors don’t approach disabled students with a welcoming or problem-solving approach to prioritizing and implementing accommodations. Participant 5 said when she addresses accommodations with professors, she usually perceives “annoyance” and “irritability” from instructors. She went on to say that

It’s not a positive emotion that I feel... It’s just not very, welcoming, I would say. Sometimes, I experience flat-out refusal. I had one professor who just straight up refused about the extra time on some weekly quizzes, and I didn’t know what to do at that point because I was kinda taken aback...because I didn’t know what to do. (Participant 5)

Even when she could use her extra time on in-class quizzes, the primary solution professors provided is to stay after class, but she often had a “class after, and it takes me longer to get to my next class. And they’re just not very concerned. It’s a little frustrating.” Participant 3 mentioned that pop quizzes “cause such intense anxiety that I’ve almost dropped a class because

they said there’s a possibility of it.” Participant 7 told almost the same story as Participant 5 about quizzes and noticed “the way that [professors] approach students with accommodations – it’s like a lot of times, it’s an afterthought.” As a result, that “has made [Participant 7] not wanna really do anything about [getting accommodations]”. Participant 5 also had instructors who requested she avoid using some of her formal accommodations, such as using technology, i.e., a laptop, to take notes. She shared that she’s “had professors ask me not to do that if I can” because they worry that her using a laptop will influence other students to break their no-technology policy.

2) Accommodation Logistics: Students with formal accommodations were burdened with teaching their professors how to implement certain accommodations. Participant 9 admitted that “the engineering experience does feel a little alienating sometimes...especially because I’ve had some professors – especially the new professors – that don’t really understand what accommodations are or how to approach them with students.” She then expressed that she doesn’t feel like she should be the one explaining that to them. Participant 10 said he had to “teach [the professor] how to do the actual submitting of the exams [to the campus testing center] because he didn’t even know that they changed. He thought it was through a different portal. He didn’t know how to do it.”

3) Lack of Communication: Participants also explained how professors failing to respond to email requests impacted them. Participant 3 recalled one course where “there was no online option, and the professor was very, very unaccommodating” which contributed to her falling behind and being underprepared for midterm exams. She didn’t know what topics were covered in the classes she missed and when she reached out to the professor, “he wouldn’t respond to my messages either.” Missing class is often an inevitable part of being a disabled student, and when instructors fail to respond to these students’ efforts to learn missed material, their learning suffers. Participant 6 told us how one professor never acted on her request to find a volunteer note-taker, one of her formal accommodations. She finds this accommodation useful “for when I can’t attend or when I can’t concentrate in class.” The professor replied the day before the exam asking if she “needed accommodations for a different testing room. And I was like, ‘No, I don’t need that...’” She replied asking again if they could “sit down sometime and discuss getting a note-taker for me? and he said, ‘I don’t know how to go about doing that.’” (At this institution, the accommodation letters include a link to instructions and scripts for recruiting volunteer notetakers.) In this instance, the student had an accommodation to support their learning material when they miss class, but there were unable to utilize it, again, due to both a lack of response from and of knowledge about the accommodation from the professor.

4) Perception of an Unfair Advantage: Professors have also commented how accommodations are unfair and won’t

prepare students for industry. Participant 5 described interactions with professors as

[H]urtful - Just refusing to communicate with me...or give me my accommodations...or telling me it's unfair to the other students... They were saying it'd be unfair or that it would make me unprepared for a life in industry or something. And honestly, maybe, but I kinda feel like that's not their job to gatekeep me from industry. I'm there to learn, and they're there to teach me the material, and whether or not I get a job in industry - I don't know; I just feel like that's not even a conversation that I should be having with them at that point. (Participant 5)

While professors argue that this stance will set a student up for a successful career in industry, they fail to realize that, just as in universities, employers are required to give "reasonable accommodations" to employees with disabilities, per the Americans with Disabilities Act [6].

