

How Engineering and STEM Librarians Support Disabled Students: Current Practices and Future Directions

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Abstract

Despite efforts to improve inclusion in institutions of higher education, disabled students still face bias, discrimination, and inadequate support, particularly in STEM programs. Academic librarians are well positioned to make their campuses more disability-inclusive by implementing inclusive pedagogy, resources, research help, and learning spaces. While research shows that librarians value supporting disabled students, no studies have investigated how and to what extent librarians incorporate disability-inclusive practices into their daily work.

The authors surveyed academic librarians about their knowledge of disabilities, attitudes toward supporting disabled students, and the specific supports they offer disabled students. The survey also asked about the factors that help and hinder librarians' ability to provide disability inclusion and support. This paper focuses specifically on data from STEM librarians who participated in the survey.

Introduction

It is well-documented that disabled people are substantially underrepresented in STEM (science, technology, engineering, math) fields and that they face significant barriers in STEM degree programs and professions [1], [2], [3], especially those with multiply-minoritized identities [4].

Across all fields of employment, the Office of Disability Employment Policy (ODEP) (2025) reported a stark disparity between disabled and non-disabled workers: in March 2025, 41% of disabled people in the United States were employed compared with 71% of non-disabled people [5]. Additionally, disabled workers are employed on a part-time basis almost twice as often as non-disabled workers and experience significantly higher unemployment regardless of their level of education [6], [7] ¹.

For STEM fields, the disparity is worse. The National Center for Science and Engineering Statistics (NCSES) reports that only 3% of the STEM workforce identified as having a disability

¹ Please note that the report cited is no longer publicly available, presumably due to executive order 14151.

in 2021, a figure that has not changed since 2011² [6], [8]. Although this statistic indicates a shockingly low number of disabled workers in STEM fields, it is important to note that this number is potentially artificially lowered because many people do not disclose their disabilities to their employers [9]. Additionally, the NCSSES report shows that disabled people in STEM occupations have lower levels of degree attainment, earn less money, and are less likely to be employed on a full-time basis than their non-disabled peers[8].

STEM librarians provide vital access to resources, learning spaces, library instruction, and research support for campus communities. They can support disabled students' success by integrating inclusive practices that make library resources and services accessible to all. However, many educators – including librarians – often do not implement accessible practices like those recommended in Universal Design for Learning (UDL) [10]. Instead, they rely on disability services offices (DSOs) to manage disabled students' needs, following higher education's typical approach of providing individualized accommodations only to students who qualify [11], [12].

Unfortunately, research has shown that accommodations do not always provide the support disabled students need. Many disabled students do not qualify for needed accommodations, receive inadequate or inappropriate accommodations, or do not realize that accommodations are available to them [3], [13], [14], [15]. Other disabled students do not even attempt to get accommodations: according to the National Center for Education Statistics (NCES), the majority of disabled students do not disclose their disability to their institutions, even when doing so could provide them with access to accommodations [16]. Researchers have found that disabled students do not disclose their disability status for a variety of reasons, including: fear of experiencing bias or discrimination, not wanting to identify as disabled, and not wanting to go through the often-difficult process of qualifying for, securing, and negotiating accommodations with their DSO and instructors [13], [14], [17], [18].

² Please note that the cited report is no longer available on the NSF website, presumably due to executive order 14151.

Library and Information Science (LIS) literature shows that academic librarians value providing services, resources, and spaces for all patrons, including disabled students and researchers. However, there is little research about how academic librarians incorporate support for disabled students into their daily work. To investigate this question, the authors conducted a survey asking student-facing academic librarians in the United States and Canada about the ways they support disabled students, as well as their knowledge, attitudes, and the factors they perceive as helpful or hindering that support.

This conference paper focuses exclusively on the data provided by survey participants who worked with STEM disciplines. Therefore, the term “participants” here refers only to those STEM discipline-supporting respondents. Any discussion of non-STEM librarians will be clearly indicated. The complete survey data, including all non-STEM librarians, will be addressed in a separate publication.

The researchers hope that the results of this work will spark conversation among their STEM librarian colleagues about better supporting disabled students. They aim to inspire more STEM librarians to learn, implement, and advocate for inclusive practices. This advocacy could lead to collective action that establishes professional standards for disability support and develops guidelines to promote the adoption of inclusive practices across the profession.

Language choices and researcher positionality

“Disability” is a broad term that can refer to a wide range of conditions, differences, and limitations among human beings. In this study, the term ‘disability’ refers to any condition of the body or mind in which people experience activity limitations or impairments in their daily lives. This includes all disabilities, ranging from apparent to invisible (also called “non-apparent,” “hidden,” or “non-visible” disabilities). For further discussion and definitions of disability terms relevant to this study, please see Appendix F.

The authors identify as white, cis-gender, female, invisibly disabled librarians who support STEM disciplines at R1 universities. They chose to use identity-first language (disabled person),

as opposed to person-first language (person with disabilities) in the survey instrument used in this research project. This aligns with their personal preferences and the language conventions typically used in Disability Justice scholarship [19], [20], [21], [22]. In this publication, they use both terms and strongly advocate for the respectful use of the language preferences of disabled individuals and groups [22], [23].

The authors acknowledge that language choices in relation to disability are difficult to navigate and that preferences vary widely between individuals, groups of disabled people, disability advocates and scholars, and across countries and regions [23], [24], [25]. As librarians, they understand that language shapes understanding and can result in harm. This includes the prevalence of deficit-based perspectives towards disability, as well as the frequent use of ableist words and phrases in everyday speech. Additionally, not all people who experience a limitation or impairment identify as disabled; many people prefer other terms or ways of talking about their experience of disability. The authors appreciate and welcome discussions about the nuance and complexity of language, which evolves over time to reflect changes in the preferences of communities, attitudes across our broader society, and from new scientific research.

Literature Review

Consideration of disability is critical for creating an inclusive campus environment. Approximately a fifth of the global population is disabled [16], [26], [27], [28] and according to the Centers for Disease Control and Prevention (CDC), 25% of all American adults reported having a disability in 2022 [29]. Students in higher education experience similar rates of disability: in 2021, 21% of enrolled undergraduates and 11% of graduate students reported having a disability [30]. This data shows that disability is prevalent in all populations, including higher education.

Barriers experienced by disabled STEM students

In post-secondary educational settings, many disabled students experience barriers that negatively impact their academic experience and prevent them from fully accessing educational

spaces, materials, and opportunities [31]. Some of these barriers include: biased and discriminatory attitudes of faculty and staff, inaccessible spaces, uncomfortable physical conditions in learning spaces such as laboratories, exclusion from social and academic groups, lower levels of financial support than non-disabled STEM students, and fewer mentorship options [3], [32], [33].

Additionally, disabled students may invest significantly more time managing their academic experiences than their non-disabled peers. These students spend additional time learning the disability services office's (DSO) policies and procedures, finding supportive and knowledgeable advisors and mentors [33], and exploring ways to navigate inaccessible spaces, instruction, equipment and resources [33], [34], [35], [36], [37]. Time spent managing disability-related issues detracts from disabled students' time to spend on other priorities, such as academic work, research, social engagement, or personal obligations.

