Understanding Disability Services Toward Improving Graduate Student Support

Murtaza Tamjeed
School of Information
Rochester Institute of Technology
Rochester, USA
mt1256@rit.edu

Vinita Tibdewal
School of Information
Rochester Institute of Technology
Rochester, USA
vt2173@rit.edu

Madison Russell
School of Information
Rochester Institute of Technology
Rochester, USA
mmr4561@rit.edu

Michael McQuaid
School of Information
Rochester Institute of Technology
Rochester, USA
mickmcquaid@gmail.com

Tae Oh
School of Information
Rochester Institute of Technology
Rochester, USA
thoics@rit.edu

Kristen Shinohara
School of Information
Rochester Institute of Technology
Rochester, USA
kristen.shinohara@rit.edu

ABSTRACT

Few students with disabilities transition from undergraduate to graduate programs. Graduate students often receive ineffective and insufficient accommodations, including lack of support specific to graduate students, because disability services policies are shaped by undergraduate experiences. To understand how disability services offices accommodate graduate students: we (1) critically analyzed disability services websites of 18 U.S. institutions, and (2) interviewed 17 disability services staff. Disability services websites publicly present institutional accommodation policies and guidelines, and staff are responsible for identifying, providing, and implementing reasonable accommodations. We found that policies may be interpreted differently depending on specific student circumstances. We discuss our findings in two main themes: (a) ***Policies and attitudes ascribed to disability, technology, and faculty***, and (b) ***Impacts of policies and perspectives on accommodation decisions for graduate students***. The contributions of this work include an empirical investigation of institutional support for disabled graduate students and suggestions for how to improve support from disability services offices to empower students.

CCS CONCEPTS

• **Human-centered computing** → **Accessibility**; • **Social and professional topics** → **Computing education**.

KEYWORDS

Accessibility, Higher Education, Computing Education Research, Ableism

ASSETS '21, October 18–22, 2021, Virtual Event, USA

ACM ISBN 978-1-4503-8306-6/21/10…$15.00
https://doi.org/10.1145/3441852.3471231

ACM Reference Format:
Murtaza Tamjeed, Vinita Tibdewal, Madison Russell, Michael McQuaid, Tae Oh, and Kristen Shinohara. 2021. Understanding Disability Services Toward Improving Graduate Student Support. In *The 23rd International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '21), October 18–22, 2021, Virtual Event, USA.* ACM, New York, NY, USA, 14 pages. https://doi.org/10.1145/3441852.3471231

1 INTRODUCTION

In the United States approximately 26% of individuals above the age of 18 have some disability [19]. According to the National Science Foundation[1] 2017 Survey of Earned Doctorates, 19.49% of the students enrolled in undergraduate programs in the United States have one or more disabilities. By contrast, the total number of students with disabilities who earned doctorate degrees in 2017 was approximately 7.2%. This percentage further decreases to 5.5% for students with disabilities in computing doctorate programs. Data from the National Postsecondary Student Aid Study in 2012 [21] indicated that roughly 11% of undergraduates but only 7% of graduate students self-identified as having a disability, where one in four undergraduates but one in five graduate students were likely to enroll in science and engineering programs. We admit that accurate data on disability is hard to collect and understand [7], yet the decrease in numbers indicates few students with disabilities transition from undergraduate to graduate programs, especially in computing fields. The underrepresentation of disabled[2] students in computing graduate programs is problematic as it suggests less diversity among researchers. This lack of representation at the highest levels in computing can negatively impact innovation overall [14, 20].

Disability laws in the U.S., such as the Americans with Disabilities Act of 1990 under Section 504 and the Federal Rehabilitation Act of 1973, mandates institutions of higher education provide reasonable accommodations and equal access to students with disabilities. In response to these laws, disability services offices were created at institutions of higher education to provide access to education to students with disabilities. For students to receive accommodations, they need to register with their disability services office and

[1] https://ncses.nsf.gov/pubs/nsf19304/data
[2] We use person-first and identity-first languages interchangeably because individuals may have their own preferences[38, 60].

provide documentation of a diagnosed disability. However, previous research showed that support for students particularly at the graduate level was often ineffective [33, 53] which may discourage disabled students from pursuing graduate school [16, 17]. Despite graduate students' specific needs [33, 45], most research addressing the gap to support disabled students has focused on undergraduate students [10, 12]. Our research focuses on graduate students in computing fields for several reasons:

- Few disabled students transition from undergraduate programs to graduate programs. This lack of representation at the highest level of computing will negatively impact innovation and progress [22].
- Computing students at the graduate level face specific challenges including technical barriers (e.g., accessibility of technical tools) [33, 53, 54].
- Typically, disability services offices' responsibilities are shaped by legal requirements and undergraduate curriculum [34], not graduate-level research activities, creating a gap for graduate research activities.
- Graduate-level education and activities differ significantly from undergraduate-level education [33].

We investigated how disability services offices accommodate graduate students and make research (non-course related) tasks accessible. To do so, we (1) critically analyzed disability services *websites* of 18 U.S. institutions, and (2) interviewed 17 disability services *staff*. We focused on these two institutional aspects because they may directly influence students' success. Disability services websites may be the first point of contact for students seeking information about disability accommodations. The language used in websites may also reflect the ability, willingness and flexibility of the institution to support students. On the other hand, disability services staff are students' direct contact with universities about accommodations. They make decisions that determine the kind of support students receive. Although we focused on how disability services offices decided accommodations broadly, we also considered how decisions might affect technical accommodations and assistive technologies, which may impact students who use advanced technical tools.

A note: The focus of this work is not investigating accessibility and usability of websites nor checking compliance with disability laws such as the Americans with Disabilities Act, or other laws that mandate equal access to academic programs, activities and services for students with disabilities. Rather, we analyzed the content of disability service websites through a lens of ableism [31], taking a critical view of how policies and guidelines were communicated publicly, and focusing on how the language used may be perceived. Similarly, we interviewed disability services staff to understand their roles and services for supporting the students but we did not ask about disability laws.

The findings in the paper highlight two ways that disability services offices' decision making procedures impacted accommodation outcomes that could have material consequences for disabled graduate students: (a) ***Policies and attitudes ascribed to disability, technology, and faculty***; when disability services offices differentiated between students, avoided technical support, and struggled to manage faculty attitudes. (b) ***Impacts of policies and perspectives on accommodation decisions for graduate students***; when institutional policies and staff perspectives resulted in denial, partial provision or tensions around accommodations for graduate students.

2 RELATED WORK

In this section, we present prior work on U.S. university disability services in higher education, experiences of disabled graduate students, and disability services website content analysis, and briefly discuss ableism.

2.1 Disability Services in Higher Education

There are two components of Section 504 of the Rehabilitation Act legislation that created the need for documentation: the student must self-identify their disability and request accommodations, and the student must be *qualified* to receive accommodations [24]. However, there are no set of guidelines for documentation defined at the federal level. Thus, most disability services offices developed institution specific guidelines based on guidelines developed by the Association on Higher Education And Disability (AHEAD) [24]. Prior work assessed that institution specific guidelines follow medical or individual models of disability as opposed to social or universal models for documentation requirements [8, 24, 27, 28]. The medical model focuses on limitations of an individual person due to disability [5, 6, 24], and contends a reliance on medication and rehabilitation are components to integrating into any societal routine [24]. In contrast, the social model pivots the notion of disability as part of the built environment, and advocates for basic human and civil rights for people with disabilities to create an environment of inclusion and equality [24, 41, 55]. Friedman [24] found that a few universities used hybrid models where disability services staff incorporated a social model but many documentation guidelines were rooted in the medical model. It was found that more students registered with disability services offices that implemented hybrid models, and staff who implemented these models had more experience in their current position in higher education [24].