Participant 6 also said that professors' strictness "makes it hard for me to ask for accommodations because it feels like I'm asking for a handout." And Participant 7 said "There are clear accommodations that students can get, and for [the professor] to be like, 'No, that's not fair,' that's not for you to debate. That's just what it is." Students interpret these comments to mean their instructors are the ultimate arbiters of fairness in engineering and that they have little recourse in the face of such power.

5) Assumptions about Disability and Questioning Accommodation Validity: Participants also described prior experiences with engineering instructors that made false assumptions about their disabled experience and discouraged them from seeking further support. Participant 7 has avoided requesting informal accommodations from their professors because "people hear those words like autism and dyslexia, and then, they automatically have their assumptions about how it operates. And I don't wanna be viewed in that way." Participant 3 said "a lot of times like I feel like they look for [disabilities] that are visible and often [one's disabilities are] not visible." Since students don't have to disclose specific diagnoses to their professors, engineering professors often make assumptions, which was exemplified when Participant 5 was speaking with an instructor about an accommodation that allows her to take 10-minute breaks from class. Her instructor started talking about how they used to have one student with that same accommodation, and then, their student used to go outside and take insulin shots or something. And...then, they didn't know why that student needed extra time on tests. (Participant 5)

During that conversation she thought to herself, "First of all, what do you know about that student? Second of all, why are you telling me this right now?" She was "very confused" by the story and told the interviewer that instructors should not "make comments about peoples' conditions or accommodations because you don't know what's going on, and many peoples' disabilities are invisible or you don't know how it affects their day-to-day life." She also advises professors that since they are not medical professionals that they don't try to assume, or argue with me, or...decide what I need.

Because I have my accommodations because I have already been to the doctor and been through the disability office, so they have already decided what's appropriate for me. (Participant 5)

Students having to defend their accommodations is yet another burden placed on SWD, and students are beginning to recognize this. As Participant 5 said, instructors who "have any issues [should] take it up with the disability office and not directly with me."

6) General Ignorance about Disability and Unhelpful Comments: Some professors told inappropriate stories, perhaps a misguided attempt to relate to the student, or dismissed the importance of addressing their support needs. When Participant 9 did poorly on her first exam, her professor contacted her about her grade. She explained that this is something that always happens on her first exam while her brain adjusts to the class and format of a test, and she "could tell he didn't really believe me."

Participant 10 said he approached professors about how he suspected he had ADHD before he had a formal diagnosis or accommodations. One professor "seemed kind of apprehensive about the concept that people struggled to learn because of something else," and then dismissed Participant 10 by saying "Well, I have problems paying attention, too. I have problems doing this sometimes... but I still have a doctorate. I still made it through school." This comment made it difficult for Participant 10 to advocate for support in the course. This professor also expressed to the student that he didn't understand why people need to go to psychotherapy, which further exemplified his misunderstanding of disabilities and support needs. After the student tried to explain therapy is helpful to those with the resources, the instructor replied, "I guess that's true, it's just I didn't have that as a kid, so it's just strange to me." Further, Participant 10 witnessed his classmates bringing up concerns and being dismissed with the same lack of compassion from this professor. Participant 10 ended his story by telling the interviewer, "that's the biggest thing: they just need to have a little bit more empathy." Participant 9 expressed that professors may "understand that they have students with disabilities," but because they don't understand the need for accommodations, they don't "understand that...their expectations for students with disabilities can be different than regular students." To clarify, disabled students are fully capable of succeeding in engineering so it is not the learning objectives that need to change, rather, greater flexibility and choice might be possible in how students show they've met the learning objectives.

C. Systems

Systemic barriers contributed specifically to the engineering experience, as addressed by about two-thirds of participants. It is worth noting there are more systemic barriers, such as barriers to diagnosis and accommodations, which are not addressed or fully explored in this paper [5]. As Participant 11 summarized, "most of the problems come not from the professors themselves...but I think from just the system that is set up."

Students most frequently described talking to professors to obtain accommodations. Participant 5, who has accommodations, said

The whole process at the start [of the semester] where you have to reach out to your professors, the first contact with your professors being about telling them about your accommodations, always makes me very nervous and fills me with a little bit of anxiety. Mainly, I think I've had a couple bad experiences with that, so I just never enjoy it.