Disabled students in STEM disciplines face the additional barrier of cultural stereotypes about who belongs in scientific and technical fields. Those who do not fit specific socially normative expectations encounter discriminatory practices, microaggressions, and discouragement from teachers and other authority figures [1], [38], [39], [39], [40]. Dominant cultural narratives portray disabled people as incompetent and physically weak regardless of the nature of their disability [41]. Such biases magnified for those with multiply marginalized identities; for example, people with non-dominant gender and racial identities are often portrayed in entertainment and other media as less intelligent, dependable, and capable in academic pursuits, particularly in science and technology. These barriers perpetuate exclusionary practices, attitudes, and policies that significantly impact disabled peoples' success in STEM [42], [43].

To these barriers, invisibly disabled people often opt to suppress their needs and hide their differences. Referred to as "passing" or "masking," this practice involves minimizing unique personality traits and striving to meet normative expectations of activity and behavior. Research has shown that masking is stressful, may cause serious mental and physical health conditions, and can contribute to an individual's development of burnout. Additionally, masking can prevent disabled individuals from seeking access to accommodations or other supportive measures that could help support their success [44], [45], [46], [47].

Accommodations

In the United States, institutions of higher education (IHEs) typically provide support for qualifying disabled students via accommodations, which are a set of tools, policies, and procedural adjustments meant to provide equal access to instruction and assessment for disabled students [48]. Examples of accommodations include extended time to complete assignments, access to assistive technologies, priority registration, options to participate virtually, and access to recordings of lectures and other learning digital learning materials, among others [49]. Students must prove they meet eligibility requirements through medical documentation and work with their institutional DSO to identify and be approved for necessary accommodations. While DSOs inform instructors of approved accommodations, students typically must negotiate the details of implementation with each instructor every semester [18].

Not all disabled students receive accommodations. Some may not be able to afford the necessary documentation, have their request denied, or encounter faculty who do not comply with DSO-recommended accommodations [13], [14], [18]. Students in high-stakes STEM situations like exams or labs may see accommodations denied over concerns it will give them an “advantage” over their peers. Regardless of the reason, the denial or withholding of accommodations can have a negative impact on disabled students’ success and cause them increased emotional, academic, and financial difficulties [50].

Additionally, institutions are only required to offer “reasonable” accommodations, which is an ambiguous standard. The Equal Employment Opportunity Commission (EEOC) allows the denial of accommodations “if doing so would cause an undue hardship,” which means, “unduly costly, extensive, substantial or disruptive, or would fundamentally alter the nature or operation of the business” [51]. This vague wording allows IHEs to reject modifications to specialized spaces, like laboratories, if they are deemed too costly. Additionally, even physically accessible spaces may contain sensory barriers like smells, fluorescent lights, loud noises, which can impact disabled students’ ability to perform at a high level [34].

Due to these many limitations within the accommodation system, librarians and other educators should not assume that “someone else” within their institutions, such as DSOs, will provide disabled students with the support and access they need for academic success. The responsibility falls to librarians themselves to make their instruction, services, and spaces accessible to all students. By creating an inclusive environment, librarians can minimize disabled students’ reliance on the accommodation system and reduce the need to disclose their disabilities to participate in learning activities [52].

Inclusive practices in academic librarianship

To effectively provide inclusive instruction and services, librarians must learn about disabilities and inclusive practices, then apply that knowledge throughout their work. Since inclusive best practices for inclusivity change over time, this process is inherently iterative, requiring continual adaptation to stay current with best practices.

Two of the most recognized frameworks for disability inclusion are Universal Design (UD) and Universal Design for Learning (UDL). UD, developed in the 1970s by architect Ron Mace and colleagues at North Carolina State University's Center for Accessible Housing, focuses on designing physical environments that are accessible and inclusive of all users, including those with disabilities. It can be applied in homes, public areas, workspaces, and educational settings to ensure comfort, safety, and functionality for a wide variety of people [53].

Drawing on UD principles, UDL was developed by the Center for Applied Special Technology (CAST) to guide inclusive pedagogy and teaching practices. The UDL Guidelines help educators create flexible learning environments by increasing student engagement, varying representation of content, and offering diverse ways for students to express their understanding [10]. While an in-depth discussion of UD and UDL is beyond the scope of this paper, Appendix A provides a few recommended resources on these topics.

Library and Information Science (LIS) literature increasingly reflects librarians’ interest in applying UDL and UD to library instruction and services. Although no professional guidelines

exist for implementing UDL in librarianship, some authors have made suggestions for interested librarians. Peter and Clement [54] offer charts with suggested strategies for employing UDL in library instruction. Similarly, Cook and Clement [55] propose ways to make library instruction more inclusive of people with invisible disabilities utilizing UDL.

Other LIS scholars have explored inclusive practices across library contexts. For example, in their 2009 article, librarians Chodock and Dollinger discuss their use of what they call “Universal Design for Information Literacy (UDIL),” a library-specific application of UDL. Zhong (2012) offered a UDL-based lesson plan to teach Boolean search strategies [56].

Subsequent literature has expanded on this work, addressing topics such as general overviews of disability inclusion and UDL in LIS [57], [58], [59], [60], [61], gradual implementation of UDL practices into teaching [54], staff and faculty training [62], [63], website information and accessibility [64], [65], support for specific disabilities [55], [66], [67], [68], [69], collaboration with disability services offices (DSOs) [70], assistive technologies [71], [71], and disability inclusion in library outreach [72].

Despite this progress, little research specifically addresses disability inclusion in STEM librarianship. Recent efforts include Van Loon and McCann’s (2024) evaluation of STEM database accessibility [73], and Xie and Liu’s (2024) investigation of DEI efforts in STEM librarianship in Canada, which included interviews of two disabled participants without focusing on inclusion [74]. Napp and Obertacz (2022) discussed a plan to create a space for autistic students in their library, though it did not come to fruition due to the COVID-19 pandemic and subsequent loss of funding [75].

Research Questions

1. In what ways are STEM librarians supporting disabled students in higher education?
2. What barriers, if any, prevent STEM librarians from supporting disabled students?
3. What factors enable STEM librarians to support disabled students?

Methods

Survey Instrument & Recruitment

For this exploratory research project, the researchers sought to gather data from as many librarians as possible and therefore utilized a survey that could be distributed widely. To capture more individual details from participants, they included qualitative as well as quantitative survey questions.

The 23-question survey instrument (full text in Appendix B) was approved as exempt by the Institutional Review Board (IRB) of both researchers' institutions (Emory University and University of Colorado Boulder). The survey was disseminated in November 2023 and active for one month. The researchers sent invitations to participate via disciplinary listservs, social media channels, and personal emails. For a list of listservs and social media channels, see Appendix C.

The introductory page of the survey provided participants with an explanation of the research. Participants were required to consent to taking the survey and asked two screening questions that limited survey participation to librarians who were a minimum of 18 years old and worked directly with students in instructional, reference, and research assistance capacities. Anyone who did not provide consent or who did not meet inclusion criteria were excluded from participation in the survey.