Typically, after documentation of disability is verified, disability services staff collaborate with students and faculty to identify appropriate accommodations. However, prior work found that staff may not have enough resources and/or knowledge about needs associated with students' disabilities, and may not be able to address students' academic requirements in ways that leveraged students' strengths [12, 47]. To implement an accommodation for a particular course, faculty receive letters detailing the approved accommodation from either the student or staff. These letters are produced by the disability services office, and are confidential and do not disclose students' disabilities. Previous research found that some faculty disregard accommodation letters, requiring staff to intervene and explain that the approved accommodations are reasonable accommodations mandated by federal law [42]. In addition, although faculty may acknowledge students' disabilities, they may not know how to accommodate them [42]. These findings are based on student interviews, however, less is known about the direct interaction between disability services and faculty. In our research, we focused on how staff interpreted the policies and procedures set

by disability services offices and how their interpretations affected accommodation policy and implementation.

Prior work investigated the process of accommodation requests [3, 15, 25], however, few software packages exist to smooth the work of disability services offices. Some guides exist for running disability services offices [43, 44, 52] and some work exists on accommodation literature in general [29, 51]. A cursory search for software to aid disability services found three vendors—Symplicity [57], AIM [1], and ClockWorks [11]—devoted to disability services in higher education, although many others addressed insurance and compliance for corporate and government entities. The education-specific software packages [1, 11, 57] all aim to be end-to-end solutions for the needs of disability services offices, including automating processes like producing accommodation letters, exam scheduling, providing content in alternative formats, managing cases, managing appointments, managing note-taking services, and more. These vendors appeared to be liability-focused.

2.2 Graduate Experience for Students with Disabilities

Most prior research investigating accessibility barriers for disabled students in higher education focused on undergraduate experiences [10, 12]. However, graduate level education and activities differ significantly from undergraduate activities [33]. For example, a study about students with learning disabilities found that graduate students needed greater support than undergraduates because the academic, social, and emotional demands of graduate work exceeded those at the undergraduate level [45]. Previous research also revealed that PhD students received ineffective accommodations, often due to inefficient systems and procedures, including lack of support for graduate specific activities [33, 53]. Accommodations requested by graduate students included: captioning, sign language interpreters, scribes and electronically formatted lecture notes, and access to reading material [33, 53]. However, these accommodations may not work in every situation and for every disability [35]. For example, scribes cannot be scheduled for irregular seminar talks, a common scenario for graduate students [30]. As a result, graduate students use ad-hoc strategies, such as seeking help from friends [33, 53].

Prior work reflected student perspectives by conducting interviews or surveys with students [33, 45, 53], but did not consider other institutional aspects that may influence disabled graduate student success. We focused on institutional aspects—specifically, disability services—that impact graduate students' experience: (1) we analyzed disability services websites to understand how accommodation policies and guidelines are communicated and presented. And, (2) we interviewed disability services staff to understand how they accommodated graduate students. We focused on these two aspects to build on existing knowledge about student experiences and to learn more about institutional practices.

2.3 Disability Services Websites Content Analysis

Disability services websites are typically part of a college or university's web presence and contain extensive information for students about how to request accommodations, about legal and institutional policies, about the types of services and assistive technologies available, and about training and other extracurricular resources. The disability services website may be the first presentation of policy that disabled students encounter; and such sites contain important information that students need to know how to request accommodations, such as for events or lecture series on campus. Readily available information on disability services websites can ease the transition to college for students and ultimately can empower them to successfully complete a college degree [18]. However, lack of information on websites may prevent disabled students from obtaining the accommodation they need [40].

Previous website analyses focused mainly on accessibility and usability issues [14, 58]; however, websites' accessibility includes more than just checking source code [62]. For example, language, education literacy, and cultural barriers may affect how easily information is accessed and understood [59]. Few research studies on website content focus on college and university disability services sites. One study that analyzed the content of disability services websites focused on identifying variability of information between institutions in the CUNY college system [18]. Their study revealed that websites of graduate schools tended to have less information on disability services compared to the websites of undergraduate schools; the researchers determined that graduate students required less assistance related to accessibility because they were familiar with the higher education system, including disability services [18]. Contrary to [18], findings about accessibility for graduate students found that their needs were not being met [33, 53, 54]. Similar to [18], we did not focus on usability or accessibility of websites but rather we analyzed the content through a lens of ableism [31]. We were interested to understand how policies and guidelines were presented (and thus may be perceived) rather than understanding variability of information among different websites. We discuss further below how we applied a lens of ableism in our analysis.

2.4 Ableism

Ableism is defined as prejudice and discrimination against people with disabilities, privileging non-disabled individuals over disabled individuals [39]. Ableism can be found at individual, institutional and societal levels [15]. Nachman et al. [46] conducted a critical content analysis on public two-year college websites and found that most colleges' websites were unwelcoming particularly to students with Autism. They found that the websites were replete with ableism and lacked contents related to Autism. In our analysis, we adopted a lens of ableism to critically evaluate stated policies of disability services offices, focusing on how language used on disability service websites may privilege or not privilege different aspects of accommodation decision making. We further used this lens to examine how attitudes exhibited by staff may have benefited or disadvantaged students with disabilities.

Similar to [53, 54], we take the notion of ableism to understand how academic culture and systems may be ableist. Specifically, we consider how disability services offices' policies and staff decisions create or sustain institutional barriers for disabled graduate students. Moreover, disability services are shaped by undergraduate curriculum [34]; thus institutions may lack policies and guidelines on how to accommodate graduate-level activities, such as research

and conferences, disadvantaging disabled graduate students compared to their non-disabled peers. Academic culture prizes individual merit and a certain level of ability is presumed, from accommodating students to supporting their research activity. Taking a lens of ableism, we center that consideration and ask: how could such academic environments center disability and better support students?

3 METHOD

The main goal of this study was to understand how disability services offices support graduate students and what their policies and procedures were with regard to graduate level activities. We first critically analyzed the content of disability services websites of 18 U.S. institutions because the websites are often the first step for students to learn about institutional policies and guidelines, and to learn how to obtain accommodations. Then, we conducted an interview study with 17 disability services staff from 14 different U.S. institutions. Staff working at disability services offices are mainly in charge of identifying, providing and implementing reasonable accommodations for students. In this section, we describe our methods for selecting websites and recruiting disability services staff for interviews, and explain our data analysis approach.

3.1 Websites Content Analysis

We identified and analyzed patterns of how accommodation information was communicated, organized and portrayed on disability services websites. We first listed top graduate engineering programs from US News [50] (27 universities) and top computing universities from CS Ranking [13] (61 universities). We selected the intersection of both lists (22 universities), to reduce source bias and ensure universities we assessed had graduate computing (and related) programs. Then, we added 14 universities from our previous research about doctoral students in computing [54], resulting in 36 universities for analysis. We focused on top institutions because they were likely to have strong research programs and therefore, more graduate students and more students focused on research in general. Such institutions would likely have robust doctoral programs, and have strong support for graduate students, broadly. Understanding disability services procedures and practices for such institutions could help bridge gaps in support for disabled graduate students. We also specifically focused on institutions that have graduate programs in computing to allow considerations for technical accommodations to emerge, as they may occur at high frequency for students in computing and related fields.

Next, we reviewed the 36 websites to identify different categories of accessibility and accommodation information presented. Influenced by previous work to analyze disability services websites [18], we identified 14 accommodation categories that were available at least on one of the websites, such as documentation guidelines, assistive technologies, updates related to COVID-19, housing, dining, among others. Then, we assessed the availability of each accommodation category in each website in more detail, specifically assigning scores depending on if and where we found the information. For each category, we assigned a score of 0, 1, or 2. We scored a "0" when a category was not found on the website; we scored "1" when the category was found through a link redirecting the user outside the university website domain or through a downloadable PDF document; and we scored "2" when a category was found directly on the website, as opposed to external links and PDFs which may be less accessible compared to direct website content. The sum of the score therefore reflects the availability of the information and is shown as "*Accommodation Information Score*" in Table 1. Our goal was to inform our decision of which websites to choose for further content analysis. The Accommodation Information Scores ranged from 7 to 26. A higher score means the website had more information readily available; we sought institutions with a range of scores for analysis.

