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Disentangling the Intersectional Identities of Disabled Women in Engineering Programs through Narrative Inquiry (WIP)

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Abstract

This Work-in-Progress (WIP) Research paper explores intersectionality among disabled women in engineering higher education. Our work seeks to understand the complexities of navigating the interlocking systems of sexism and ableism within engineering higher education. Semi-structured interviews were conducted with four disabled women engineering students from a single institution. The purpose of these interviews was to gain a deeper understanding of disabled women's unique experiences navigating their engineering degree program. Interview data were analyzed using narrative inquiry through thematic analysis. Preliminary results showcase the interdependence and compounding nature of sexism and ableism as they operate within engineering education. In this paper, we expand upon the impact of holding multiple marginalized identities, including disability, as described by these students and its effects on their lived experiences within engineering education.

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Introduction

This Work-in-Progress (WIP), Research paper explores intersectionality amongst disabled women[1] enrolled in higher education engineering programs. Intersectionality theory offers critical insights into how shifting categories of identity influence how people navigate interlocking systems of oppression. It was originally used to describe the experiences of Black women (Collins, 2002; Crenshaw, 1989), and here we expand that original conceptualization to recognize, identify, and critically examine how navigating the interlocking systems of ableism and sexism influences the ways that disabled women in engineering navigate identity categories of gender and disability influence the experiences of disabled women their engineering higher education environments. In engineering education research, several studies have examined intersectionality along the dimensions of race and gender (e.g., True-Funk et al., 2021; Wilkins-Yel et al., 2022) or race, class, and gender (e.g., Bruning et al., 2015). Still, much of the existing engineering education research has focused on individual identities, such as gender, race, and ethnicity, without considering the intersectional nature of identities and how they interact to shape student experiences (Figard et al., 2023a).

Although intersectionality research is growing in engineering education, studies discussing disability as an aspect of intersectionality or identity are almost entirely nonexistent. While higher education research has slowly grown to address disabled students' experiences on campus and recognize disability as a social identity and aspect of campus diversity, it has still failed to address how ableism intersects with other aspects of oppression to impact disabled students' experiences (Naples et al., 2019). Scholars have called for an expanded use of intersectionality to study and work with disabled people (Miles et al., 2017). Our work seeks to understand the complexities of intersectional lived experiences among disabled women in the context of their engineering higher education programs.

Semi-structured interviews were conducted with disabled women in undergraduate and graduate engineering degree programs at a single U.S. institution. The purpose of these interviews was to gain a deeper understanding of disabled students' unique experiences navigating their engineering degree program. This paper explores the unique impact of holding multiple marginalized identities, including disability, as described by these students and its effects on their lived experiences within engineering education. Building on our past works around disabled students' experiences in engineering (e.g., Figard & Carberry, 2023; Figard et al., 2023b; Figard et al., 2023c), this paper expands on the nuanced complexities surrounding identity within the disabled engineering community by addressing the following research question: How do disabled women in engineering degree programs describe the intersections of their marginalized identities, as they relate to their educational experiences?

Methods

The findings presented in this paper are a subset of a larger project and data collection effort that focuses more broadly on the experiences of disabled engineering students. More complete methodological details can be found in (Figard et al., 2023b; Figard et al., 2024).

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[1] Identity-first language is used in this paper to emphasize the identity and experiences of a collective group. Using person-first language (i.e., students with disabilities) can diminish disability as an integral part of one's identity (Brown, 2011; Okundaye, 2021).

Research Design

The data sources for this study come from semi-structured interviews with four disabled women engineering students. The first author conducted these interviews at a single institution in Fall 2022. Interview transcript analysis was conducted in two rounds, using thematic analysis with a critical lens. A narrative inquiry approach was used to answer our research question. Narrative inquiry studies an individual's view of a phenomenon, typically presented in the form of a story (Connelly & Clandinin, 1990). Kim (2015) elevates story form using narrative inquiry as a "portal through which a person enters the world and by which their experience of the world is interpreted and made personally meaningful" (p. 18). Narrative inquiry also provides opportunities for counter-stories (Kim, 2015), which was particularly important to this research as disabled students continue to be a dismissed and largely ignored group within the engineering student population.

Co-researchers

This study presents the lived experiences of four disabled women engineering students. Included in this sample are three undergraduate students and one doctoral engineering student. The representation of the sample's race and ethnicity makeup includes: Black (*n*=1) and white (*n*=3). Table 1 provides additional co-researcher demographic information, as reported in the screening survey.