The first section of the survey consisted of five demographic questions, which purposefully avoided asking identifying questions to protect participant anonymity. The next section, titled "Knowledge and Confidence" (Q 8-16), asked participants to perform a self-assessment of their knowledge of disabilities and their confidence in supporting disabled students with library services and instruction. Each question in this section presented a statement (e.g., "I know a lot about disabilities"), and asked participants to select the option that best applied to them on a five-point Likert scale ranging from "strongly agree" to "strongly disagree." Participants could select only one answer for each statement.

The third section, titled “Practices, Barriers, and Enabling Factors” (Q17-Q22), explored the specific accessibility practices respondents had used in their work, as well as the factors they believed to have facilitated or hindered that support. This section included a list of predetermined answers from which participants could choose, as well as an option to provide their own responses in a free text box. Due to an error in the survey design, one question (Q19), which was intended to be a follow up question that asked about the frequency with which librarians implemented various supports, failed to display in the survey and is therefore not included in this study.

At the end of the survey, participants were given a free-text box in which to share additional thoughts or experiences on the topic. They were also asked if they would be willing to participate in further research, for which they could provide an email address. Participants were informed that all submitted emails would be kept confidential and would not be associated with survey responses.

Data Analysis

All data was analyzed collectively and will be addressed in a separate article. This conference paper specifically focuses on how responding STEM librarians support disabled students in their work.

The quantitative data collected included participant demographics, Likert scale responses, and close-ended questions with predefined answer options. This data was analyzed using Qualtrics software tools to generate counts and percentages of responses to the various answers.

The qualitative data was collected in the second part of the survey. To analyze this data, the researchers employed thematic analysis methodology [76], [77]. Researchers coded participants’ responses individually, then collaboratively created a codebook of themes found in the data. The researchers also used the Qualtrics Stats IQ functions to perform some statistical analyses of the data; however, no statistically significant relationships were found between variables.

Results

Participant Demographics

Out of the 291 total completed surveys, 122 participants indicated that they work closely with STEM disciplines. 27% of these participants had worked in academic libraries for five years or less, 21% for 6-10 years, 30% for 11-20 years, and 21% for more than twenty years.

Participants' institutions were doctoral degree-granting (53%), master's degree-granting (22%), associate degree-granting (13%), baccalaureate-granting (6%), and special focus institutions (5%). The institutions represented were fairly evenly split between large institutions with more than 15,000 students (36%), medium institutions with 5,000-15,000 students (29%), and small institutions with fewer than 5,000 students (36%).

Disciplines and Patrons Supported

Respondents could select multiple disciplinary categories, including four STEM categories, as well as any (or all) of six other categories: humanities, social sciences, writing courses, arts/music/dance/theater, "no specific disciplines," and "other." The "other" category was an open response option and responses included business, psychology, general education classes, ministerial courses, and interdisciplinary courses. Of the STEM-supporting participants, 43% supported an engineering discipline, 30% supported mathematics, 53% worked with health science-related disciplines, and 52% supported a natural science discipline.

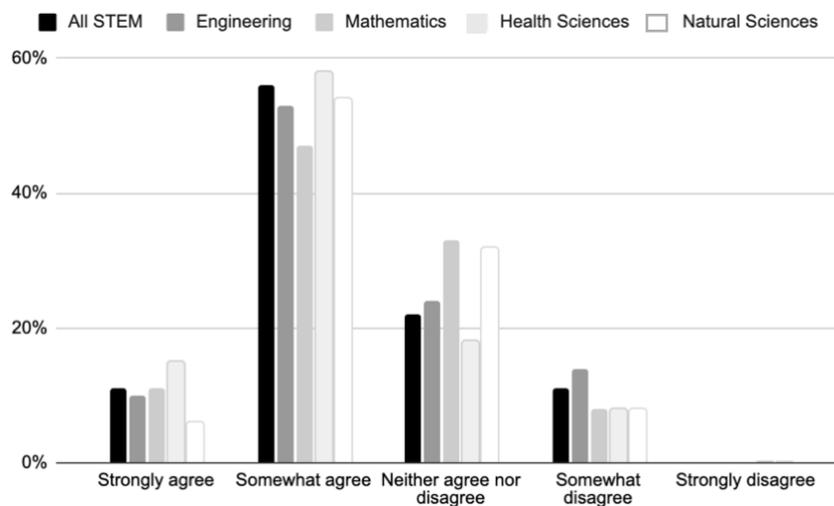
A large majority of STEM participants worked with undergraduate students (93%) and faculty and staff (89%). Most worked with graduate students (68%) and more than a third worked with researchers (39%). 12% reported working with other types of patrons, including public patrons and alumni.

Survey Responses: Knowledge and Confidence Section

The introduction to this section of the survey included definitions of relevant terms and a statement about the researchers' use of identity-first language. See Appendix C for term definitions. The questions in this section asked participants to rate their knowledge and opinions

of several disability related topics. All questions in this section were single answer; options consisted of a five-point Likert scale ranging from “strongly agree” to “strongly disagree.” In the figures below, participant responses are reported in aggregate (in black) and by STEM discipline (in shades of grey). Note that participants were able to select multiple disciplines they supported. Complete data tables for all figures is included in Appendix E.

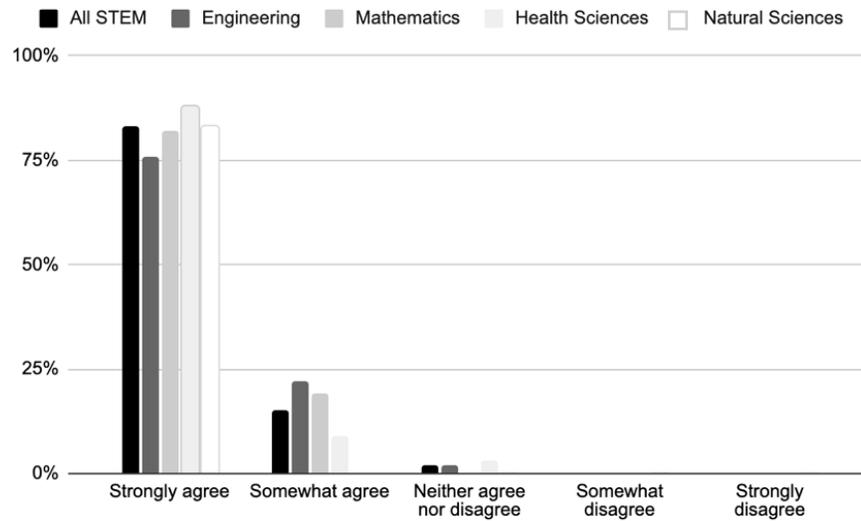
Figure 1. Participant agreement with statement: “I know a lot about disabilities.” (By percentage of participants in each STEM discipline. Participants may be represented in multiple categories, n=121).



All four STEM fields showed a similar pattern; in every group, the largest percentage of respondents indicated that they “somewhat agreed” with the statement “I know a lot about disabilities.” A smaller percentage of participants indicated that they felt very confident in their knowledge (“strongly agree”) or that they were somewhat lacking in knowledge (“somewhat disagree.”) Librarians who supported the health sciences expressed the most confidence in their knowledge. None of the respondents strongly disagreed with this statement.

The next statement investigated participants' personal values by asking them to assess the importance of supporting disabled students.