3.1.1 Websites Information. Out of the 36 websites for which we assessed Accommodation Information Scores, we chose 6 with the highest scores, 6 with lowest, and 6 with mid-ranged scores—18 in total—to conduct in depth inductive thematic analysis, taking care to also ensure regional and institutional size diversity [9], especially when there was more than one institution with the same score. We show information about the university websites we thematically analyzed in Table 1. To keep university names anonymous we represent them with a University ID (UID). Twelve were private universities and six were public universities. We show student enrollment for academic year 2020-2021 and institutional region as reported by U.S. News [50], rounded to the nearest thousand for anonymity. We copied the textual content from each site into separate Google Docs for analysis. In Table 1, we show the number of Google Docs pages of data we analyzed for each website. In total, we analyzed 736 pages of data for the 18 universities, an average of 41 pages of data for each institution. The data was retrieved from September 2020 to November 2020.

3.1.2 Website Data Analysis. Three researchers individually coded the same four websites using an inductive open-coding approach and consolidated codes through weekly discussion. Then, the three researchers split the remaining 14 websites and coded individually. The researchers met bi-weekly to discuss any new codes that were identified. A total of 81 codes were generated. Once open coding was completed, axial and selective coding was conducted together with a larger group of five researchers. This process, conducted over a period of 7 months, helped identify relationships between different groups of codes and helped to prioritize themes, such as what policies and procedures were stated on the websites and how they were communicated. Additional weekly meetings during that time focused on refining relationships between the themes and to finalize the findings.

In general, websites with higher Accommodation Information Scores had comprehensive and well organized content but websites with lower scores did not contain complete and organized information. Unlike the websites with low scores, the websites with higher scores used friendly and conversational tone and language. There was less noticeable difference in content quantity and quality between websites with medium and low scores.

3.2 Disability Services Staff Interviews

In addition to the web content analysis, we conducted semi-structured interviews with 17 representatives from disability services offices across 14 U.S. institutions to understand how staff supported disabled graduate students. The interviews were conducted virtually via video conferencing tools and lasted from 30 to

Table 1: University disability services websites information

UID	Institution type	Student population	Institution region	Accommodation Information Score	Pages of data
U1	Private	2000	West	7	12
U2	Public	36000	Southeast	20	15
U3	Private	16000	Northeast	21	20
U4	Public	16000	Southeast	20	24
U5	Private	47000	West	24	35
U6	Private	12000	Midwest	24	34
U7	Private	13000	Northeast	25	32
U8	Public	48000	West	24	70
U9	Public	20000	Northeast	26	66
U10	Public	16000	Midwest	10	32
U11	Private	17000	West	13	43
U12	Private	21000	Midwest	15	34
U13	Private	24000	Northeast	13	121
U14	Private	8000	Northeast	15	43
U15	Private	14000	Northeast	18	36
U16	Private	13000	Northeast	17	54
U17	Private	21000	West	20	25
U18	Public	22000	Northeast	18	40

90 minutes each. All interviews were recorded and transcribed for analysis purposes.

Our main goal for interviewing staff was to understand their perspectives about how they supported graduate students and how they completed their tasks in providing accommodations to students. Participants were asked to explain the differences in how they accommodated undergraduate and graduate students, if at all. We also asked participants about their roles and responsibilities, documentation requirements, student accommodation requests, their accommodation decision making process, and about challenges coordinating with faculty and other departments.

3.2.1 Participants. We recruited 17 participants from the 36 universities in our website analysis, from listservs such as AccessComputing and AHEAD, and through snowball sampling. We recruited staff (a) who worked at disability services offices, and (b) who accommodated students in computing fields. For reasons of anonymity we present our participants with a Participant ID (PID) and refrain from identifying their affiliation (Table 2). Twelve participants were from private universities and five were from public universities. Participants' titles included Director of Disability Services, Assistant Directors, Access Specialists, Testing Coordinators, among others (see Table 2). About half of the participants were in leadership roles; however, all had experience of working directly with students, and we focused questions primarily on their interaction with students. The total number of disabled students registered with participants' offices ranged from 250 to 4000, and total disabled graduate students registered ranged from 30 to 700, when known. Case loads of students managed per staff ranged from 150 to 900.

3.2.2 Interview Data Analysis. We transcribed the interview recordings and conducted an inductive analysis on the data obtained around the experiences of participants using a grounded theory approach [26, 56]. Specifically, we asked participants how policies and procedures were implemented for providing accommodations, and we uncovered various instances of how policies and procedures were adjusted and handled, depending on student circumstances and faculty demands. Our themes are thus grounded in how policies were interpreted and implemented, and in staff concerns about student accommodations and faculty attitudes.

Over a period of six months, two researchers coded and analyzed the interview data. First, they independently coded the same four interviews, followed by discussions to consolidate and refine codes. Then, the two researchers independently coded the remaining 13 interviews, adding new codes through weekly discussions. After completing all coding, the researchers again comprehensively reconciled inconsistencies. Eighty-three inductive codes were defined from this initial analysis. Through meetings with a larger group of five researchers, codes were first grouped using axial coding followed by selective coding. The larger group met again to refine the categories of the codes and discuss the connections and relationships between different categories until the current themes were identified.

4 FINDINGS

Similar themes were identified from both the websites and the interviews; therefore, we combined the findings when presenting them in this paper. We first provide an overview of common accommodation processes that were described on the websites and in interviews. Then, we report our main findings around two overarching themes: (a) ***Policies and attitudes ascribed to disability,***

Table 2: Participant information (N/P = not provided)

PID	Sex	Job title	Institution type	Institution student population	Institution region	Disabled student population	Grad. student population	Disabled students per staff
P1	F	Director Disability Services	Private	24000	Northeast	~ 1400	N/P	700
P2	F	Associate Director	Public	13000	Northeast	1800+	~ 700	900
P3	M	Director	Private	16000	West	~ 2000	~ 100	~ 285
P4	M	Director	Public	29000	Southeast	2700+	~ 270	~ 600
P5	M	Assistant Director	Private	12000	Midwest	1000+	~ 200	500
P6	F	Access Specialist	Private	12000	Northeast	500–800	N/P	~ 150
P7	F	Access Services Specialist	Private	5000	Midwest	250–300	120	~ 150
P8	F	Senior Assistant Director	Public	11000	Midwest	1368	344	~ 700
P9	M	Director of Assistive Technology & Assistant Director	Public	21000	Midwest	1500	600	~ 370
P10	M	Assistant Director	Public	21000	Midwest	1300	600	260
P11	F	Assistant Director	Private	21000	Midwest	1200	50+	260–500
P12	M	Director Student Accessibility Services	Private	69000	Southeast	2500	125	N/P
P13	F	Access & Testing Coordinator	Private	21000	Midwest	1500–1600	600	220–230
P14	F	Assistant Director	Private	31000	West	1300	400	250–280
P15	F	Associate Director	Private	10000	Northeast	2047	200+	N/P
P16	F	Director	Private	14000	Midwest	900–1000	~ 30	200
P17	M	Graduate disability specialist	Public	43000	West	4000	300	500

technology, and faculty; when disability services offices differentiated between students, avoided technical support, and struggled to manage faculty attitudes; (b) ***Impacts of policies and perspectives on accommodation decisions for graduate students***; when institutional policies and staff perspectives resulted in denial, partial provision or tensions around accommodations for graduate students. We show evidence from the websites with Ux, where U refers to University and x refers to the number of the university in Table 1. And, we show evidence from the interviews with Px, where P refers to a participant who reported the evidence and x refers to the number of the participant in Table 2. We do not provide full quotes from the websites to preserve university anonymity as a web search may bring them up.

Overview of accommodation processes: Disability laws mandate institutions of higher education provide reasonable accommodations and equal access to students with disabilities in all programs. Based on the laws, students must first self-identify to the disability services office and then provide documentation to *qualify* for accommodation. Despite no official directive on process [24], our website analysis and interviews found that most institutions followed similar procedures in identifying student needs and providing accommodations. Generally, disability services offices required students to: (a) register with the office and fill accommodation request forms, (b) provide current and detailed disability documentation, (c) attend intake interviews with staff, and (d) meet with faculty, before disability services staff could approve and implement accommodation requests. The offices required documentation as a measure to confirm that the students had a disability. They required the documentation to be current and contain information about the student's disability history, severity of impairment, impact on activities, method of diagnosis, accommodation recommendations, among others. Most websites we assessed stated that if documentation provided by students lacked information to determine if the student had a disability, or to determine whether the requested accommodation was necessary to provide, the disability services office would seek opinions of additional healthcare providers. Documentation provided by family members was not acceptable even if family members were qualified professionals. The participants admitted that documentation requirements were one of the major challenges faced by students for requesting accommodation. Especially due to the COVID-19 pandemic, many students were unable to access doctors' offices for completing required diagnostic tests.

