

Navigating the academy in the absence of graduate disability accommodation policies

D. C. Beardmore, University of Colorado Boulder

Mx. Beardmore is currently a PhD student at the University of Colorado, Boulder. They study inclusive engineering education and construction engineering risk management. Their full bio and current and historical positionality statements can be found on their website at dcbeardmore.com

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Abstract

University accommodation policies and departmental practices often overlook engineering graduate students with disabilities. The failure of policies and programs to consider graduate students with disabilities is reflected by the dearth in the literature pertaining to them. Responding to this gap in knowledge, I conduct an exploratory qualitative study. I explore the experiences of two engineering graduate students who identify as having invisible disabilities or different abilities. Using a dialogic serial interview process, the participants and I co-develop a rich-vivid phenomenology. I include a portion of the findings in this manuscript. Specifically, I focus on the participant's experiences with accommodation policies and practices while navigating their graduate programs. I discuss the findings as they relate to concepts in literature and my own auto-ethnographic experience. I also provide researchers, students, faculty, staff, and policy makers in Science, Technology, Engineering, and Mathematics (STEM) academia with recommendations. Finally, I present the research community with areas for further academic study.

Introduction

Problem

There is a dearth of knowledge pertaining to graduate students with disabilities. Publications regarding the enrollment, retention, and graduation rates of this population are scarce. Similarly, little is known about the retention and graduation rates of graduate students with disabilities [1], [2]. More generally, there is a gap in knowledge regarding the experiences of graduate students with disabilities [1], [3].

Even the size of the population of graduate students with disabilities is not well understood. Some sources estimate that individuals with disabilities make up around five to ten percent of the total graduate student body [3]. However, these estimates do not account for individuals who choose not to disclose their disability status [3]. Some studies have included non-disclosing students in their estimates of undergraduate populations [3]. These studies estimate that non-disclosing populations may be three times the size of disclosing populations [3]. If a similar percent of graduate students choose non-disclosure, individuals with disabilities might make up around 15 to 30 percent of the graduate student body.

The existing body of knowledge is further limited by the difficulty in defining the “dynamic and contested nature of the boundaries and meaning of disability” [3]. Studies are dependent on researcher and participant attitudes towards disability. They are dependent on whom is perceived as having a disability [1], [4], especially those with invisible disabilities [5]. The body of knowledge also depends on whom is willing to participate. It depends on if individuals identify as having a disability, feel comfortable enough to disclose, and choose to disclose [1], [4].

There is a diversity of opinions on how to define disability. The traditionally accepted view of disability-as-impairment fits within the medical model of disability. Under this model, disability

is viewed as a deficit in a person's innate capabilities or an impairment that must be "fixed" to conform with normative values [3], [6], [7]. The medical model is exemplified by the legal definition of disability in the United States. Section three of the Americans with Disabilities Act of 1990 (ADA), defined disability, with respect to an individual, as "(A) a physical or mental impairment that substantially limits one or more of the major life activities of such individual; (B) a record of such an impairment; or (C) being regarded as having such an impairment." [8]. The medical model of disability remains a dominant discourse in the United States, guiding public opinion and driving professional practice [3]. Alternatively, the conceptualization of disability-as-oppression fits within the social model of disability [9]. The social model of disability presents disability as a consequence of a systemically excluding and oppressive environment [3], [6], [7]. It acknowledges that we, as a society, have manufactured and enforced systemic barriers, derogatory attitudes, and social exclusion for individuals who are different from those in power [7]. Additionally, some scholars view disability through a neoliberal-ableism critical lens. This model acknowledges both the realities of impairment and implicates society in the enforced disablement of "non-desirable others" [9]. It celebrates disability as an identity that disrupts norms and subverts ableist values of society [9]. It also acknowledges the pain and interlocking oppressions people with disabilities may face [9]. The neoliberal-ableism critical model condemns the binary cultural constructions used to naturalize sameness, propagate "othering", and oppress those who are not the "idealized normal" [9].

Rather than define disability and what might be included under the broad umbrella of invisible disabilities, I invited participants to decide what disability meant to them and determine what disabilities they experienced as invisible. Both participants described their disabilities or different abilities in a fluid manner, that at times seemed to correspond to each of the aforementioned models. Note: When referring to the disability status of the interview participants I use both the term "disability" and the term "different ability" to honor each participant's preferred term. The methods section of this manuscript includes additional discussion on the disability or different abilities of the participants.

Background

Most of the research surrounding college-level (also referred to as post-secondary and tertiary) students with disabilities has focused on undergraduate students [1], [3]. Scholars have pointed out that the barriers to students in graduate programs may be substantially different from those facing undergraduate students [3], [10]. Yet, there is very little research present regarding the accommodation needs of graduate students [10]. Note: the terms graduate and postgraduate are sometimes used synonymously in the literature; however, postgraduate can either refer to a person who has earned a high school diploma or who has also earned a collegiate-level degree.

Graduate students and undergraduate students often follow different paths in the academic environment. They serve divergent roles, face separate challenges, and have different experiences. Graduate students face obstacles beyond the classroom—in their ability to meet with advisers, attend conferences, and develop social support from their peers—that undergraduate students may not face [3]. Even in the classroom graduate students may be expected to meet different expectations than their undergraduate counterparts. This may include a greater volume of reading and reading assignments provided from multiple resources, each of which the student may be expected to have converted into alternative formats (e.g., screen

readable pdfs or braille [11]). Graduate students are often expected to understand and communicate complex concepts in technical jargon (that is not used in undergraduate studies) [11]. Additionally, graduate students are in a competitive and much more independent environment than undergraduate students [11]. Due to the independent nature of their work, graduate students' needs may be more extensive than the needs of undergraduate students [10]. Yet, the accommodations available are typically designed for undergraduate coursework. While these accommodations may be potentially helpful for some graduate coursework, they are inadequate for research activities [1], teaching activities [1], navigating the milestones of a thesis or dissertation [10], and accessing conferences or fieldwork [11]. Even if formal accommodations are approved, they will likely not be enough to address all the systemic and attitudinal barriers encountered by students in graduate school [3].