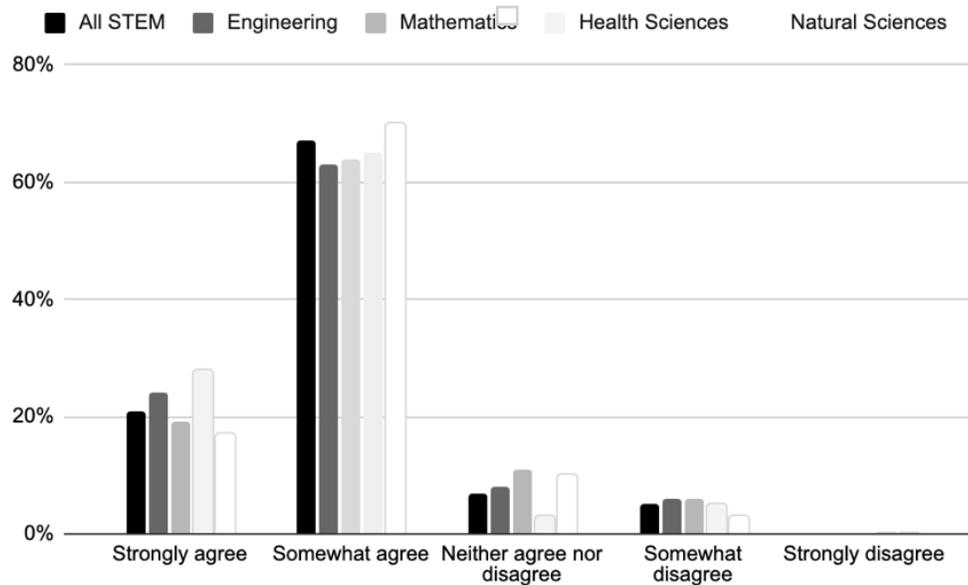
Figure 2. Percentage of participant agreement with statement: "Supporting disabled students is important to me." (By percentage of participants in each STEM discipline. Participants may be represented in multiple categories, n=121).



Survey data shows that nearly all participants valued supporting disabled students (Figure 2). The majority of participants across all STEM categories indicated strong agreement that supporting disabled students was important, with a smaller percentage of participants expressing moderate agreement. Only three participants indicated neutrality, and no participants expressed that such support was unimportant.

Participants were then asked about their knowledge of how disability impacts students in higher education.

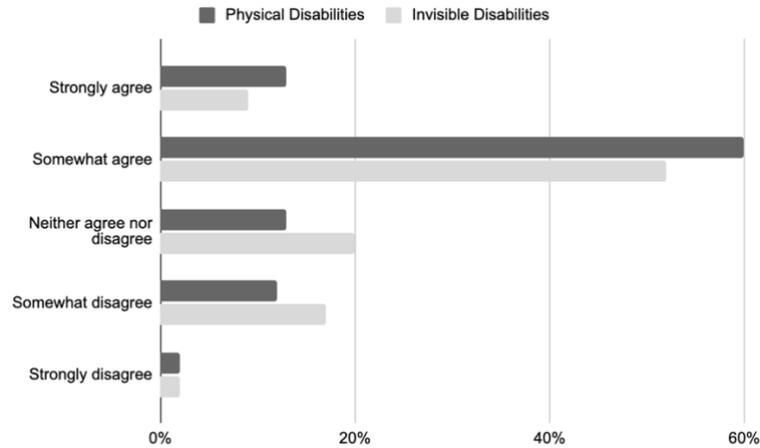
Figure 3. Percentage of participant agreement with statement: "I am familiar with the ways disabilities impact students in higher education." (By percentage of participants in each STEM discipline. Participants may be represented in multiple categories, n= 121).



Participants in all categories followed a similar pattern in their responses to the third statement. Most participants in each category indicated that they agreed somewhat. Smaller percentages indicated they felt neutral or moderate disagreement, which indicates a lack of confidence in understanding of the experiences of disabled students in higher education.

The next two survey questions asked participants about their confidence in supporting physically and invisibly disabled students in instructional spaces and in research consultations. Figure 4 shows a comparison of participants' responses to each category of disability. (For definitions of physical and invisible disabilities, see Appendix F.)

Figure 4. Percentage of all STEM participants' agreement with the statement: "I am confident in my ability to support a *physically/invisibly* disabled student in a class/in a consultation/in their research" (By percentage of total participants, n=121).



Participants indicated more confidence in supporting students with physical disabilities than those with invisible disabilities.

Figure 5. Percentage of participant agreement with statement: “I am confident in my ability to make digital materials accessible.” (By percentage of participants in each STEM discipline. Participants may be represented in multiple categories, n=121).

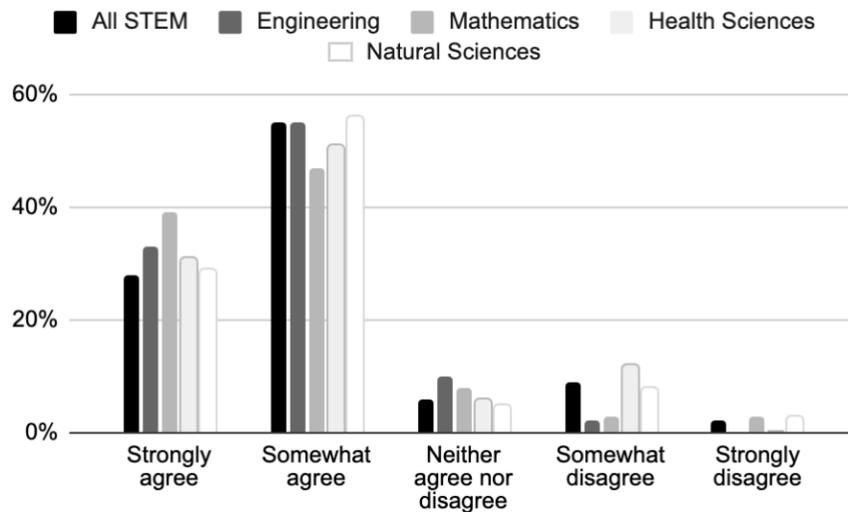
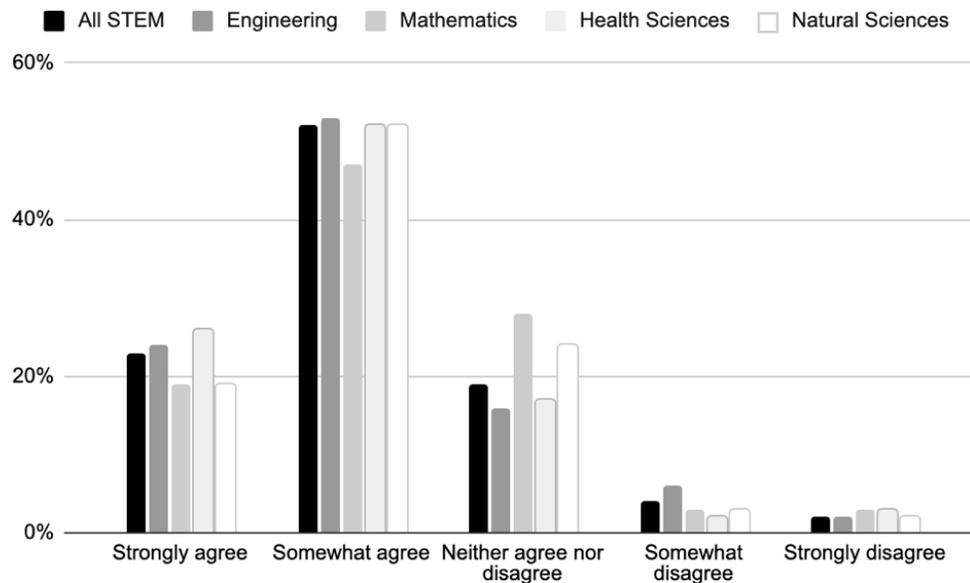