To address these issues, a few participants mentioned they were implementing a social model approach for documentation where the students were provided temporary accommodations until they received their documentation.

Documentation alone was not sufficient for disability services offices to approve students' accommodation requests. Participants indicated they mandated intake interviews to: (a) confirm that the student had a disability, and (b) to verify that the requested accommodation matched their disability. Often, when staff were not convinced about the student's disability in a single intake interview, students were required to meet with staff for additional interviews. Once accommodations were approved, students were often required to meet with instructors to confirm the approved accommodations. In most cases, disability services offices provided a letter of accommodation to officially inform faculty of their obligation to fulfill accommodations. Even with a letter, individual faculty sometimes required students to meet with them about their accommodations over and above recommendations from the disability services office. At some universities students were required to get hard copy accommodation letters signed at disability services offices and then to deliver them to instructors at the start of each term.

Although many institutions' policies and procedures shared common elements, such as those described above, there were nuanced differences in how such policies and procedures were interpreted and implemented. Next, we present findings demonstrating how policies were interpreted and how those interpretations influenced decisions specifically for graduate students.

4.1 Policies and Attitudes Ascribed to Disability, Technology, and Faculty

Our findings showed that disability services offices and staff had different policies, perspectives, and approaches toward students with visible and invisible disabilities. Participants also reported that providing technological support was overwhelming to them, and that they devoted considerable effort to manage faculty opinions towards students. Thus, the theme *"Policies and Attitudes Ascribed to Disability, Technology, and Faculty"* was identified from our data that underlines the opinions and behavior of the staff and various policies towards students with disabilities, tools, and services, which may negatively impact students including the students at the graduate level.

4.1.1 Differentiating Between Students with Visible and Invisible Disabilities. According to the Invisible Disabilities Association [2], *"an invisible disability is a physical, mental or neurological condition that is not visible from the outside, yet can limit or challenge a person's movements, senses, or activities."* Often, the terms "hidden" and "non-obvious" are used as synonyms to refer to "invisible" disabilities [48, 61]. The websites we examined and the participants we interviewed used either "invisible" or "non-obvious" to refer to students' disabilities which were not immediately apparent. For consistency in this paper, we use the terms "invisible" and "visible" where websites and participants used "non-obvious" and "obvious," respectively.

We found that most websites and participant interviews portrayed different policies for visible and invisible disabilities. For example, the policy on U1's website indicated that students with visible disabilities were exempt from providing documentation while others must provide documentation to prove disability. Specifically, the language on the website stated, "*except in the case of obvious disabilities*" students "*must provide*" documentation to confirm the existence of disability. U12 stated students must have visible or documented disability to qualify for accommodations. Likewise, interview participants revealed that documentation requirements differed for students with apparent disabilities:

> *"So if the condition is obvious. For example, if the student is blind, or if the student is deaf, if the student is in a wheelchair if they have, you know, they're in a brace, or using a cane. Those are all physical and obvious disabilities. We don't require documentation for those if they're obvious. It's the more hidden or non obvious ones in which we are more likely to require some additional documentation for."* - P16

Participants also reported that students with visible disabilities had better chances of receiving accommodations from faculty without a lot of pushback.

> *"I think students who have visible [disabilities] actually have a little bit of the like, not an advantage, but faculty are much more likely to be like, Oh, I see it. So I'll help you."* - P11

U6 stated that their disability services office would require verification from qualified health professionals or third parties for students' "invisible needs" or "invisible disabilities" before the students could enjoy housing allocated for disabled students. We recall that for documentation requirements broadly, students' own testimony or documentation from family members were not acceptable. With regard to invisible disabilities, however, it became clear that this policy was a common strategy to safeguard institutions from disingenuous students seeking accommodation; they required documentation especially from students with invisible disabilities.

> *"Now, is the process of reviewing documentation laborious? Absolutely. but it is a part of the job. It is not our sole piece of information but it is a critical piece to establishing history and demand, and all of the background information that we need on the person so history speaks volumes to the frequency and the pervasiveness of the condition and its impairment on the person's life. So we look to, you know, use that documentation for that purpose... I do think it's important, especially for non obvious disabilities, because... the challenge to this particular role is that you must also safeguard the institution as well, so I don't assume every student is trying to game the system to get accommodations, but we know that it does happen. So there must be some measures, put into place, in order to try to right size that or to check and balance that piece."* - P16

As P16 indicates, requiring documentation for students with invisible disabilities was meant to deter students who may "game" the process, indicating a perception of distrust for some requests. Thus, we found that websites presented different policies for students with visible vs. invisible disabilities, and that participants also

applied policies differently for students with visible vs. invisible disabilities.

4.1.2 Obstacles to Providing Assistive Technology Support. When it came to technical support, we found that most participants were generalists in that they lacked specific knowledge of assistive technologies. When staff encountered an issue related to technological accommodation requests, they referred the student to other students or to a technology specialist outside the office, but did not often handle the request themselves. No participant reported more than one assistive technology specialist on their team. In cases where a specialist was not on the team, the staff needed more time than they had to research what assistive technology was available, or how students could use existing assistive technology.

> *"I wouldn't say that we're experts in assistive technology, we're just familiar and work with the technology that students have brought to us, so to speak, so it's not an easy find to have, you know, an area where a student can be formally evaluated and recommendations made to the students. So that would be a challenge with assistive technology."* - P5

Participants also reported that the disability services offices were usually understaffed and that existing staff found it difficult to address technology requests for each student. Because of this, a student may have to figure out a solution without any support from the disability services office. To get some support around assistive technologies, sometimes the disability services offices also involved other departments, such as IT. Further, participants expressed that the process of getting and providing assistive technology was more complicated than other accommodations, and they therefore tended to avoid technical support:

> *"...I've kind of decided to stay out of the app [assistive technology] business because it's so complex and trying to get the vendor and how to set that up and how to issue a license to the student using our procurement system and it is such a big headache."* - P16

Some participants were also unsure about students' ability to use assistive technology, for example, if the student encountered challenges using technology:

> *"I think the hardest thing for assistive tech though, we're working with students with disabilities, is user ability. So like, we may teach a student how to use something, but if they don't know how to use it themselves, they're gonna say it's not working for them, but... Is it the function of the technology that's not working or is it your ability to use the technology?"* - P13

In such situations, participants felt ill-prepared to support students in addressing technical difficulties, whether an issue with the technology or tackling a learning curve. Overall, the technical aspect of supporting the students was overwhelming for participants which made it difficult for them to provide and implement technological accommodations. To handle such situations, participants instead suggested alternatives to students, referred them to other students and departments, or instructed students to figure out a solution themselves.

4.1.3 Challenges in Coordinating Accommodations with Faculty. Most participants reported experiencing difficulty when working with some faculty to implement student accommodations, particularly when faculty were resistant to change or when they challenged processes.

> *"I'd say some faculty, and if you think about it, kind of that traditional bell curve,... on one side of the bell curve, you have people who are exceptional, and who go out of their way and do you know, just really supportive of the process, really supportive of the students, you have, most of the people are in the middle, who they'll do what they need to do, as far as access and accommodations. As long as they understand the process, they'll ask us the questions that they want to ask that they need to ask. And on the opposite side of the bell curve, you have a handful people who are really difficult, for whatever reason, difficult with the process, difficult toward the students who create a lot of issues."* - P12

Many participants reported that the legal requirements for providing accommodation were relatively new and it was possible that older faculty began teaching before it became legally required to provide accommodations. Such faculty may be more likely to push back:

> *"...the student [had] been approved for recording a class. The professor didn't want her to do that. Didn't have a great reason for it just wasn't comfortable with it.... Deans got involved. Ultimately, General Counsel was pulled in and said look, this is an approved accommodation. This is not a fundamental alteration. We've heard your side. You have to do this. You have to let them do this. And then, you know, he had to cave at that point. You know the ones that tend to push back tend to be older professors that have been there for a while, and maybe don't have a real good grasp on why accommodations are needed because that's not always been the case."* - P9

Participants also reported it was common for faculty to not respond to emails from students and staff, making coordination and implementation of accommodations very difficult.