And I also don't like that that's the first interaction I usually have with my professor. (Participant 5)

Participant 3 spoke similarly, saying "you have to individually talk to every single instructor I believe and oh, my God, that is so stressful!" Participant 3 cited this as a reason that she did not request formal accommodations, feeling it was more stress than it was worth. Earlier sections describe more specific interactions with instructors that discourage students from requesting, using and discussing accommodations in future courses.

Students also discussed how professors get confused with implementing accommodations and believe professors are not trained properly surrounding accommodations. Examples are provided in prior sections. Participant 7 believed that "professors need to get trained on how to approach accommodations and just kind of accept them."

IV. CONCLUSION

A. Discussion

The attitudes, norms, and systems in engineering education are perpetuating an ableist environment that is harming engineering students with disabilities. The requirement for students to discuss their accommodations with every professor every semester can be overwhelming, especially when met with resistance, which may result in students not disclosing their disability and/or accommodations in the future. Anytime a professor asks a student to avoid using their accommodations, or flat-out refuses, they are exploiting ableism by preventing disabled students access to their education. Rigor and inflexibility have been norms in engineering, but don't set up all students for success, and should be addressed. Mastering engineering content has little to do with typical engineering courseloads, the fast pace of many engineering courses, long prerequisite chains, many hours of lab work and homework, and our reliance on high stakes, timed exams. Overall, attitudes exhibited by instructors was the most prominent display of ableism, but it is also the one over which instructors have the most power to change.

As instructors, there are many ways to increase accessibility and inclusivity, some of which require little additional time or effort. The effort to increase access should be valued because the number of disabled undergraduates in the USA consistently grows, with the population virtually doubling from 2007-08 to 2019-20 [7]. As soon as accommodations letters are available, instructors should reach out to students to discuss their accommodations, as early as before classes

begin. This immediately shows students you are welcoming and reduces their stress. Implementing Universal Design for Learning (UDL) in the classroom could reduce the burden on students with accommodations, and support those who do not feel comfortable disclosing their disability to their professors and their university. UDL also supports non-disabled students if they fall ill, have a family emergency, or have another life event. UDL can include being proactive about supplying your students with course materials, and when possible, lecture recordings. Although students need to develop the self-regulation skills to avoid relying on lecture capture as a substitute for attending class [8], students with disabilities greatly appreciate the accessibility of recorded lectures for rewatching lectures and catching up on missed content [9]. When discussing your syllabus on the first day of class, personalize what you have to say about disability services. Invite students to attend office hours to discuss extra support regardless of accommodation status. Avoid asking for underlying diagnoses or making comments about past students who needed similar accommodations, unless you are offering ideas for implementation that go beyond the bare minimum required. There are many reasons a student may have an accommodation. Instead, ask how the accommodation can be implemented to best support them. Asking students what they need or how you can help is a great way to honor their needs; however, sometimes students know they need support but don't know what that could look like, so have a few solutions in mind to offer to a student. Remember that students who approach you for support often feel vulnerable or stressed, so meet them with warmth and empathy. If you ever have questions on how to use certain accommodations or why you need to implement them, reach out to your university's disability support office. A contact should be listed at the bottom of each accommodation letter.

B. Future Work

While talking about their experiences, participants often told stories of how ableist attitudes have negatively impacted them. Participants also used language that implied internalized ableism. Moving forward, we plan to analyze these interviews for how students have internalized the ableism of engineering culture.

There were a few participants who had significant experience in non-engineering courses, through a second major or a minor, who felt the experience as a disabled student is worse in engineering. These interviews did not ask students to compare engineering to non-engineering experiences, but the amount of unsolicited commentary on it warrants study of differences between disciplines by interviewing disabled students who double major or minor in other areas. These comparisons demonstrate that the way we do things in engineering is not the only way to educate and accommodate undergraduates with disabilities.

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