Figure 5 shows high levels of participant confidence in making digital materials accessible. Digital accessibility is an essential inclusive practice, allowing people who use screen readers and other tools to engage with content in synchronous and asynchronous settings. Overall, 83%

of STEM participants selected “strongly agree” or “somewhat agree”, whereas 7% indicated they did not agree or disagree with the statement, and 11% indicated some level of disagreement.

Figure 6. Percentage of participant agreement with statement: “I am confident in my ability to use appropriate (non-ableist) language when interacting with disabled people or discussing disabilities.” (By percentage of participants in each STEM discipline. Participants may be represented in multiple categories, n=121).



A significant majority of participants agreed to some extent that they could use non-ableist language appropriately (Figure 6). However, it is important to note that quarter of all participants (across all STEM categories) did not agree with this statement.

Figure 7. Percentage of participant agreement with statement: “I am confident in my ability to identify ableist microaggressions or prejudice in higher education settings.” (By percentage of participants in each STEM discipline. Participants may be represented in multiple categories, n=121).

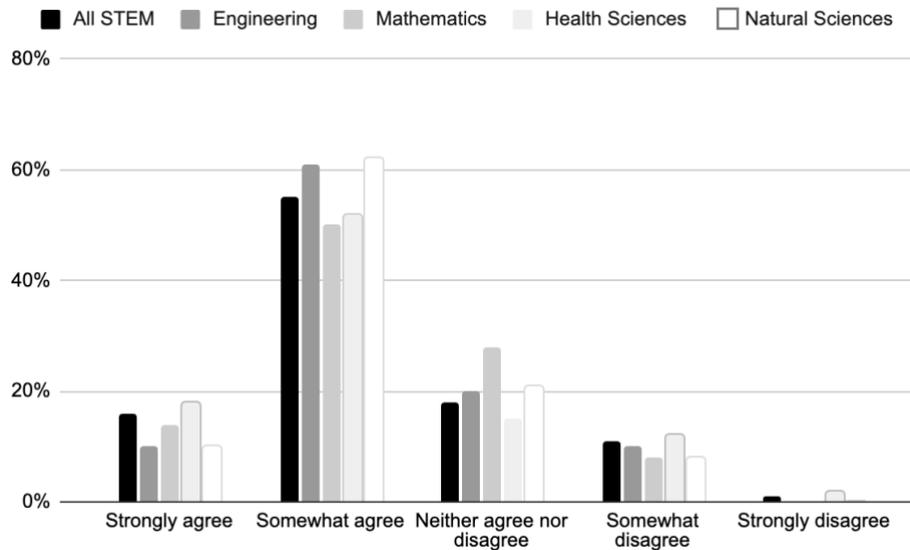


Figure 7 displays participants' confidence in their ability to identify ableist microaggressions or prejudice in a collegiate setting. Overall, respondents reported more confidence in their ability to use appropriate language (Mean: 3.91) than their ability to identify microaggressions (Mean: 3.74).

Table 1. Percentage of participants selecting responses to: "Please select all supports you, as a librarian, have provided for students or researchers. Check all that apply." (By percentage of total participants. Participants could select multiple categories, n=120).

Asynchronous access to materials	92%	110
Begin with overview of topic	83%	100
Accessible digital materials	81%	97
Explain context/relevance of tools/resources	73%	88
Content in multiple formats or media	70%	84
Closed captioning or A/V options for instruction or events	54%	65
Strategies for achieving tasks or projects	50%	60
Multiple options for responses and answering questions	49%	59
Alternatives/options for group or partner activities	17%	20
Alternatives/options for physical activities	14%	17
Live interpreters for events/instruction	13%	16
Other (please describe)	6%	7

Participants indicated that they employed a variety of inclusive supports; two of the top three supports selected were related to digital accessibility practices. In the “other” category, participants listed providing OCR enabled book chapters, the option to meet virtually, private follow-up sessions, and providing materials ahead of time through the campus learning management system (LMS).

Table 2. Percentage of participants selecting responses to: “In situations when you provide support for disabled students, what factors contribute to your ability to do so? Check all that apply.” (By percentage of total participants. Participants could select multiple categories, n=119).

Self-education: reading	86%	105
Support from colleagues or mentors	68%	83
Institutional trainings	49%	60
Self-education: classes	43%	52
Participation in a group or Community of Practice	25%	30
Other (please describe)	12%	15

Participants indicated a variety of factors that contribute to their ability to support disabled students. In addition to those listed above, participants listed the following factors: self-education through teaching, following established policies, coordinating with DSO, previous professional experience, personal and family experiences with disability, learning via the ACRL SRRT (Social Responsibilities Round Table), common sense, free webinars, and specialized software.

Table 3. Percentage of participants selecting responses to: “In situations when you do not incorporate support for disabled students, what factors inhibit you from doing so? Check all that apply.” (By percentage of total participants. Participants could select multiple categories, n=118).

Not informed of disabled students in classes	75%	92
Lack of training	53%	65
No time to prepare	52%	63
Encounter few disabled students	35%	43
Other (please describe)	13%	16
Too many higher priorities	9%	11
Concerns about fairness	4%	5

In situations where participants did not provide inclusive support, they identified not being informed of a need for disability inclusion as the biggest barrier to doing so. More than half also identified lack of training and time to prepare as inhibiting factors. The 13% who offered additional barriers listed the following items: lack of awareness of appropriate strategy/technique, lack of access to interpreters, limitations of space, no access to assistive technologies, having no chance to prepare for “on the fly” sessions, missing or broken technology, not knowing how to provide support, and inflexible classroom layouts. One participant felt always able to accommodate disabled students.

Table 4. Percentage of participants selecting responses to: “What would help you to provide more support for disabled students in your work? Check all that apply.” (By percentage of total participants. Participants could select multiple categories, n=116).

Help/support from experts or mentors	67%	82
Support from supervisor/administration	52%	63
Time for professional development	47%	57
Support from colleagues/community of practice	45%	55
Access to professional development funds	28%	34
Other (please describe)	19%	23

Participants expressed that help from experts, supervisors and administrators, time and funding for professional development, and support from colleagues would help them incorporate more disability-inclusive practices in their work. Additionally, some participants suggested additional factors that could help them implement such practices: funding for inclusive technology, support from departmental faculty, time to implement new supports, examples and templates appropriate to implementing UDL in one-shot instruction sessions, reminders to implement inclusive practices, more research related to LIS and disability support, integrated support across campus, being able to “outsource” digital accessibility tasks, such as making a PDF screen reader

accessible, institutional guidelines, more institutional priority for inclusive practices, guidelines for providing support, and better communication about disability issues (presumably with faculty and DSO, but unclear).