> *"Yeah, I'd say that's a common... for professors not responding to their emails, ... whether it's from us, or... the students. There are times where we or students need to email the professor and we need certain information, or we need to make sure the professor is doing something to make sure the student has access. And if they're not responding to that communication, it makes it very difficult to get that done."* - P12

Outside of denying accommodation requests or being nonresponsive, other faculty challenges created obstacles to supporting students, such as misunderstanding disability, or seeking more information despite privacy policies that prohibit requiring disability disclosure. In these situations, participants interceded:

> *"Yeah, so, sometimes the faculty give a little pushback and they say well if I don't know what's going on... I can't teach properly and... I like to give the example*

> *of the reason... that I don't personally give diagnosis is because humans in general ... tend to either a) think of like the very worst thing ever or b) something we've seen on TV, and those are not necessarily the realities of our students and I give the examples of if an instructor hears that a student has as a diagnosis Tourette's Syndrome, their automatic response is well how am I supposed to teach with someone that's going to be yelling profanities. Well in reality the research shows that less than 3% of people with Tourettes actually yell profanities. Right, it's not a true representation of that group. And then the other example that I use is, if someone says, Autism. The first thing that people think of from TV is Sheldon from the Big Bang Theory. And, and that's not what Autism looks like, not for every single person. Right. And so, it's not a realistic understanding. And so I will bring out those examples to instructors and I tell them ... let's focus on what the student accommodations are, what their impacts are, and where this needs to be incorporated in your course. And a lot of times, once I kind of give that explanation... people are like, oh okay gotcha gotcha gotcha. I think a lot of times it's just looking at it from that different angle."* - P14

In P14's statement, we see participants' role in assuaging faculty also included informing them about disability, and encouraging them to "focus on what the student accommodations are." On the other hand, with regard to managing faculty attitudes, not all such interventions were successful, for example when persuading an advisor to adhere to accommodation requests:

> *"More recently I was working with an engineering student... mechanical engineering, you know who had a faculty member pretty much telling him, no way you're going to get these accommodations in the workforce so you know, my recommendation to you is that you just drop out of this program right now... and you know the student was pretty distraught, pretty upset... And, you know, this was something that... when a faculty member has this kind of opinion you know it's very rare that just a conversation is gonna change their mind about things."* - P17

Ultimately, P17 had to change the student's advisor. Moreover, participants reported that sometimes faculty did not believe there were disabled students in college. This belief created hardship for disability services offices in implementing accommodations. However, faculty who viewed disability as a weakness might overaccommodate students, creating issues of ensuring fairness. P4 gave an example of how faculty responded to the students' disabilities and how the faculty created barriers for the staff.

> *"Um you have some faculty that believe that disability is a weakness, you have some that go to the other extreme and will do anything necessary for the student to pass even if it means giving them an unfair advantage... Some faculty are, feel they're overwhelmed with the work that they have, and there's just too many students with disabilities so we get a lot of push back from that. A lot of questioning as to our procedures about identifying a disability. That's why we spend you know, we're very careful with our documentation requirement because the push back we get comes from inside. So we want to be consistent and fair to everybody."* - P4

Overall, participants had to juggle student needs with faculty expectations and assumptions. Although we did not directly interview faculty in this study, faculty responses to accommodation requests emerged as a finding as it related to how participants managed faculty attitudes and expectations as part of their job. In situations where faculty pushed back about accommodations, staff first advocated for students, and if that did not work, they referred to institutional legal obligations to support accommodations. Documentation was one way for participants to wield legitimacy in support of student needs. We highlighted participants' experiences with faculty, and how they were supportive of students, including having open attitudes about disability and what it means to be disabled (i.e., that Autism is different for different people).

4.2 Impacts of Policies and Perspectives on Accommodation Decisions for Graduate Students

Most of the university websites we examined reflected legal requirements for accommodation and portrayed a disability accommodation request to be unreasonable if it fundamentally altered the university program, policies or procedures, or caused undue financial and/or administrative burden. However, some universities provided other reasons, such as expense on *personal study* that contributed to the rejection of an accommodation request. We also found that participants treated graduate and undergraduate students' accommodation needs in the same way, despite clear differences in graduate versus undergraduate student needs [53, 54]. Additionally, participants reported that graduate students were especially concerned about their relationship with faculty advisors and the tendency for ableist mindsets in higher education. As a result, students either did not register with disability services offices or they did not report challenges they faced after receiving accommodations.

4.2.1 Research as Personal Study. Interviews revealed that often graduate student research work outside of a specific class was categorized as *personal study* and was therefore rejected for accommodation. However, the definition of *personal study* varied depending on the accommodation requested, and provision or denial of the accommodation depended on how staff interpreted requests. P12 described a situation where a blind student requested reading support for a large amount of content "in class or for homework in preparation for class," but the request was denied because P12 classified the request as *personal study*. P12 further clarified research activities would be designated the same category:

> *"I would put research in the same category where that's more personal study time, so the student needs to figure out how to make that accessible for them without us really getting involved in that."* - P12

P12 further explained that because *personal study* was not a qualified activity for accommodation, the student had to seek help from outside for research related activity.

> "*That's not something that we do. So that student has to use technology, or that student has to maybe find a friend, hire a tutor, someone else to help them during that personal study time.*" - P12

Similarly, students' assistive technology requests could be denied when they sought technological accommodations on their personal devices. For example, P16 categorized app-based assistive technologies as personal, therefore obligating students to acquire and manage such tools.

> *"Now that we are in this age where so many people own their personal devices. The challenge now is,... the question is doesn't [the] University have to provide you with assistive technology? because you own your device, and most of these devices are... now app based. So when there's an application that is on a personal device, the University doesn't have responsibility technically to put something forward on... your personal device. So, it changes that dynamic. And so students have the responsibility of acquiring their own apps on their own to make it work."* - P16

Additionally, participants indicated confusion about accommodations related to conferences and events, such as who was responsible for costs associated with activities outside campus. Most participants claimed event organizers needed to take care of accommodation and accessibility for their attendees. Likewise U13's website stated that before applying to an institution, it is necessary that you ask for information about funding and procedure of accommodation from the host institution. But if neither the organizers of the event nor the disability services office provides any accommodation for the event, then the task falls upon the students. We infer graduate students would be most affected by decisions involving such activities because they may be expected to attend and present their research at conferences.

> *"If a student were attending a program at [university], um we would provide accommodations if they're registered with our office. However, if an organization of [university] or a department was hosting a talk, and they needed an interpreter, just because people were attending that were deaf, but they weren't registered with our office, we would tell them they have to provide that... If a student... were going to another conference, at another school, um, we would have the student contact that school about their accommodations because conferences and schools like that should be something that they're responsible for to make their program accessible."* - P2

For off-campus accommodations, or accommodations that were deemed *personal study*, disability services offices often did not have clear policies and processes. For example, some institutions like U13 stated that students seeking accommodation for study abroad should contact their host institutions, while many institutions did not state any policy at all about conferences and study abroad accommodations. P10 commented that accommodations for talks and conferences was a gray area and was handled case by case.

> *"[conference accommodations are] a gray area...there's a student who used CART [Communication Access Realtime Translation] Services, that I think our office paid for. I don't think for conferences. But for talks and lectures on campus that are outside of academics, yeah. That's happening as case by case."* - P10

Thus, ultimately, disability services support ensured university events were accessible, meanwhile support services did not follow the student outside of their home university events by default. Some disability services offices provided partial accommodation to students for travel and study abroad since the staff interpreted such requests to be personal assistance. For example, P10 described the story of a graduate research student with physical disabilities who requested accommodations for travel. The student was initially accommodated for some of her needs but after the student appealed, the office increased support for the student only to a certain extent.