Some studies identify a few of the barriers faced by graduate students with disabilities. One study highlighted the prevalence of ableism in the admissions process, where references to invisible disabilities such as mental illness have been considered a "kiss of death" in the graduate application process [12]. Other studies have shown how stigma often prevents students, especially graduate students [13] from disclosing their disability status or requesting accommodations [14]–[16]. These studies demonstrate how students may not want to identify as part of a group they perceive to be excluded from their chosen profession [15]. They also point to a common belief that nondisclosure is necessary to protect them from being discredited in their learning environment [15]. Adding to these barriers, graduate students with disabilities report major obstacles related to the availability of faculty, program structure or requirements, course scheduling, and work/financial commitments [2].

Additionally, students with disabilities carry a higher financial burden than students without disabilities, especially graduate students [2]. The 2016 Canadian study found that 41% of graduate students without disabilities versus 64% of graduate students with disabilities participating in their study carried debt from their graduate education [2]. Similarly, in 2018 the National Science Foundation found that graduate students with disabilities in the United States received less funding than graduate students without disabilities, forcing them to frequently rely on loans and personal finances [17]. A 2020 study demonstrated how the Covid 19 pandemic has disproportionately exacerbated these burdens for students with disabilities [18].

The 2016 Canadian study also highlighted the students' dissatisfaction with their academic experiences. When ranking their overall experiences at their university, 10-12% fewer graduate students with disabilities, as opposed to those without disabilities, ranked their overall experience as "good" or higher in the 2016 Canadian study [2]. The study also found that students with disabilities were 8%-9% less likely to recommend their university or program [2].

These negative experiences and barriers may be particularly prevalent in Science, Technology, Engineering, and Mathematics (STEM). Both students and professionals with disabilities are socially marginalized, stigmatized, discredited, and devalued in engineering [19]; yet there is a paucity in research exploring the perceptions and experiences of postsecondary STEM students [20]. The ratio of students with disabilities to those without disabilities who are enrolled in STEM programs is much lower than in other disciplines. Although 19.5% of undergraduate students in a 2016 study reported a disability this was only true for 5.66% of students in engineering programs [21]. The 2016 report lacked this same information on graduate students.

However, a Canadian survey from the same year reported that 15% of graduate students vs 5% of engineering graduate students reported having disabilities [2].

Many of the surveys presenting barriers to students are limited to students with visible disabilities as seen through the medical model of disability (e.g., [2] and [17]). The proportion of graduate students with visible versus invisible disabilities is not known. Invisible disabilities make up a substantial portion of undergraduate accommodation requests [22]. Lizotte and Clifford Simplican called for future research to prioritize graduate students with invisible disabilities (e.g., psychiatric disabilities, autism, and brain injuries) [3]. Yet, very little research has been done on students with invisible disabilities [5].

A dearth of knowledge on graduate students with disabilities was identified in a 2017 literature review [3]. Subsequently, the gap in the literature on university students with disabilities in research roles was identified in a 2019 literature review [1]. It is essential to include all individuals who can contribute to research, especially those from diverse backgrounds and abilities [10]. Yet, individuals with disabilities continue to be excluded from academia. The current literature available in Web of Science, the American Society for Engineering Education (ASEE) Papers on Engineering Education Repository (PEER), and several of the leading educational journals reveal that graduate students with disabilities have been ignored in institutional policies and departmental practices [10], [23], instruction and advising [2], and academia and research [1], [3].

Purpose

This manuscript presents a portion of the results from the first phase of an ongoing broader study. The broader study was meant to be a first step in addressing the gaps identified by Lizotte and Clifford Simplican and Lillywhite and Woldbing [1], [3]. The research question guiding the broader study was: “How do individual STEM graduate students with invisible disabilities experience navigating their academic environments?”

The primary objective of the broader study was to identify areas that need further study to motivate, propose, and prioritize future areas of inquiry. This included bringing visibility to disability in STEM. It included providing readers with context that might serve to increase their own disability awareness or help them spread awareness in STEM academia. The objective also included inspiring all readers (students, faculty, and staff) to consider the recommendations provided and continue their efforts as instruments of change. The last and perhaps the most important part of the objective was to validate the experiences of individuals in STEM with disabilities. In the words of one of the participants:

So, just let folks show what they know in a way that works for them, and don't assume that everybody is just trying to trick you or fool you. It's already hard enough. Just for a moment, believe that it's real and think about “God, if this really was real, how hard it must be for this person right now?”. And then just keep thinking that because it's real. Believe students. Trust them. And make sure to continue sharing resources. And let people change and grow...
[Disabled/differently abled] folks are awesome and have a lot to give. They've already made it through so much to get in your doorway.

The first phase of the broader study revealed multiple topics of interest. This manuscript's purpose is to explore themes related to the impacts of university and departmental accommodation policies. Lizotte and Clifford Simpican believed that researching the accommodation policies and practices being developed for graduate students with disabilities could "offer important insight for faculty, administration, and doctoral students" [3].

This manuscript addresses the research question of "What are individual engineering graduate students with invisible disabilities experiencing when they navigate accessibility or accommodation policies and degree requirements or expectations in their university programs?"

Once the findings from this first phase of the broader study have been disseminated, I hope to continue this research, further exploring the gaps with additional participants.

Methods

The following paragraphs present the methods used in the first phase of the broader study.

Design

This manuscript used a mixed-method approach to describe the experiences of graduate students with disabilities or different abilities. Specifically, the qualitative methods included in this investigation included a phenomenology interwoven with an autoethnography. The combination of a phenomenology or narrative derived from interviews and an autoethnography derived from the review of the author's experiences is an established mixed-method approach [24]–[26]. Phenomenological studies provide detailed descriptions of individuals' lived experiences pertaining to a concept or phenomena [27]. Specifically, this manuscript uses a shared phenomenology to combine the experiences of two participants. I chose this format to add a layer of protection to the participants' anonymity (i.e., so that the reader would not be able to attribute a list of experiences to each participant). Autoethnography is a research method that "seeks to describe and systematically analyze personal experience in order to understand cultural experience" [28]. Including autoethnographic elements enabled me to provide additional context and present my bias as part of the target population.