The final question on the survey was completely open-ended. Some of the themes that emerged from these participant comments included: (n=44)

- Disabled students do not inform educators of their needs
- Learning inclusive practices takes a lot of time and effort
- Individual efforts are less effective than having group/institutional support
- Librarianship as a profession does not emphasize disability-inclusion sufficiently
- It is easy to forget about accessibility, especially if you do not have access challenges
- Overburden at work makes learning inclusive practices difficult or impossible
- Expert support really helps people learn about inclusive practices
- Quick-reference guides to inclusive practices would be very helpful
- Society is not inclusive; we need to work hard to make it more so
- Ongoing education about inclusion is essential
- Many university resources are not digitally accessible
- There is a lack of coordinated support for disabled students on campus
- Disability support is unevenly distributed on campus
- No one on campus wants to pay for the changes necessary for inclusive support
- When an institution does not support inclusion, it is hard for individuals to implement

Discussion

Librarians care about disabled students

The survey data revealed that survey participants placed a high value on supporting disabled students. Most felt at least somewhat knowledgeable about disabilities and how they impact students in higher education. Participants reported feeling more comfortable providing accessible asynchronous digital content than providing synchronous support for disabled students. When interacting directly with disabled students, they reported feeling more confident supporting a

physically disabled student than an invisibly disabled student. Respondents felt more confident personally using appropriate language than identifying ableist microaggressions.

Some participants noted that colleagues, administrators and the profession at large should be more concerned with accessibility. This is reflected in statements such as, “I push for wider accessibility efforts internally in my library but sometimes feel like I get weird pushback from other colleagues and my unit leader. I think maybe they don't like the idea that they're not doing something they should be doing? I don't know.” Another noted the lack of librarian knowledge of institutional support as well as their own library’s disability-inclusive efforts, “...there is no reason we as librarians do not receive more training or access to work with screen readers, have an understanding of the accessibility features of our major resources, understand what accommodations are actually available via institutional funding versus expected to be provided by the individual.” Such education could be included in library onboarding programs to make sure all librarians and staff know about various accessibility issues, features, and institutional tools available.

Digital accessibility broadly supported

Overall, STEM librarians are using many inclusive practices in their work with students. Three out of the five most commonly-provided supports by respondents related to digital accessibility: 90% have provided asynchronous access to materials such as recordings of lectures, links to resources, library guides, handouts, and similar, 80% reported providing accessible digital materials such as slides and documents that have appropriate color contrast and are screen-reader accessible, and 53% reported using closed captioning for AV content, events, and instruction.

Participants’ widespread adaptation of digital accessibility practices is hardly surprising; due to the COVID-19 pandemic, educators across the globe were forced to adapt to a virtual teaching environment beginning in 2020 [78], [79]. Like other fields, academic librarians learned to provide services, instruction, and resources digitally, which many had not done extensively before. Considerable LIS literature covered the efforts made and lessons learned during this transition, all of which helped librarians improve their digital accessibility skills [59], [80], [81].

Additionally, the pandemic showed educators the frustration of inaccessible digital content and the headache of accessibility issues in their daily lives [79]. It is perhaps disappointing that it took a pandemic to make more people value inclusive digital practices, but it is tremendously positive that digital accessibility has greatly improved. Many librarians and other educators have extensively incorporated digital teaching tools and become proficient in online and asynchronous instruction. Additionally, the demand for improved virtual work environments inspired industries and higher education to improve digital systems, resources, and tools, making them much more accessible for all users [79]. Digital accessibility practices are likely to continue to be important and heavily utilized due to the post-pandemic shift towards online and hybrid study and work [82], [83].

More education needed

As noted in Table 3, more than half of participants identified a lack of training as a barrier to implementing inclusive practices. Because library science programs typically do not include coursework on the implementation of UDL and other inclusive practices, librarians must find other ways to learn these skills [54]. Many participants indicated that self-education and reading was their primary method of learning about inclusive pedagogy and practices. However, as Peter and Clement [54] discuss, implementing UDL into instruction can seem overwhelming; the framework includes many principles and considerations. Additionally, many UDL resources are focused on semester-long courses rather than the “one-shot” style of teaching common for academic librarians.

Some participants reported that despite efforts to learn inclusive practices, they did not feel that they achieved the needed level of proficiency. For example, one participant stated, “I have been working to include accessibility in my librarianship for some years now, through e-courses on Universal Design for Learning and related topics...I have incorporated practices as much as I can but still feel like I'm not fully versed in what should be expected of an academic library.” Without discussion, guidance, and support from other librarians, implementing

inclusive practices can feel overwhelming and disappointing; it takes continuous iterative effort to learn accessibility best practices translate them into the needs of a one-shot instruction session.

Other participants indicated confusion regarding how, why, when and where inclusive practices could be employed to help students. One participant wrote, “If someone has an invisible disability it's hard/impossible to know what they need in a one-on-one interaction (e.g., research consultation) unless they tell you...what are you supposed to do if you're not supporting them because you don't know they need support? I'm thinking esp. about research consultations, for instance (versus UDL practices in a classroom).”

Though typically associated with classroom settings, the UDL framework can also be applied to individual interactions like research consultations and reference interactions. The framework helps educators address diverse student needs and consider instruction techniques that will be accessible to all learners. Even in one-on-one sessions, it is helpful to consider accessibility of documents, resources, and virtual/physical spaces; present students conceptual overviews and multiple examples; offer varied approaches to the research process; connect to students' motivation and prior knowledge; clarify jargon and check student understanding; and help students organize and plan to achieve their goals.

Do you really need to know?

Overall, respondents indicated anxiety around the information gap of what accommodations individual students might need; 75% indicated no knowledge of disabled students in classes as a barrier to providing supports to disabled students. This is one of the most important barriers to address for librarians who want to be more supportive and inclusive of disabled students.

One participant commented, “If I knew what types of disabilities they had, I would be better able to ways to assist them with their information needs.” This sentiment was repeated throughout the survey.

Sara Maurice Whitver [11] argues that this issue is at the heart of the need for inclusive practices, noting that librarians can never reliably know if they are teaching disabled students; such

information can only legally be shared by the student, many of whom choose not to do so. She writes, “As the system stands, librarians have no clear legal path for ascertaining the abilities of students entering their classroom. Historically, course instructors have relied on accommodations to guide the retrofitting of curricular design on a case-by-case basis [11, p. 383]”.