> *"[the graduate student] was seeking an assistant to carry, a research assistant, she was going... abroad and needed someone to help her with...her travel... and also carry books and... cook meals at the end of the day. So it kind of ventured into... personal assistant care, personal care attendant realm, which is not something universities, generally pays for... especially when it's... daily activities of life, like cooking. So we paid for some, but not all, their expenses and I think that was met with some frustration for the student and they appealed..."* - P10

Thus, we found that accommodation requests for assistive apps on personal devices, or for research related activities were frequently considered *personal study*, and alongside off-campus activities, were commonly rejected for accommodation. Alternatives, such hiring a tutor or finding a friend, was suggested instead. In rare cases, partial accommodation was provided.

4.2.2 Conflating Undergraduate and Graduate Students' Needs. Our findings show that most disability services offices did not differentiate between graduate and undergraduate students in how support and services were determined and provided. Participants stated that the same accommodations worked for both, and treated both graduate and undergraduate students alike. In contrast, demands and requirements of graduate and undergraduate students differ significantly [33, 45].

> *"I guess the list of accommodations are the things themselves that's the same. So we don't treat undergraduate and graduate different in that sense. Now, what the students may ask for, I'll be honest, I don't know enough of what is different."* - P12

Indeed, many participants were unaware of any differences between graduate and undergraduate student needs. In some cases, participants were not aware of differences simply because their offices served more undergraduate students.

> *"I don't think that I've had one of my students with a research piece that has been a little outside the box versus right that typical, you need extended time, time and a half, you need a note taker, that type of thing."* - P14

From our website analysis and interviews, we found most institutions did not have specific policies for graduate students, such as for accommodating research related activities and events. Most websites did not have information specific to graduate students. Interviews revealed that, in addition to lack of targeted policies for graduate students, many disability services offices did not have accommodations, tools and technologies specifically for graduate students. Instead, graduate students were offered the same accommodations commonly provided to undergraduate students.

4.2.3 Lack of Accommodation Requests from Graduate Students . Interviews revealed how challenging it might be to support graduate students. In addition to research related tasks not qualifying for accommodation, or to non-existent policies for graduate students overall, participants reported that graduate students sometimes requested accommodations that stretched the capabilities of their offices. P5 reported they were not able to provide accommodations such as more time for graduate students, especially because "more time" for graduate students usually meant extending a program, not adding minutes to a test.

> *"Financially in many cases we're not able to support students, you know, especially graduate students that they might say, you know, due to my disability, I need more time within the program but that's really, you know, funding is pretty much earmarked first for students in the program and we're not able to generate any additional funding that would allow a student, you know, more funding to stay longer in the program."* - P5

Another issue with providing accommodations for graduate students was that participants were not able to address impromptu requests, which may be common for graduate students as they may more often have unplanned meetings with their advisors or lab mates. As P12 reported, participants do not have enough time or other resources (e.g., an interpreter) to address immediate accommodation requests.

> *"We're not necessarily equipped to do something in that real time, in the moment kind of thing, kind of that impromptu thing... That's just unfortunately, the reality of coordinating that service, because it generally does require people and we don't have people just on standby to jump in somewhere. So yes, unfortunately, the reality is those things may need to be scheduled in advance if an interpreter or a captionist wants to be or needs to be present."* - P12

Though interactions with graduate students were not as frequent as with undergraduate students, participants' characterization of graduate students indicated that students operated under a clear understanding that perception management was important for success. Specifically, participants stated that graduate students were worried about ableism in graduate school, such as implications of being registered with the disability services office, and so they avoided registering. Participants further explained that graduate students were worried about their future: if faculty and advisors knew about a student's disability, the student's success at the program and their future career could be at risk. In particular, this risk was tenuous because of the sensitive nature of student-faculty relationships for graduate students.

> *"You know another challenge I think is that a lot of graduate students are very hesitant to actually register with the office. Just because of I think what a lot of students perceive is a culture of, you know, of ableism, really. And at, within graduate schools, you know, students are worried that... if they register and... their faculty get accommodation letters that suddenly poof their letters of recommendation and their whole future is, you know, going out the window because, 'I'll have a red flag for being registered with the [disability services office*]' " - P17

Overall, participants reported, often graduate students avoided relaying challenges they faced with faculty because students were concerned about retaliation. Participants further clarified that while direct retaliation was rare, retaliation could be subtle and not necessarily linked to initial challenges. For instance, faculty may confer a lower grade or may decline to write a recommendation letter and not much could be done to avoid these consequences.

5 DISCUSSION

Our findings suggest that disability services offices undertook two key objectives: providing accommodations for disabled students, and ensuring university compliance with legal requirements. In our website and interview analysis, it became apparent that these objectives were often at odds, and disability services staff were tasked with juggling competing interests. Participants advocated for students, especially when they encountered push back from faculty—confirming student perspectives [42]—while at the same time, they categorized large amounts of reading material as personal study therefore disqualifying it for accommodation. In applying a lens of ableism in our analysis, we consider that disability services staff wield authority and advocacy over competing interests with wide reaching consequences for graduate students with disabilities.

Despite flexible changes to documentation due to COVID-19, which reflected university practices broadly from the last year [37], most institutions we studied required students to submit documentation of their disability from specific providers, which may incur a substantial burden on students [23]. Yet, participants sought to discourage students who may game the process and required documentation to ensure the student had a disability. Meanwhile, participants also relied on documentation to advocate for student needs with faculty. However, inconsistently requiring students with invisible disabilities to provide extra documentation—while not requiring the same for students with visible disabilities—increases the likelihood that such students undergo additional scrutiny [18, 49], particularly if disability services offices maintain a medical model approach with strict adherence to specific diagnoses [8, 24, 27, 28, 49]. Furthermore, stating such policies on university websites may deter students from seeking accommodations they need [59].

Our analysis further revealed that disability services offices did not differentiate between graduate and undergraduate students in terms of providing support and services, instead, participants explained that the same accommodations work for both. However, graduate level education and activities differ significantly from

undergraduate activities and often require domain-specific and technically complex accommodations [33, 53]. Despite commenting on student ability to use technology, participants also reported they themselves lacked experience with assistive technologies, did not have policies for conferences and similar "gray area" requests, and they were financially constrained from granting program extensions as accommodations. These challenges indicated that disability services offices were either ill equipped to support research tasks or declined to accommodate non-course activities, corroborating student experiences of inadequate accommodations [33, 53].

Finally, our findings indicate that participants were aware of ableist tendencies, for example, when faculty did not believe there were disabled students in college, or when graduate students expressed concerns of disclosure out of fear of retaliation [4, 32]. Website and interview analysis also uncovered a willingness to be flexible and a capacity for generous interpretation of policy, in support of students. These findings suggest an opportunity to expand disability services support for graduate students with disabilities. We discuss specific recommendations for doing so below.

5.1 Recommendations

Websites are an important source of information for students and faculty [18]. Thus, disability services websites should be designed from an anti-ableist perspective [36, 46], and the AHEAD program standards [49] should be followed. AHEAD standards outline minimum essential services that disability services offices should provide to disabled students [40]. Institutions may also utilize the Institutional Disability Services Site Assessment to improve website content [18]; this tool provides a means to assess the availability and depth of information provided on websites [18].

We recommend disability services offices develop strategies that specifically target and address graduate student needs. For example, graduate students should be able to request accommodations for research tasks and events (and such requests should not be re-categorized in a way to disqualify the activity from accommodation, such as *personal study*). Policies should be equitable: when students with invisible disabilities have to provide documentation and attend intake interviews, and students with visible disabilities do not, it unequally harms students with invisible disabilities. Many improvements were made during the COVID-19 pandemic, such as waiving documentation, providing temporary accommodation or allowing electronic document delivery instead of hard copy signatures. We recommend maintaining flexibility post-COVID-19. We also recommend adopting electronic software services to improve efficiency of document handling and scheduling management.