We refer to the interviewed students as "co-researchers" as opposed to "participants" to emphasize the development of community-shared scholarship and action (Costanza-Chock, 2020). Changing the verbiage was an intentional measure we took to help the disabled community retain power in the research process while also denouncing the construction and fruition of inequitable power dynamics in academia.

Table 1
Co-researcher Demographic Information

Pseudonym	Racial Identity	Gender Identity	Disability(s)	Engineering Major	Year-in-School	International Student (Y/N)
Susan	White	Woman	Multiple physical disabilities	Mechanical	Third-year	N
Lucy	Black	Woman	Cognitive, learning	Civil	Third-year	Y
Aria	White	Woman	Cognitive	Industrial	Ph.D.	N
Claire	White	Woman	Cognitive, learning, physical	Computer Science	Fourth-year	N

Co-researcher Recruitment and Data Collection

This study was conducted at a large, research-intensive university in the Southwestern United States. Co-researchers were recruited using emails and flyers distributed by the university's disability resource office and engineering departments. Recruitment flyers described the eligibility criteria of the study (i.e., currently enrolled as an engineering student at the university and identified as being disabled or having a disability). The flier invited eligible co-researchers to share their disability-related experiences at their current institution and outlined the process for participation. The flier also noted that co-researchers would receive compensation for their contributions to the study in the form of a $25 gift card.

All data collection was done following appropriate human subjects research procedures and approved under the university's IRB. Co-researchers first filled out a screening and demographic survey to ascertain eligibility. Then, eligible co-researchers were invited to participate in a ~60-minute semi-structured interview, conducted virtually via Zoom. Every interview was audio recorded and then transcribed using a transcription service.

Interviews were conducted by the first author, a current Ph.D. candidate. Co-researchers were informed that anything they said during the interview would not be judged, scrutinized, or questioned. This sentiment was particularly important, as the disabled community at large frequently endure instances of non-disabled people failing to understand their experiences and subsequently questioning, denying, or negating those experiences. As a way to build trust with the co-researchers, the interviewer shared their own related experiences of being disabled in engineering during times of hesitancy and vulnerability within the interviews.

The interview protocol consisted of seven questions and related probes, designed to expound upon co-researchers' experiences relating to being disabled in engineering and suggestions for improvement. All interviews began with the question, "What motivated you to pursue your current engineering discipline?" The co-researchers were then asked generally about their experiences in engineering and to reflect on accessibility within this setting. Each time co-researchers mentioned negative experiences related to their disability(s) or accessibility, they were asked to consider what supports or changes could have improved their experience.

Data Analysis and Trustworthiness

Transcripts were de-identified before beginning any analysis to maintain co-researcher confidentiality. After de-identification, transcripts were uploaded to Dedoose (2021) to code and analyze the interview data. Data analysis was conducted in two rounds using thematic analysis (Braun & Clarke, 2006) through a critical lens. Salient themes were identified using a constant-comparative, open coding process (Saldaña, 2016). Open coding was used in the first round to identify meaningful and recurrent aspects of disabled students' experiences in engineering from the transcribed interviews. The second round of coding used pattern coding to organize aspects of these experiences into sub-themes. Presented in this paper are aspects related to intersectionality within two of the co-researchers' disabled identities.

The research team employed multiple measures throughout the research process to build trustworthiness and quality (Tracy, 2010; Saldaña, 2016). During all stages of the research process, we carefully reflected on our positionalities and how they could influence and/or bias the work. We met multiple times throughout the data analysis and writing process to provide diverse perspectives, interrogate our initial findings, and obtain agreement amongst the interpretations. A group of researchers external to the data analysis team then audited the final interpretations.

Preliminary Findings
Aria

Aria is a first-year Ph.D. student in industrial engineering. She is also an animal lover, a world traveler, and a hot-air balloon pilot. She moved to a new state for her doctoral program only a few weeks ago. Amidst moving, adjusting to a new environment, and beginning graduate school, she is also grappling with what it means to be disabled in a graduate school setting. She relates her experience of being disabled with another marginalized identity that she holds, being a woman:

"I mean, we could go into the whole other thing of I'm already a woman in engineering, which is hard enough."

As Aria reckons with what this experience may be like in graduate school, she recalls how disability and gender intersected during her time in undergrad:

"My undergraduate [engineering department] was an 80/20 [male to female] ratio. So that's already a struggle enough. Plus on top of that, I get such debilitating anxiety that I struggle to complete homeworks, I struggle to complete essays, like testing is just like I will be down for weeks because I just am so anxious about a test."