Participants

The investigation employed a convenience sample to find interview participants. Convenience sampling involves selecting participants that are conveniently available or who are already known to meet the inclusion criteria [27]. The inclusion criteria included graduate students who were: 1) actively enrolled in a STEM major at a University in the United States, 2) had previously earned at least one bachelor's degree, and 3) who identified as having at least one invisible disability or different ability. As the massive depth and breadth of the data became apparent, I ceased recruitment efforts. Limiting the sample size to two participants provided the flexibility needed to iteratively co-create and analyze themes with the participants during the limited window of time available.

Both interview participants described having a disability or different ability profile that would fit under the "multiple disabilities" category of the Individuals with Disabilities Education Act (IDEA). Specifically, the applicable categories included "other health impairment", "emotional

disturbance”, “visual impairment”, “hearing impairment”, and “traumatic brain injury” categories [29]. One participant shared that they experience clinical anxiety, clinical depression, attention deficit hyperactivity disorder (ADHD), and post-traumatic stress disorder (PTSD). The other participant shared that they began experiencing migraines, temporary partial vision loss, hearing loss, PTSD, a traumatic brain injury (TBI), and other different abilities after one or more unexpected events. Similarly, I have an autoimmune disorder (psoriatic arthritis/ankylosing spondylitis), PTSD, anxiety, depression, chronic migraine disorder, non-diabetic hypoglycemia, a TBI, and ADHD.

Interview protocol

Harvey’s dialogic serial interview process served as the foundation of the interview protocol. The foremost intention throughout the broader study was to respect the participant’s agency, safety, and comfort by creating an open, participant-driven dialog. Using Harvey’s process provided participants with the opportunity to take control of their phenomenology throughout the research process [30]. Harvey’s process also optimized the participants’ agency over theorizing their own experience [30]. The interview protocol consisted of iterative rounds of data collection and data analysis. Each 30-60 min interview included a loosely structured discussion and prompt before evolving into a participant-led informal conversation. Each interview also included a discussion about the process, reminders about participant rights, an invitation for participants to check in, and an invitation for both parties to set boundaries.

During the first round of interviews, I asked each participant “When you think about your experience as a graduate student with disabilities or different abilities, what comes to mind?”. Subsequently, I analyzed the interviews and built an initial phenomenology for each participant describing the “meaning”, “significance”, or “essence” of the phenomena [27] [30]. Then I met with each participant to share potential themes in an initial phenomenology to get their thoughts on the potential themes. This process was similar to member checking. Member checking is when a researcher takes findings back to the participants to determine if the participants feel they are accurate [27]. However, this interview protocol went beyond member checking. Although this manuscript does not present theory, the serial interview process also used grounded theory to co-generate theory with the participants. Grounded theory is a strategy where researchers derive theory of a process, action, event, or interaction grounded in the views of the participants [27]. As the participants and I repeated this process in a series of interviews, we iterated on the themes and theorization of the participants’ experiences. During each interview, we redefined and bound the themes within each individual and shared phenomenology [27], [31], [32].

Data Analysis

A process known as open coding [27] guided the identification of themes for the phenomenology and autoethnography. The first step of the process was cleaning the transcripts or documents while flagging potential statements of interest with short descriptive labels. The second step was reviewing the data while organizing it into loosely held chunks. Finally, the third step was iterating on the analysis, while reorganizing the chunks of data into loosely held themes. After each interview, I used this process to analyze the interview transcripts and recordings before returning to the participants with potential themes. Once all the interviews were complete, I repeated the analysis process on my journal entries, meeting notes, emails, and medical

documentation to create my autoethnography [28], [32]. After building the phenomenology and autoethnography, I triangulated the results. Triangulation is the use of multiple sources of information to build a coherent justification of themes based on convergence [27]. Using a mixed-method approach with Harvey's process allowed me to use two strategies to check the qualitative validity of the results. Qualitative validity refers to the consistency of the researcher's approach across data sources, methodologies, and projects [27].

Results and discussion

Once I completed the data collection and analysis portion of the broader study, I met with two contributors. Both contributors were previously authorized by the University of Colorado, Boulder Institutional Review Board (IRB) to access the de-identified results of the broader study. I presented them with a multitude of themes. A few examples included receiving, comprehending, processing, and remembering information; demonstrating knowledge: when, what, where, and how; and physical, social, and cultural environments. Following our discussion, I decided to expand this effort into a broader study.

I plan for the broader study to focus on multiple facets of structural dis/ableism. I believe this is necessary to adequately explore the rich, in-depth, and extensive nature of this research. The contributors and I also found it prudent to disseminate some of the key findings from this first phase of research through multiple timely publications.

The key finding presented in this manuscript is that institutions/programs seem poorly prepared to help graduate students with invisible disabilities or different abilities. Both participants found themselves having to hunt for resources and identify their own solutions. They found themselves having to accommodate themselves.

Both participants emphasized their belief that many policies don't account for the variety of needs students have. They described how arduous the process of trying to find an accommodation to match a student's needs can be. This was true even when their institution's student disability services offices (SDSO) had worked with students with the same disability or different ability before. The participants described how students sometimes needed to try out accommodations, find out if they would work or not, and then go back through the approval process to find an accommodation that might address the student's need. The participants had to reflect on their experiences to learn how they learned and worked best. This process is referred to as metacognition [33].

Institutions can determine what is a "reasonable accommodation". And I think many plans don't account for the variety of needs students have. Also, if a student tries out one thing and it doesn't work, it can be difficult to keep changing it to match what you need because I think any accommodation has to go through the approval process.

The participants realized that the accommodations their SDSO offered were reactionary. Their experience led them to believe that SDSO's would consider "unexpected" or unusual accommodation requests to be unreasonable accommodations until enough students asked for a specific accommodation "loud enough". One participant described how easily asking for

accommodations, beyond the standard undergraduate classroom accommodations (e.g., extra time on exams or screen readers), can turn into an “administrative death of a thousand cuts”.