We recommend staff receive training and support for assistive technologies and technical accessibility accommodation, and that policies allow accessible apps on personal devices. Such support would especially benefit graduate students who rely on technical tools for research related activities [33, 53, 54]. Adding assistive technology staff will expand capacity to support technical accommodation requests while freeing other staff to support non-technical related requests.

6 LIMITATIONS AND FUTURE WORK

This study was focused on a small number of institutions based in the U.S., institutions in different countries may follow different legal policies. We examined sites from top ranked institutions and our claims are therefore limited to only those institutions. Other characteristics, such as whether the institution was public or private, may also affect decisions to provide and implement accommodations, however we did not make those distinctions. Also, our sample of more participants as directors may bias findings toward leadership roles. Lastly, though we gathered data from staff perspectives about working with faculty, we did not interview faculty and make no claims from the faculty perspective. In future work, we aim to interview faculty who have advised disabled graduate students in research activities. Future work will also seek to understand disabled students' perspectives about disability services and their websites.

7 CONCLUSION

In this research, we conducted in-depth analysis of disability services websites of 18 universities from across the U.S. We also interviewed 17 disability services staff from 14 universities to understand how disability services offices accommodate graduate students and how they make research (non-course related) tasks accessible. We found that interpretation of policies by the staff influence accommodation decisions that may create barriers for graduate students. Specifically, staff did not differentiate between graduate and undergraduate students despite the differences between their requirements. We recommend increased focus should be put towards graduate student accommodation requests, meanwhile common research related activities such as increased amount of reading material or off-campus research activities should be deemed eligible for accommodation. Procedures and policies should be revisited with graduate students in mind to be agile and resourceful.

ACKNOWLEDGMENTS

Foundation under Award No. 1926209. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

REFERENCES

[1] AIM. 2021. Advanced Information Management. https://advancedinfomanagement.com/
[2] Invisible Disabilities Association. 2021. What is an Invisible Disability? https://invisibledisabilities.org/what-is-an-invisible-disability/
[3] Lucy Barnard-Brak, DeAnn Lechtenberger, and William Y Lan. 2010. Accommodation Strategies of College Students with Disabilities. *The Qualitative Report* 15, 2 (March 2010), 411–429. https://www.proquest.com/docview/195564288
[4] Lucy Barnard-Brak, DeAnn Lechtenberger, and William Y Lan. 2010. Accommodation strategies of college students with disabilities. *Qualitative Report* 15, 2 (2010), 411–429.
[5] Colin Barnes and Geof Mercer. 2005. Disability, work, and welfare: challenging the social exclusion of disabled people. *Work, Employment, and Society* 19, 3 (Sept. 2005), 527–545. https://doi.org/10.1177%2F0950017005055669
[6] Colin Barnes, Geof Mercer, and Tom Shakespeare. 1999. *Exploring Disability: A Sociological Introduction.* Cambridge University, United Kingdom. https://www.cambridge.org/core/journals/sociology/article/abs/exploring-disability-a-sociological-introduction-colin-barnes-geof-mercer-and-tom-shakespeare-cambridge-polity-1999-4950-1495-pbk-280-pp-isbn-0745614787/063946B51D9B2B4370840EE9CBCEBC6C
[7] Brianna Blaser and Richard E Ladner. 2020. Why is Data on Disability so Hard to Collect and Understand?. In *2020 Research on Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT)*, Vol. 1. IEEE, Portland, OR, USA, 1–8.

[8] Lydia Block, Gladys Loewen, and Sue Kroeger. 2006. Acknowledging and Transforming Disabling Environments in Higher Education: AHEAD's Role. *Journal of Postsecondary Education and Disability* 19, 2 (2006), 117–123. https://eric.ed.gov/?id=EJ844628

[9] Virginia Braun and Victoria Clarke. 2006. Using thematic analysis in psychology. *Qualitative research in psychology* 3, 2 (2006), 77–101. https://doi.org/10.1191/1478088706qp063oa

[10] Sheryl Burgstahler, E. Moore, and L. Crawford. 2016. *2016 Report of the AccessSTEM/AccessComputing/DO-IT Longitudinal Transition Study (ALTS).* University of Washington, Seattle, WA. https://www.washington.edu/doit/about/evidence-based-practices/indicators-participant-success

[11] Clockworks. 2021. Clockworks. https://www.clockworks.ca/

[12] Mary Elizabeth Collins and Carol Mowbray. 2005. Higher Education and Psychiatric Disabilities: A National Survey of Campus Disability Services. *American Journal of Orthopsychiatry* 75, 2 (April 2005), 304–315. https://doi.org/10.1037/0002-9432.75.2.304

[13] CSRankings. 2021. CSRankings: Computer Science Rankings. http://csrankings.org/#/index?all&us

[14] William Erickson, Sharon Trerise, Camille Lee, Sara Vanlooy, Samuel Knowlton, and Susanne Bruyere. 2013. The Accessibility and Usability of College Websites: Is your Website Presenting Barriers to Potential Students? *Community College Journal of Research and Practice* 37, 11 (sep 2013), 864–876. https://doi.org/10.1080/10668926.2010.484772

[15] Nancy J. Evans, Ellen M. Broido, Kirsten R. Brown, and Autumn K. Wilke. 2017. *Disability in higher education: a social justice approach.* Jossey-Bass, San Francisco.

[16] Allison Fleming, Kathleen Oertle, and Anthony Plotner. 2017. Student Voices: Recommendations for Improving Postsecondary Experiences of Students with Disabilities. *Journal of Postsecondary Education and Disability* 30, 4 (2017), 309–326. https://eric.ed.gov/?id=EJ1172798

[17] Allison Fleming, Anthony Plotner, and Kathleen Oertle. 2017. College Students with Disabilities: The Relationship between Student Characteristics, the Academic Environment, and Performance. *Journal of Postsecondary Education and Disability* 30, 3 (2017), 209–221. https://eric.ed.gov/?id=EJ1163997

[18] Patrick Flink. 2019. Assessment of Disability Services Information Variability Among Websites of One University System. *Community College Journal of Research and Practice* 43, 12 (Dec. 2019), 829–839. https://doi.org/10.1080/10668926.2018.1539676

[19] Centers for Disease Control and Prevention. 2020. Disability Impacts All of Us. https://www.cdc.gov/ncbddd/disabilityandhealth/infographic-disability-impacts-all.html

[20] National Center for Education Statistics. 2012. Number and percentage distribution of students enrolled in postsecondary institutions. https://nces.ed.gov/programs/digest/d15/tables/dt15_311.10.asp

[21] National Center for Educational Statistics. 2021. National Postsecondary Student Aid Story. https://nces.ed.gov/surveys/npsas/

[22] National Science Foundation. 2019. Women, Minorities, and Persons with Disabilities in Science and Engineering. https://ncses.nsf.gov/pubs/nsf19304/data

[23] Sally Friedman. 2019. Review. Academic Ableism: Disability and Higher Education. *Journal of Political Science Education* 16, 2 (April 2019), 264–267. https://doi.org/10.1080/15512169.2019.1594849

[24] Scott Nathaniel Friedman. 2017. *Disability services documentation guidelines in higher education a survey of practices in Illinois.* Ph.D. Dissertation. University of Illinois at Chicago.

[25] Elizabeth Getzel and Colleen Thoma. 2008. Experiences of College Students With Disabilities and the Importance of Self-Determination in Higher Education Settings. *Career Development for Exceptional Individuals* 31 (07 2008), 77–84. https://doi.org/10.1177/0885728808317658

[26] Barney G Glaser and Anselm L Strauss. 1967. *The discovery of grounded theory: strategies for qualitative research.* Aldine Publishing, Chicago.

[27] Alberto Guzman. 2009. *Exploring postsecondary education disability service's standards: Alignment with disability studies.* Ph.D. Dissertation. University of Illinois at Chicago. https://ezproxy.rit.edu/login?url=https://www.proquest.com/dissertations-theses/exploring-postsecondary-education-disability/docview/305114776/se-2?accountid=108

[28] Alberto Guzman and Fabricio Balcazar. 2010. Disability Services' Standards and the Worldviews Guiding Their Implementation. *Journal of Postsecondary Education and Disability* 23, 1 (2010), 48–62. https://eric.ed.gov/?id=EJ888644

[29] Judith R Harrison, Nora Bunford, Steven W Evans, and Julie Sarno Owens. 2013. Educational accommodations for students with behavioral challenges: A systematic review of the literature. *Review of Educational Research* 83, 4 (2013), 551–597.