Entering graduate school, Aria is confronted with the multiplicative nature of her marginalized identities and their subsequent impacts. She feels like she's fueling a relentless being, needing to simultaneously confront the systems of sexism and ableism to be seen as an equal to her peers.

"It's ***not only do I already feel like I have to prove myself as good as the guys, but it's also I feel like I have to work harder to just be seen as an equal***, which is really difficult."

Aria recognizes that she is a good student who works hard and gets good grades, but also feels that she has to do significantly more work to feel on par with her peers. She expresses how the process of maintaining perfectionism to be recognized is like being stuck in an infinite loop. Staying in this loop only compounds her anxiety and begins to feel unsustainable.

"And historically, I have always been a very good student and I do work very hard at it, but I always feel like I have to go that extra mile to even [have] the same quality work as my peers [recognized]. And with my anxiety and with all of that, I very much become a perfectionist about my work. And so, I will take significantly longer to do simple assignments as compared to [others] and end up with the same grade. It creates this very endless cycle of like, 'I'm so stressed about this assignment. Okay, I'm going to overthink this assignment. Oh, look I got a good grade.' … And then we just keep getting back into this really bad cycle. I'll sit and do homework with friends and it's like they're done and I'm still on Problem One because my handwriting didn't look right or it's not a great time. So I feel like I just take a lot longer, ***it's like anxiety on anxiety***."

Susan

Susan is a third-year undergraduate student in mechanical engineering. She is also a disability rights advocate, a self-ascribed space nerd, and a nonfiction book lover. As Susan nears graduation, she begins to contemplate her future career pathway. She started college wanting to work in the aerospace industry, designing space crafts. Since then, Susan has endured a plethora of ableist experiences that have made her question whether to pursue a career in engineering.

"That's been a pretty recent decision. I'd say I came to that decision probably [within the last few months] because it's something that I have been struggling with. I've been looking at freelancing with engineering or consulting or stuff like that. And just with all of the combinations of things that I'm dealing with, I just could not see any way forward in the engineering field."

She understands that receiving disability accommodations is an option if she were to pursue a career in engineering. However, she also recognizes the immense effort it has taken to just request accommodations in her undergraduate engineering courses, many of which have been questioned or denied by her professors even after being pre-approved by the university's disability accommodations office. She connects this with the attitudinal beliefs ingrained in the ideal worker norm in engineering (Cech, 2023; Larson Østerud, 2023), such as "mental toughness," "bodily normalcy," and the "work hard, play hard" mentality.

> "I love my mom to death, but she is way too optimistic about this whole thing where she's like, well, as long as you start working there, you can get accommodations and stuff. And I'm like, yeah, but I'm going to need those accommodations from the start… I feel like it is just a very well-recognized thing in the industry that you need to be at the top of your game if you're going to be going into engineering."

Susan goes on to emphasize how she has always felt like an outsider in her major, being one of few women, and how these feelings are further compounded by being so apparently different from the other women in her classes because of her disabilities.

> "I guess within the [mechanical engineering] group I always feel a bit like the odd one out anyway, being one of the only women in the class. And so being visibly different from the other women in the class is also another thing that makes me a bit nervous with that. I would say that it has impacted my sense of belonging, both with [UNIVERSITY NAME] and within the engineering community."

As Susan continues to reflect on what it may mean to pursue a career in engineering, she considers how her identity as a woman already negatively impacts her job application process. Susan recognizes that her decision to pursue an alternative career post-graduation was not made on a whim. When adding in that she is a *disabled* woman, the mere idea of going into engineering feels unattainable.

> "And no matter how much businesses will say we don't discriminate, ***if you are offered a man's resume with the same qualifications as a disabled woman's resume, I already have a disadvantage being a woman in STEM*** then having to be like, 'I also can't always be there at the time that you want me to and I might not always be able to get things done on deadline.' Looking at that, they're clearly going to go for the person that they don't have to give accommodations to and they'll come up with some excuse."

Conclusion

This paper explores the lived experiences of disabled women in engineering programs. Preliminary findings showcase how sexism and ableism are interdependent in their existence, which further convolutes what it means to be disabled in engineering education. Through these narratives, we witness how the co-researchers' marginalized identities coincide, making their disabled identity feel like just one more load to bear. Future work will seek to further understand the multifaceted intricacies of the disabled community and their experiences within engineering education. Understanding the multiplicity of intersecting identities within the disabled community and their connections to navigating engineering education is a crucial first step in dismantling ableism within higher education, which continues to marginalize and exclude disabled students from engineering.

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