There's a bit in the ADA that says that accommodations can't be toooooo difficult for the institution to fulfill (reasonable accommodation) so if folks ask for accommodations the institutions feel are too burdensome, then they can ask for an extension or suggest a different accommodation and over time it (can) become an administrative death of a thousand cuts. Most accommodations are also reactionary. A student says, "hey this captioning isn't good enough" and when a ton of people say it loud enough it gets changed, but there's very little pro-active accommodation thought, and accommodations themselves are often very limited. As an example, I do much better with math when I can speak aloud and move, either walking or bouncing or hand-flapping, but that's not an accommodation style that is expected. Only MORE QUIET is seen as something folks need.

Even in my own experience, authorities interpreted some of my accommodation requests as unreasonable. It felt as if my inherent worth had been called into question on one such occasion. I had found a list of potential PTSD accommodations online. The list made me feel validated and empowered. I was excited to make a request. However, after I made what the coordinator considered an unreasonable request, I was scared that I would lose my funding.

My heart still races when I recall the ADA coordinator asking me, “Are you telling me you are unable to do your job?” At that moment, I had to instantly weigh what the coordinator’s motive might have been. Were they asking because a person must be unable to do their job to gain accommodations? Or had they decided no reasonable accommodation could be made and were trying to ascertain if I needed to be dismissed from my job at the university?

The participants had trouble finding out what resources and accommodations were even available to them. They were not able to find out what resources and accommodations might be available to them through their advisers, instructors, SDSOs, or other campus offices. The participants described having to hunt down resources by themselves. They described how simply finding these resources took years to accomplish.

I mean all of those things that I now know about, years later, I did not know about initially. But there was an expectation that I did know about it. And there weren't resources out there—enough for me anyway.

I also had difficulty finding out what resources and accommodations were available. Hearing the participant’s stories, I was reminded of the frustration and hopelessness I felt when I first asked my SDSO coordinator about accommodations for PTSD. It became clear that the SDSO coordinator would or could not tell me what accommodations were available.

After a lot of back-and-forth, I realized the SDSO coordinator wanted me to identify the accommodations I needed. They wanted me to identify what I needed without revealing what accommodations were available or what they had made in the past. I was at a loss for what to request. I knew nothing about accommodations.

Throughout the interviews, the participants described having to find, learn, and pay for multiple assistive technologies (e.g., notetaking and screen reading software) for their coursework and research to find something that would work for them. The participants felt like they had to accommodate themselves.

I've had to teach myself software. I've had to purchase software both to help me study, but also to do my research.

I feel like I have to accommodate myself.

Both participants found themselves navigating the academy in the absence of graduate student accommodation policies. The participants' advisers, programs, and institutions (including the graduate school and SDSO) did not have any infrastructure, pathways, or procedures for people with disabilities or different abilities to pursue research and PhD requirements.

It was just, you know, it was a constant effort of finding what doesn't work. And the reality is that you only have a semester to figure out if this new tool is working... No one really has any idea on how to help someone with [Disabilities/different abilities] tackle the research path, because you have to take two paths. You have to take the coursework path, and you have to take the path of trying to start your, let's say application for funding, literature review, or drafting your proposal.

The lack of institutional policies regarding graduate student accommodations was not unique to their experience. I tried to obtain accommodations for my doctoral competency exams (what my department referred to as preliminary exams, comprehensive exams, and the final dissertation defense). I was particularly concerned about the duration of the comprehensive exam (which would take place over five consecutive \geq eight-hour days). Without a policy, I was left running in circles with no one who knew how to help. I just wanted to know if obtaining a PhD would even be possible before I devoted any more time and finances to my education.

The coordinator told me that the SDSO only handled accommodations for coursework and that it would be up to my department. So, I went to my department. They wanted to help but had never had a student ask for accommodations on their comprehensive exam before. They explained there wasn't a precedent for accommodations, and I should go to the SDSO with my request. After going back and forth between the department and SDSO I went to my adviser and tried requesting an informal accommodation (breaking the exam into shorter nonconsecutive chunks). My adviser explained they needed to consider what was fair to the other PhD students, but we could figure something out when it was time for me to take the comprehensive exam.

These problems are not isolated to just the participants and me. Prior literature discussed some of these same issues. Internationally, institutional accommodation policies often put the burden on university students to initiate, negotiate, and manage their support [16]. University students in Australia found it difficult to ascertain what institutional support was available to them [16]. Even if those Australian students were able to make it through their institution's disclosure and proof-of-disability process, they often perceived the accommodations and support they received

to be ineffective [16]. Unfortunately, many academic institutions have not yet developed accommodation policies for graduate students [10].

While analyzing the potential themes in the interviews, the participants requested this manuscript highlight specific problems. They also provided recommendations based on the lessons they learned while navigating their academic environments in the absence of research and graduate pathway accommodation policies.

Recommendations

The following paragraphs present some of the problems highlighted by the participants and their recommendations to address the problems. These paragraphs discuss the problems and recommendations while tying them into the current body of knowledge. Finally, I build on the results and literature to offer strategies targeting specific considerations.

The participants in this study emphasized their desire for departments to define and explicitly communicate their requirements. Prior publications have made similar recommendations. Publications have recommended individual departments or programs explicitly define the essential requirements of each of their degree options [10], [34], expose hidden curriculum [35], [36] by making their requirements publicly available [11], [23], and discuss their requirements with prospective students [10]. Rose further recommended that universities provide departments with resources to develop and communicate their requirements and requisite learning objectives [10]. Rose also recommended that universities could provide a process for mediating requests for accommodation that would take program-specific requirements into consideration [10]. I recommend that departments, colleges, graduate schools, and SDSOs work together to identify conflicts and gaps in each of their expectations. Additionally, I would suggest that these groups engage student unions and societies as well as alumni, professional organizations, and disability rights groups to evaluate and provide feedback on the accessibility and effective communication of their expectations.