Librarians also must understand the emotional toll constant self-advocacy takes on disabled students. These students risk encountering pushback, negative attitudes, and invasive personal questions with each disclosure, often leading them to avoid conversations about disability [11], [14], [64]. Many students choose not to disclose their disabilities, limitations, or accommodations. While this creates an information deficit for librarians, it does not prevent proactive accessibility planning through flexible resources, practices, and policies. Though information-gathering is a natural librarian instinct when problem-solving, relying solely on individual disclosures is neither efficient nor effective for supporting disabled students. Moving beyond the "accommodation and retrofitting" mindset toward flexible approaches that help all students meet learning goals is essential. Depending exclusively on institutional DSOs for disability inclusion leaves critical student needs unaddressed and reinforces systemic barriers in higher education.[11], [14], [64]

Support needed: institutional and professional

Survey participants expressed a clear need for more support to stay informed and current with inclusive practices. Many voiced frustration with limited institutional backing, noting that individual research is time-consuming and less effective than collaborative approaches or formal training. As one respondent wrote, “There is some support on campus, but it can be hard to access. There really needs to be more support at a campus level... We are already overburdened with work.”

Participants identified several key barriers: insufficient funding, poor coordination, lack of assistive technology, and inconsistent institutional commitment to inclusive practices. Some expressed that their institutions did not value disability inclusion at all, with one participant noting, “due to the nature of our institution, the need to support or accommodate those kinds of

challenges is not expected, so I don't have any experience or training in how to do that...". Several respondents highlighted how the siloed accommodation approach undermines consistency in student support.

Many participants stated that they valued input and support from colleagues and inclusivity experts – expert feedback is rarely available to individuals but can be accessed through coordinated institutional approaches. Institutional coordination could establish minimum accessibility standards ensuring all students have access to educational materials and course activities.

The library profession must provide better guidance for implementing inclusive practices. Participants noted that most UDL educational materials target semester-long courses rather than the “one-shot” instruction sessions typical in academic libraries. As one participant wrote, “Aside from accessibility of online content, webinars I've attended lacked specific actions I could take to make class materials or teaching methods most inclusive.”

Developing comprehensive, regularly updated best practices for implementing UDL in academic library settings would give librarians a starting point. This approach might seem to challenge the principle that UDL shouldn't be treated as a checklist. UDL should be engaged with deeply and used as a reflective tool for iteratively designing instruction, but librarians need practical entry points to basic inclusive pedagogy principles. Cook and Clement's [55] work on integrating UDL into library instruction offers a foundation that could be expanded to cover all aspects of library services. Such guidelines would encourage more librarians to begin incorporating inclusive practices into their daily work and routines.

A question of justice

The first draft of this paper was written before the second Trump administration took office and some things have changed in a very short amount of time. As has been widely noted, the new administration has cut many programs that were inclusive of many marginalized groups, including disabled people, and has encouraged and has even celebrated the use of racist,

misogynistic, and ableist language and slurs [84]. In a new era of anti-“DEIA” sentiment, support for minoritized groups has not only faded from many governmental offices, public institutions, and colleges, but has become dangerous even to judges [85] and the most esteemed and powerful universities in the world [86]. In this new national order, the injustice of discriminatory policies may be best met with resistance in the form of continuing the work of inclusion.

The existence and incorporation of inclusive practices, pedagogies, materials and spaces is a matter of justice. Even discounting recent executive orders, current practices in higher education put the onus on students to navigate a complex and often unwelcoming system to gain equitable access to educational opportunities. Disabled students must spend time and energy self-advocating for accommodations; this system strongly favors those who have the capacity—or have the privilege of familial, financial, and emotional support—to have their needs met. Access to the learning environment is a “necessary precursor for equity,” but for many of these students, their access needs are seen as too costly, inconvenient, or difficult to meet [87]. This system unfairly penalizes less privileged students, who may have intersectional or non-dominant identities, by blocking their equitable participation in STEM disciplines.

Conclusion

The data shows that STEM librarians possess foundational knowledge about disabilities and are currently employing some inclusive practices. The challenge now is expanding these efforts to more librarians—and educators—to help regularly update and expand their understanding of disability, ableism, accessibility, and inclusion. Widespread adoption could reduce disabled students’ reliance on the flawed accommodation system.

Implementing UDL principles would benefit numerous other student groups beyond disabled students – international and first-generation students, those with significant work or family responsibilities, and anyone struggling in the post-secondary academic environment.

Additional institutional support is clearly necessary. Academic institutions must transform their cultures and integrate inclusive strategies across all curricula to create truly equitable educational opportunities. Establishing minimal standards and guidelines would be a significant first step towards this goal. However, the current political environment – significant reductions in grant funding, challenges to intellectual freedom, hostility to international students and immigrants, and attacks on accessibility initiatives and the Americans with Disabilities Act – present substantial obstacles to achieving these essential improvements.

For librarians specifically, development of professional guidelines could help overburdened librarians to begin exploring UDL-based accessibility practices. Requiring coursework in inclusive pedagogy for accreditation in LIS programs would ensure that librarians are introduced to accessibility concepts before they step into the classroom. Communities of practice and discussion groups are excellent forums to share ideas around implementing inclusive practices in library instruction, reference work, and individual research consultations. Librarians with expertise can lead efforts to educate their colleagues and promote inclusive strategies in library work. And all libraries interested in being more accessible can investigate collaborative efforts with other UDL practitioners on their campuses or in their regions to facilitate the broad adoption of inclusive pedagogy and practices in their institutions.

Study Limitations

One of the significant limitations of this study is that participants volunteered to participate, which undoubtedly resulted in self-selection bias [88]. In the case of this project, volunteers quite likely had a personal interest in disability inclusion, which influenced their participation in the survey. Thus, the data collected in this exploratory study reflects the knowledge, attitudes, and practices of the librarians who encountered the survey and were willing to fill it out. These librarians may be considerably more informed about disability issues than the average academic librarian. In addition, other forms of bias may also be present, such as social-desirability bias, which is when research participants provide answers to questions that they think put them in a more positive light due to social norms and expectations rather than reflecting their true thoughts, beliefs, or behavior [89].

Readers should also note that a very small number of STEM-supporting librarians participated in this survey compared to the number of academic librarians who support these fields throughout the U.S. and Canada. None of the findings presented here should be generalized to all STEM librarians.

Another limitation of this study is the selected method of data collection; the researchers chose to employ a survey for this initial project because they wanted to receive input from as many librarians as possible. However, much of the information that was of interest to the researchers is not well captured by surveys. The wording of the questions, terminology used, and organization of the survey could have influenced participants' answers and may have been interpreted differently by the various individuals. For a more thorough understanding of how academic STEM librarians support disabled students, the authors plan to engage in more traditional qualitative and quantitative methods, including interviews and focus groups.

A final limitation to this paper is that some of the surveys and reports cited are no longer available due to executive orders that have required governmental organizations to essentially erase all mention of anything related to 'diversity, equity, and inclusion' [90]. This erasure has impacted materials cited from the Bureau of Labor Statistics, National Center for Education Statistics, and National Science Foundation, among others. Future work investigating disability inclusion is likely to encounter challenges related to data availability. Researchers may need to rely on secondary sources as some types of data may no longer be collected or disseminated regarding disabled students in higher education.

However, one important line of inquiry still open to researchers is the investigation of disabled students' firsthand experiences with library spaces, services, and instruction. Although funding may be limited to provide student participants with deserved remuneration for their time and effort, such work would greatly contribute to the understanding of disabled student experiences with academic libraries and librarians.