[30] Rodney Hartnett and Warren Willingham. 1980. The Criterion Problem: What Measure of Success in Graduate Education? *Applied Psychological Measurement* 4, 3 (July 1980), 281–291. https://doi.org/10.1177%2F014662168000400301

[31] Thomas Hehir. 2002. Eliminating Ableism in Education. *Harvard Educational Review* 72, 1 (April 2002), 1–33. https://doi.org/10.17763/haer.72.1.03866528702g2105

[32] Emily J Hutcheon and Gregor Wolbring. 2012. Voices of "disabled" post secondary students: Examining higher education "disability" policy using an ableism lens. *Journal of Diversity in Higher Education* 5, 1 (2012), 39.

[33] Dhruv Jain, Venkatesh Potluri, and Ather Sharif. 2020. Navigating Graduate School with a Disability: A Trio-Ethnography. In *Proceedings of the 2020 ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '20).* Association for Computing Machinery, New York, NY, 17 pages.

[34] Deborah Rock Kendrick. 2017. *Disability Services at Institutions of Higher Education.* Ph.D. Dissertation. University of Washington. https://www.proquest.com/docview/1972443236 Dissertation/Thesis.

[35] Nancy La Monica. 2016. *Surviving or Thriving in Academia: Autoethnographic Accounts of Non-Visibly Disabled Grads' Experiences of Inclusion and Exclusion.* Ph.D. Dissertation. McMaster University. https://macsphere.mcmaster.ca/handle/11375/20404

[36] Priya Lalvani and Alicia Broderick. 2013. Institutionalized Ableism and the Misguided "Disability Awareness Day": Transformative Pedagogies for Teacher Education. *Equity and Excellence in Education* 46, 4 (2013), 468–483. https://doi.org/10.1080/10665684.2013.838484

[37] Jonathan Lazar. 2021. Managing digital accessibility at universities during the COVID-19 pandemic. *Universal Access in the Information Society* 20, 2 (2021), 17 pages. https://doi.org/10.1007/s10209-021-00792-5

[38] Cara Liebowitz. 2015. I am Disabled: On Identity-First Versus People-First Language. https://thebodyisnotanapology.com/magazine/i-am-disabled-on-identity-first-versus-people-first-language/

[39] Simi Linton. 1998. *Claiming Disability: Knowledge and Identity.* New York University Press, New York, NY.

[40] Joseph W. Madaus. 2011. The History of Disability Services in higher education. *New Directions for Higher Education* 2011, 154 (2011), 5–15. http://search.ebscohost.com/login.aspx?direct=true&db=afh&AN=61807808&site=ehost-live

[41] Ravi Malhotra. 2006. Justice as fairness in accommodating workers with disabilities: The limitations of a Rawlsian framework for empowering people with disabilities in Canada. In *Critical Disability Theory: Essays in philosophy, politics, and law*, Diane Pothier and Richard Devlin (Eds.). University of British Columbia Press, Vancouver, 70–86.

[42] Laura Marshak, Todd Wan Wieren, Dianne Ferrell, Lindsay Swiss, and Catherine Dugan. 2010. Exploring Barriers to College Student Use of Disability Services and Accommodations. *Journal of Postsecondary Education and Disability* 22, 3 (2010), 151–165.

[43] Lisa M. Meeks and Neera R. Jain (Eds.). 2016. *The guide to assisting students with disabilities: equal access in health science and professional education.* Springer, New York.

[44] Lisa M. Meeks and Leslie Neel-Boylan (Eds.). 2020. *The guide to assisting students with disabilities: equal access in health science and professional education.* Springer, Cham, Switzerland. https://doi.org/10.1007/978-3-030-46187-4

[45] Aile Montoya. 2009. *A comparison of the educational supports needed and provided for undergraduate and graduate students with learning disabilities in higher education.* Ph.D. Dissertation. University of Florida. https://ezproxy.rit.edu/login?url=https://www.proquest.com/dissertations-theses/comparison-educational-supports-needed-provided/docview/89183925/se-2?accountid=108

[46] Brett Nachman and Kirsten Brown. 2019. Omission and Othering: Constructing Autism on Community College Websites. *Community College Journal of Research and Practice* 44, 3 (2019), 211–223. https://doi.org/10.1080/10668926.2019.1565845

[47] Patricia B Nemec and P Kramer. 2002. Postsecondary perspective. In *Supported education and psychiatric rehabilitation: Models and methods.* International Association of Psychiatric Rehabilitation Services, Linthicum, MD, 49–61.

[48] ADA National Network. 2012. About Non-Obvious Disabilities: Legal, Practical, and Human Considerations. https://www.adapacific.org/assets/documents/2i.-facguidenon-obviousdis_final.pdf

[49] Association on Higher Education and Disability. 2021. Association on Higher Education and Disability. https://www.ahead.org/learn/resources

[50] U.S. News & World Report. 2021. U.S. News & World Report. https://www.usnews.com/

[51] Kathleen Scalise, P. Shawn Irvin, Fahad Alresheed, Keith Zvoch, Huna Yim-Dockery, Sunhi Park, Britt Landis, Paul Meng, Bren Kleinfelder, Lauren Halladay, and Andrea Partsafas. 2018. Accommodations in Digital Interactive STEM Assessment Tasks: Current Accommodations and Promising Practices for Enhancing Accessibility for Students With Disabilities. *Journal of Special Education Technology* 33, 4 (2018), 219–236. https://doi.org/10.1177/0162643418759340 arXiv:https://doi.org/10.1177/0162643418759340

[52] Anthony F. Shay. 2019. *Assistive technology service delivery: a practical guide for disability and employment professionals.* Academic Press, London.

[53] Kristen Shinohara, Michael McQuaid, and Nayeri Jacobo. 2020. Access Differential and Inequitable Access: Inaccessibility for Doctoral Students in Computing. In *Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '20.* Association for Computing Machinery, Virtual, 12 pages pages.

[54] Kristen Shinohara, Mick McQuaid, and Nayeri Jacobo. 2021. The Burden of Survival: How Doctoral Students in Computing Bridge the Chasm of Inaccessibility. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems.*

1–13.

[55] Anita Silvers. 2009. An Essay on Modeling: The Social Model of Disability. In *Philosophical Reflections on Disability*, D. Ralston and Justin Ho (Eds.). Springer, New York, 19–36. https://doi.org/10.1007/978-90-481-2477-0_2

[56] Anselm L. Strauss and Juliet M. Corbin. 1998. *Basics of qualitative research.* Sage Publications, Thousand Oaks, CA.

[57] Symplicity. 2021. Symplicity. https://www.symplicity.com/

[58] Deborah Tsagris. 2010. *Exploring the use of an Internal Student Homepage for Students with Learning Disabilities in a Postsecondary Web Community.* Ph.D. Dissertation. University of Calgary. https://ezproxy.rit.edu/login?url=https://www.proquest.com/dissertations-theses/exploring-use-internal-student-homepage-students/docview/848503025/se-2?accountid=108

[59] Pamela Whitten, Samantha Nazione, and Carolyn Lauckner. 2013. Tools for assessing the quality and accessibility of online health information: initial testing among breast cancer websites. *Informatics for Health and Social Care* 38, 4 (2013), 366–381. https://doi.org/10.3109/17538157.2013.812644

[60] People with Disability Australia. 2018. Words to Describe People with Disability. https://pwd.org.au/resources/disability-info/language-guide/words-to-describe-people-with-disability/

[61] Disabled World. 2020. Invisible Disabilities: List and General Information. https://www.disabled-world.com/disability/types/invisible/

[62] Yeliz Yesilada, Giorgio Brajnik, Markel Vigo, and Simon Harper. 2015. Exploring perceptions of web accessibility: a survey approach. *Behaviour & Information Technology* 34, 2 (2015), 119–134. https://doi.org/10.1080/0144929X.2013.848238