The participants attributed some of their difficulty accessing their graduate education to their instructors' and advisers' knowledge of accessibility and accommodation policies and options. The participants noted encountering rigid requirements, not knowing they could ask for alternative pathways, what accommodations were available, and how to obtain accommodations. The participants recommended Universities provide training programs to instructors and advisers. The purpose of such programs would be to train instructors and advisers in inclusivity and accessibility. The programs could help instructors and advisers identify and redesign problematic policies, practices, and curriculum. These programs could also inform instructors and advisers on what campus and community resources are available to students. This would allow instructors and advisers to share resources with students and better support the diverse student population. Prior literature has recommended that universities and departments offer, incentivize, or require post-graduate education programs for instructors and advisers [34], [37], [38]. I would recommend that such programs help advisers and instructors consider multiple pathways or alternative modalities for graduate students to consume content, engage in their learning, and demonstrate their knowledge. I would also encourage departments to explicitly communicate the flexibility in their degree pathways.

We, in academia, often design our curricula, set our requirements, and choose our learning objectives based on our “beliefs and assumptions about what students do and should know and what they can and should be able to do” [37]. Our culture and perception of diversity, roles, student needs, and students’ prior knowledge can block progress toward inclusivity [39]–[41], and silence challenges to the status quo [42]. Training programs could help student-facing faculty and staff critically examine their practices through an ableism lens [43]. Communities of practice could be established to help faculty and staff interrupt and challenge their assumptions and beliefs. If such programs are not yet available, as is commonly the case, I would recommend instructors, advisers, administrators, and staff engage with andragogical coaches, published literature (e.g., [44], [45]), or even professional development courses on inclusive andragogy.

Inclusive andragogy, also known as universal design for learning (UDL), can be used to decrease stigma in our institutions [20]. Although UDL is usually targeted at the classroom level, the principles can be applied universally. Prior literature recommends policymakers use UDL principles in examining, revising, and writing new policies [43]. Inclusive andragogy could guide departments, advisers, and supervisors in expanding the accessibility of their research projects, thesis/dissertation paths, and programs. I would recommend these individuals and groups use UDL principles to promote a shift to more inclusive norms and climates. Prior literature has recommended graduate orientation [46] and mentoring programs [47]. I would recommend that these programs and even required courses expose students to university resources, potential pathways or approaches, and metacognition. Further, I would recommend University and department leadership enable their faculty and staff to participate in making their environment more inclusive by considering and rebalancing the different responsibilities and expectations they require of faculty and staff (e.g., research, teaching, service, and professional development).

The participants also recommended advisers regularly check in with their graduate students on their wellbeing and understanding of requirements. Prior literature has suggested such meetings be held on a regular or semester basis [37], [38]. However, the participants in this study point out how doing this on a once-a-semester basis is not enough. A participant stated, “If a student is falling behind identifying the problem too late can have serious consequences”. They added that checking in with students early and often (perhaps every week) can help establish a trusting relationship that invites students to be vulnerable with their adviser who “holds your future in their hands”. During these check-ins, I would recommend that advisers and students learn about and employ principles of effective communication. Books such as *Crucial Conversations* [48] and *Dare to Lead* [49] offer instruction on practicing effective communication. I would also recommend advisers and students regularly communicate their individual understanding of any requirements and learning objectives to confirm their understandings are in agreement. Allowing students to advocate for themselves can contribute to managing the stigma of invisible disabilities [50]. I would recommend advisers encourage self-advocacy and help students explore their own understanding. Specifically, advisers could engage students in metacognition and invite students to propose and map out their individual approaches to meeting the requirements and learning objectives of their program.

Limitations

This study had several limitations. The aim of this study was to explore participants' experiences in depth while building a trusting relationship and respecting the needs and boundaries of the participants. I chose to use a convenience sampling method because the participants and I already had a level of familiarity with each other and knew that we shared identities relevant to the study. However, the participants may have been hesitant to share information or stories about events I might be familiar with or people whom I might know. The information the participants already knew about my own experiences as a graduate student with disabilities may have influenced what information they chose to share in their interviews. Despite these concerns, I believe that my insider identity and participant-driven interview approach allowed the participants and me to establish a deeper level of trust, safety, and vulnerability than could otherwise have been developed in the short data collection timeframe [51]. The contributors and I believe that my membership within the target population was invaluable to the design and implementation of this study.

Outside of having a prior relationship with the participants, I also held bias around my own experiences as a member of the population. This bias guided my verbal and nonverbal communication in interviews and interpretation of the data. The contributors were able to review the preliminary data and provide insights from their own distinct perspectives. Each held a different role in the academy while embodying similar and dissimilar identities, experiences, and perspectives to the target population of this study. Angela R. Bielefeldt (she/her/hers), my current adviser, provided her perspective as an engineering faculty member without personal experiences related to disabilities. Over the last 25 years, she has worked with many undergraduate and graduate students to provide them with accommodations in the classroom setting. Robyn E. Sandekian (she/her/hers), my mentor, provided her perspective as a staff member and as a prior engineering student who experienced and received informal accommodations for severe anxiety and depression during her academic career. As a staff member, she has experienced the frequent tension between wanting to support a student and being limited by institution policy and law.

Additionally, the interview participants and I are not just graduate students with invisible disabilities or different abilities. We each have a nuanced positionality (social status) and intersectionality (experience of interlocking oppressions) that contribute to our experiences and influence our epistemology (theory of knowledge) [52]. Originally the participants intended to share brief introductions about their intersectionality in this manuscript. However, the participants and I wanted to minimize the inclusion of any identifiable information. We iterated on short descriptions that sought to balance these intentions. However, the participants decided to only include descriptions related to their disabilities or different abilities in this manuscript. Although the participants' positionality statements are not included in this manuscript, I believe this manuscript is able to accomplish the objectives, listed in the introduction section. Note: My positionality statement can be found on my website at <https://dcbeardmore.com/>.

Future research

Several future research questions could be explored. The introduction section of this manuscript examined the dearth of knowledge pertaining to graduate students with disabilities. The results

and discussion section provided some examples of phenomena identified in the first phase of this research, that are not explored in this manuscript. Each of these areas would benefit from further study.

Additionally, the recommendations subsection listed examples of interventions that would also benefit from further study. A few examples of topics that could inform the development of such interventions include:

- What accommodation policies, accessibility resources, and degree requirements do institutions, STEM programs/departments, or individual faculty already have? What gaps are there in the current policies and resources of institutional policies/offices and program departments?
- What level of flexibility would professors, programs, and departments be willing to consider in their requirements?
- What adjustments are needed for graduate education in STEM to become accessible to students with disabilities? What are some best practices (e.g., accommodation or accessibility policies) that we could use as a benchmark?

The results and discussion section also introduced the need for the ongoing broader study on structural dis/ableism.

Conclusions

This paper develops an in-depth perspective of what engineering graduate students with invisible disabilities or different abilities have experienced while navigating their institutions' accommodations policies. The investigation draws on a series of interviews to explore the participants' prior interactions with administrators and faculty at various levels of their home institutions. The investigation uses themes in the participants' experiences to identify gaps in the current body of knowledge, share recommendations, and propose areas for future research.

The participants in this study fell in a gap between university-level accommodation policy and departmental practices. The results highlight how the individuals in this study experience the absence of graduate disability accommodation policies. The participants discussed not knowing what accommodations, if any, were available to them; who could provide the accommodations; how to obtain formal accommodations; or that informal accommodations might even be a possibility in some cases. They talked about how this lack of knowledge regarding accommodations especially as they applied to the research compounded their difficulty in meeting their departments' requirements. This was especially difficult, as the participants had a difficult time discovering their department's hidden curricula or implicit expectations and requirements. The manuscript shares the participants struggle in negotiating with their departments (who lacked any precedent or experience providing graduate accommodations) and their SDSO's (who lacked research, thesis, and dissertation track policies). The results also highlight the participants' recommendations including explicitly communicating requirements, providing training to instructors and advisers, and holding regular adviser-student check-ins.

This paper has multiple practical implications. It recognizes the experiences and perspectives of graduate students with disabilities or different abilities. It is intended to validate and hopefully provide a sense of solidarity to readers (including students, faculty, and staff) with disabilities.

The paper provides instructors, professors, advisers, and support staff with recommendations grounded in the lived experiences of the participants. Hopefully, the paper inspires researchers to continue recognizing and exploring the experiences of graduate students with disabilities. Hopefully, it also inspires readers to continue recognizing and learning about the experiences of others while finding ways to continually adjust their perceptions, approach, and practices to be more inclusive.

Acknowledgments

I would like to thank the participants for their vulnerability and contribution to this study. I would also like to thank my adviser and mentor. The collective contributions of my adviser and mentor included but were not limited to 1) helping brainstorm safeguards for participant interaction and engagement, 2) reviewing my proposed research protocol and providing guidance while I navigated the University of Colorado, Boulder IRB's review process and gained approval for the broader study, 3) recommending literature relevant to the background and problem explored in the broader study, 4) reviewing the preliminary findings, and 5) editing this manuscript.

This work was conducted while I attended the University of Colorado, Boulder. I honor and acknowledge that the University is located on the land of the Ute, Cheyenne, and Arapaho peoples. Further, I acknowledge that 48 contemporary tribal nations are historically tied to the lands that make up the state of Colorado. Although I do not disclose the land where the participants were located during this study, I honor the Tribal Nations to whom each land belongs. I recognize the Indigenous peoples as the original stewards of the land, water, plants, and animals who called these places home. I also acknowledge the painful history of genocide and forced removal from these territories. I respect the many diverse Indigenous peoples still connected to these lands. I pay my respect to them and give thanks to all Tribal Nations and the ancestors of these territories.

I acknowledge the limitations in my own personal and social awareness. Further, I acknowledge the limitations of the language I use and cite in this study as I learn about myself and others while evolving my worldviews, language, and practices. I have dedicated space on my website, listed in my author bio, to acknowledge such limitations in my publications.

I also provide my current and historical positionality statements on my website to acknowledge the fluid and evolving nature of my identity and understanding of my positionality.

I received no funding for this research and have no conflicts of interest to report.

References

- [1] A. Lillywhite and G. Wolbring, "Undergraduate Disabled Students as Knowledge Producers including Researchers: A Missed Topic in Academic Literature," *Educ. Sci.*, vol. 9, no. 4, pp. 259, 2019, doi: 10.3390/educsci9040259.
- [2] National Educational Association of Disabled Students (NEADS), "Comparison of Specific Populations of Graduate Students with Disabilities Using 2016 CGPSS Data." 2019.

Accessed: Aug. 11, 2021. [Online]. Available:

https://www.neads.ca/en/about/media/CombinedReport_Nov28.pdf

[3] M. Lizotte and S. Clifford Simpican, “Doctoral Students With Disabilities: Challenges In Graduate Programs And Research Methodology,” *J. Study Postsecond. Tert. Educ.*, vol. 2, pp. 181–193, 2017, doi: 10.28945/3900.

[4] S. A. Smith, E. Woodhead, and C. Chin-Newman, “Disclosing accommodation needs: exploring experiences of higher education students with disabilities,” *Int. J. Incl. Educ.*, vol. 25, no. 12, pp. 1–17, 2019, doi: 10.1080/13603116.2019.1610087.

[5] R. Vergunst and L. Swartz, “‘He doesn’t understand that he’s struggling with the way I felt’ – university students, psychosocial disability and disclosure in the Western Cape, South Africa,” *Disabil. Soc.*, vol. 36, no. 2, pp. 226–239, 2021, doi: 10.1080/09687599.2020.1730159.

[6] Alison Hillman and Gerard Quinn, “Justice for all Q&A: A Different Approach to Disability,” *Open Society Foundations Voices*, 2021. Accessed: Aug. 9, 2021. [Online]. Available: https://www.opensocietyfoundations.org/voices/q-and-a-a-different-approach-to-disability?utm_source=news&utm_medium=email&utm_campaign=news_080621&utm_content

[7] D. Marks, “Models of disability,” *Disabil. Rehabil.*, vol. 19, no. 3, pp. 85–91, 1997, doi: 10.3109/09638289709166831.

[8] Americans with Disabilities Act of 1990, Pub. L., No. 101-336, 104 Stat. 328, 1990.

[9] D. Goodley, *Dis/Ability Studies: Theorizing disablism and ableism*, 1st ed. New York, NY: Routledge, 2014.

[10] M. Rose, “Accommodating Graduate Students with Disabilities,” Council of Ontario Universities, Toronto, 2010. [Online]. Available: <http://www.cags.ca/documents/highlites/AC-Working-Paper---Accommodating-Graduate-Students-with-Disabilities---May-2010-1.pdf>

[11] V. Farrar, “Equal to the task: Disability issues in postgraduate research study,” in *Towards Inclusive Learning in Higher Education*, 1st ed., M. Adams and S. Brown, Ed. London, England: Routledge, 2006, pp. 176-186, doi: 10.4324/9780203088623.

[12] D. C. Appleby and K. M. Appleby, “Kisses of death in the graduate school application process,” *Teach. Psychol.*, vol. 33, pp. 19–24, 2006, doi: 10.1207/s15328023top3301_5.

[13] A. Jacklin, “To be or not to be ‘a disabled student’ in higher education: the case of a postgraduate ‘non-declaring’ (disabled) student,” *J. Res. Spec. Educ. Needs*, vol. 11, no. 2, pp. 99–106, 2011, doi: 10.1111/j.1471-3802.2010.01157.x.

[14] M. L. Sanchez-Pena, N. Ramirez, X. R. Xu, and D. B. Samuel, “Work in Progress: Measuring Stigma of Mental Health Conditions and Its Impact in Help-seeking Behaviors Among Engineering Students,” presented at the 2021 ASEE Virtual Annual Conference, 2021. [Online]. Available: <https://peer.asee.org/38181>

[15] S. Grimes, “University student experience of disability and the influence of stigma on institutional non-disclosure and learning,” *Journal of Postsecondary Education and Disability*, vol. 33, no. 1, pp. 23-37, 2020. [Online]. Available: <https://eric.ed.gov/?id=EJ1273678>

[16] S. Grimes, J. Scevak, E. Southgate, and R. Buchanan, “Non-disclosing students with disabilities or learning challenges: characteristics and size of a hidden population,” *Aust. Educ. Res.*, vol. 44, no. 4, pp. 425–441, 2017, doi: 10.1007/s13384-017-0242-y.

[17] National Center for Science and Engineering Statistics, “Women, Minorities, and Persons with Disabilities in Science and Engineering: 2021,” National Science Foundation, Alexandria, VA, Special Report NSF 21-321, 2021. [Online]. Available: <https://nces.nsf.gov/wmpd>

[18] K. M. Soria, B. Horgos, I. Chirikov, and D. Jones-White, “The experiences of undergraduate students with physical, learning, neurodevelopmental, and cognitive disabilities

- during the COVID-19 pandemic,” SERU Consortium, University of California - Berkeley and University of Minnesota, 2020. [Online]. Available: <https://hdl.handle.net/11299/216715>
- [19] E. Cech, “Engineering’s Systemic Marginalization and Devaluation of Students and Professionals With Disabilities,” presented at the 2021 ASEE Virtual Annual Conference, 2021. [Online]. Available: <https://peer.asee.org/37080>
- [20] W. James, C. Bustamante, K. Lamons, and J. Chini, “Beyond Disability as Weakness: Perspectives from Students with Disabilities,” presented at the Physics Education Research Conference 2018, Washington, DC, 2018. doi: 10.1119/perc.2018.pr.James.
- [21] U. S. Department of Education, National Center for Education Statistics, “2015–16 National Postsecondary Student Aid Study,” NPSAS:16. 2019. [Online]. Available: <https://nces.nsf.gov/pubs/nsf19304/data>
- [22] M. Gordon and S. Keiser, “Accommodations in higher education under the Americans with Disabilities Act (ADA): A no-nonsense guide for clinicians, educators, administrators, and lawyers.,” GSI Publications/Guilford Press, Dewitt, NY, 2000.
- [23] L. M. Meeks *et al.*, “The Unexamined Diversity: Disability Policies and Practices in US Graduate Medical Education Programs,” *J. Grad. Med. Educ.*, vol. 12, no. 5, pp. 615–619, 2020, doi: 10.4300/JGME-D-19-00940.1.
- [24] C. Woodcock, “Mothers of Children with Dyslexia Share the Protection, ‘In-Betweenness,’ and the Battle of Living with a Reading Disability: A Feminist Autoethnography.,” *Qual. Rep.*, vol. 25, no. 6, pp. 1637–1657, 2020, doi: 10.46743/2160-3715/2020.4162.
- [25] M. Thomas-Franklin, “An Exploration of the Lived Experience of African American Women Who Experienced Infidelity in Their Monogamous Relationship and Their Journey to Healing: An Autoethnography and Narrative Inquiry,” Psy.D., Saybrook University, Ann Arbor, 2020. [Online]. Available: <https://colorado.idm.oclc.org/login?url=https://www.proquest.com/dissertations-theses/exploration-lived-experience-african-american/docview/2420096814/se-2?accountid=14503>
- [26] S. Zheng, “A Multi-methods Approach in Communication Studies,” *Commun. Methods*, vol. 1, no. 2, pp. 196–208, 2019, doi: 0.35951/v1i2.43.
- [27] J. W. Creswell, *Research Design*, 4th ed. Thousand Oaks, CA: SAGE Publications, 2014.
- [28] C. Ellis, T. E. Adams, and A. P. Bochner, “Autoethnography: An Overview,” *Hist. Soc. Res. Hist. Sozialforschung*, vol. 36, no. 4 (138), pp. 273–290, 2011. [Online]. Available: <http://www.jstor.org/stable/23032294>
- [29] A. M. I. Lee, “The 13 disability categories under IDEA,” *understood.org*, 2014. Accessed: Aug. 15, 2021. [Online]. Available: <https://www.understood.org/articles/en/conditions-covered-under-idea>
- [30] L. Harvey, “Beyond member-checking: a dialogic approach to the research interview,” *Int. J. Res. Method Educ.*, vol. 38, no. 1, pp. 23–38, 2015, doi: 10.1080/1743727X.2014.914487.
- [31] K. Krippendorff, *Content Analysis An Introduction to Its Methodology*, 2nd ed. Thousand Oaks, CA: SAGE Publications, 2004.
- [32] J. Saldana, *The coding manual for qualitative researchers*, 3rd ed. Thousand Oaks, CA: SAGE Publications, 2016.
- [33] D. J. Hacker, J. Dunlosky, and A. C. Graesser, *Handbook of metacognition in education*. London, England: Routledge, 2009.

- [34] National Academies of Sciences Engineering, and Medicine, *Graduate STEM Education for the 21st Century*. Washington, DC: The National Academies Press, 2018. doi: 10.17226/25038.
- [35] G. Rugg and M. Petre, *The unwritten rules of PhD research*, 3rd ed. London England: Open University Press McGraw-Hill Education, 2020.
- [36] I. Villanueva, L. A. Gelles, M. Di Stefano, B. Smith, R. G. Tull, S. M. Lord, L. Benson, A. T. Hunt, D. M. Riley, and W. G. Ryan, "What Does Hidden Curriculum in Engineering Look Like and How Can It Be Explored," presented at the 2018 ASEE Annual Conference & Exposition, Salt Lake City, UT, 2018. doi: 10.18260/1-2--31234.
- [37] C. Hockings, "Inclusive learning and teaching in higher education: a synthesis of research," York: Higher Education Academy, 2010. [Online]. Available: <https://www.advance-he.ac.uk/knowledge-hub/inclusive-learning-and-teaching-higher-education-synthesis-research>
- [38] K. D. Roberts, H. J. Park, S. Brown, and B. Cook, "Universal Design for Instruction in Postsecondary Education: A Systematic Review of Empirically Based Articles," *J. Postsecond. Educ. Disabil.*, vol. 24, no. 1, pp. 5–15, 2011. [Online]. Available: <https://eric.ed.gov/?id=EJ941728>
- [39] N. Zepke and L. Leach, "Improving student outcomes in higher education: New Zealand teachers' views on teaching students from diverse backgrounds," *Teach. High. Educ.*, vol. 12, no. 5–6, pp. 655–668, 2007, doi: 10.1080/13562510701596190
- [40] C. Hockings, S. Cooke, and M. Bowl, "Learning and teaching for social diversity and difference in higher education," Colchester, Essex: Economic and Social Research Council, RES-139-25-0222, 2008, doi: 10.5255/UKDA-SN-850016.
- [41] J. Shaw, B. Brain, K. Bridger, J. Foreman, and I. Reid, "Embedding widening participation and promoting student diversity. What can be learned from a business case approach?," York: Higher Education Academy, 2007. [Online] Available: <https://www.advance-he.ac.uk/knowledge-hub/summary-embedding-widening-participation-and-promoting-student-diversity>
- [42] M. Koro-Ljungberg, "'Democracy to come': a personal narrative of pedagogical practices and 'Othering' within a context of higher education and research training," *Teach. High. Educ.*, vol. 12, no. 5–6, pp. 735–747, 2007, doi: 10.1080/13562510701596331.
- [43] E. J. Hutcheon and G. Wolbring, "Voices of 'disabled' post secondary students: Examining higher education 'disability' policy using an ableism lens.," *J. Divers. High. Educ.*, vol. 5, no. 1, pp. 39–49, 2012, doi: 10.1037/a0027002.
- [44] ASSETT, "Universal Design for Learning," 2020. Accessed: Dec. 11, 2020. [Online]. Available: <https://www.colorado.edu/asset/faculty-resources/services/udl>
- [45] CAST, "About Universal Design for Learning," 2020. Accessed: Dec. 11, 2020. [Online]. http://www.cast.org/our-work/about-udl.html#.X01_z-hKiU1
- [46] M. E. Lang, "The need for graduate orientation," *J. Coll. Orientat. Transit. Retent.*, vol. 11, no. 2, 2004, doi: 10.24926/jcotr.v11i2.2597
- [47] E. J. Grant-Vallone and E. A. Ensher, "Effects of peer mentoring on types of mentor support, program satisfaction and graduate student stress.," *J. Coll. Stud. Dev.*, vol. 41, no. 6, pp. 637-642, 2000. [Online]. Available: <https://www.proquest.com/scholarly-journals/effects-peer-mentoring-on-types-mentor-support/docview/195179069/se-2?accountid=14503>
- [48] K. Patterson, J. Grenny, R. McMillian, and A. Switzler, *Crucial conversations*. Maidenhead, England: McGraw-Hill Contemporary, 2002.
- [49] B. Brown, *The Power of Vulnerability*. Boulder, CO: Sounds True, 2012.

- [50] L. R. Strand, "Toward the Transformative Inclusion of Students with Nonvisible Disabilities in STEM: An Intersectional Exploration of Stigma Management and Self-Advocacy Enactments," The Ohio State University, Ohio, 2019. [Online] Available: http://rave.ohiolink.edu/etdc/view?acc_num=osu1554920049665926
- [51] D. Bridges, "'Nothing About Us Without Us': The Ethics of Outsider Research," in *Philosophy in Educational research: Epistemology, Ethics, Politics and Quality*, Cham, Switzerland: Springer International Publishing, 2017, pp. 341–361.
- [52] D. Takacs, "How Does Your Positionality Bias Your Epistemology?," in *Thought & Action*, 2003, vol. 27. [Online]. Available: http://repository.uchastings.edu/faculty_scholarship/1264