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Appendix A: Selected Recommended Resources

Universal Design for Learning (UDL) & inclusive pedagogy

There are many excellent resources available for those who would like to learn about UDL and UD. [CAST](#) (Center for Applied Special Technology) developed Universal Design for Learning and maintain an excellent website that includes the [UDL Guidelines 3.0](#), the most current iteration as well as a variety of learning resources [10], [91]. Both topics have been written about extensively and there are many books, webinars, and other resources available, including a recent book about UDL for academic librarians by Danielle Skaggs and Rachel M. McMullin [92].

Universal Design (UD): inclusive spaces and physical access

- R. L. Null, *Universal design: principles and models* / Roberta Null., Second edition. Boca Raton: CRC Press, 2014. Accessed: Apr. 16, 2025. [Online]. Available: <https://research.ebsco.com/linkprocessor/plink?id=04917a33-5bfc-3677-851a-aa604c832586>

Disability justice

- Kumbier and J. Starkey, “Access Is Not Problem Solving: Disability Justice and Libraries,” *Library Trends*, vol. 64, no. 3, pp. 468–491, 2016, doi: [10.1353/lib.2016.0004](https://doi.org/10.1353/lib.2016.0004).
- Sins Invalid, *Skin, Tooth, and Bone: The Basis of Movement is Our People. A Disability Justice Primer.*, Second. Berkeley, California, 2019. Accessed: Feb. 27, 2023. [Online]. Available: https://static1.squarespace.com/static/5bed3674f8370ad8c02efd9a/t/5ebb9f7d4b59573668c49bb7/1589354383387/Skin_tooth_and_bone-2ndEd-Text_Only.pdf
- L. L. Piepzna-Samarasinha, *Care Work: Dreaming Disability Justice*. Vancouver, BC: Arsenal Pulp Press, 2018.

Disability in Higher Education

- N. J. Evans, E. M. Broido, K. R. Brown, A. K. Wilke, and T. K. Herriott, *Disability in Higher Education: A Social Justice Approach*. Somerset, UNITED STATES: John Wiley & Sons, Incorporated, 2017. Accessed: Feb. 01, 2023. [Online]. Available: <http://ebookcentral.proquest.com/lib/ucb/detail.action?docID=4816152>
- J. Dolmage, *Academic Ableism: Disability and Higher Education*. Ann Arbor, MI: University of Michigan Press, 2017. doi: [10.3998/mpub.9708722](https://doi.org/10.3998/mpub.9708722).

Appendix B: Survey Text

Q1. Do you consent to taking this survey?

Yes: Continue to Q2, No: End of Survey

Q2: (Screening Question:) Are you a librarian who works directly with students and researchers? This could include: outreach, instruction, liaison librarianship, student success efforts, access services, reference, etc?

Yes: Continue to Q3, No: End of Survey

Q3. What size of institution does your library support?

1. Small (<5,000 students)
2. Medium (5,000-15,000 students)
3. Large (15,000+ students)

Q4. What term best describes your institution?

4. Doctoral university
5. Master's college/university
6. Baccalaureate college
7. Baccalaureate/associate's college
8. Associate's college
9. Special Focus Institution (please describe)

10. Tribal Colleges and Universities

11. Other

Q5. How long have you worked in academic libraries?

12. 0-5 years

13. 6-10 years

14. 11-20 years

15. 21+ years

Q6. What disciplines do you personally support or work with most? Check all that apply.

16. Natural sciences (astronomy, physics, chemistry, Earth science, biology, etc.)

17. Social sciences (economics, education, sociology, political science, etc.)

18. Health sciences (nursing, medicine, kinesiology, etc.)

19. Humanities (languages, classics, history, religious studies, etc.)

20. Arts/Music/Theater/Dance

21. Mathematics or related

22. Engineering (computer science, robotics, mechanical, biological, aerospace, etc.)

23. Writing courses

24. No specific disciplines

25. Other, please describe: (free response)

Q7. What patron groups do you personally support or work with regularly? Check all that apply.

26. Undergraduate students

27. Graduate students

28. Faculty and staff

29. External or visiting researchers

30. Other: (free response)

Q8. PAGE TWO: Knowledge/Confidence

In this section, we would like to ask you about your knowledge about disabilities and how to support disabled students.

- For this survey, we define “disability” as “any condition of the body or mind (impairment) that makes it more difficult for the person with the condition to do certain

activities (activity limitation) and interact with the world around them (participation restrictions). There are many types of disabilities, such as those that affect a person's: vision, movement, thinking, remembering, learning, communicating, hearing, mental health, and social relationships.”

- Throughout this survey, we use identity-first language, i.e. “deaf students” or “autistic students” rather than “students with disabilities”, which is common in disability rights scholarship.

For each of the following statements, please select the option that best describes you.

(Note: Although labeled “Question 8” this was clearly not a question, but rather an introduction to the next section of the survey)

Q9. I know a lot about disabilities

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly Agree

10. Supporting disabled students is important to me

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly Agree

11. I am familiar with the ways disabilities impact students in higher education

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly Agree

12. I am confident in my ability to support a *physically disabled* student in a class/in a consultation/in their research

- Physical disabilities include: visual impairments, mobility impairments, hearing impairments, etc.

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly Agree

13. I am confident in my ability to support an *invisibly disabled* student in a class/in a consultation/in their research

- Invisible disabilities include: Autism, ADHD, mood disorders, anxiety, dyslexia, dyscalculia, other learning disabilities, chronic illness etc.

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Q14. I am confident in my ability to make digital materials accessible

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Q15. I am confident in my ability to use appropriate (non-ableist) language when interacting with disabled people or discussing disabilities

- Ableist language devalues or discriminates against disabled people

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree

5. Strongly agree

Q16. I am confident in my ability to identify ableist microaggressions or prejudice in higher education settings

- Microaggressions are harmful/insensitive/insulting assumptions, actions, questions, or statements that target marginalized people. They can be intentional or unintentional and generally happen in casual, everyday situations.

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Q17. Next, we would like to ask about how you incorporate support for disabled students and researchers into your work as a librarian.

(Note: This question serves as a transition introducing the next section of the survey.)

Q18. Please select all supports you, as a librarian, have provided for students or researchers as a librarian (check all that apply):

1. accessible digital materials (e.g. contrast/screen-reader friendly)
2. asynchronous access to materials (recordings of lectures, links, guides, handouts, etc.)
3. content in multiple formats or media
4. multiple options for responses and answering questions (such as anonymous response options)
5. Begin with overview of topic and session
6. strategies for achieving tasks or projects
7. Explain context and relevance of tools or resources
8. Closed captioning or A/V for instruction or events
9. Live interpreters for events or instruction
10. Alternatives/options for physical activities
11. Alternatives/options for group or partner activities

12. Other (please describe)

Q19. *This question did not display to participants due to a design error.*

Q20. In situations when you provide support for disabled students, what factors contribute to your ability to do so? Check all that apply

1. Support from colleagues or mentors
1. Participation in a group or Community of Practice Self-education: classes
2. Institutional trainings
3. Self-education: reading
4. Self-education: classes
5. Other (please describe):

Q21. In situations when you do not incorporate support for disabled students, what factors inhibit you from doing so? Check all that apply.

1. Lack of training
2. No time to prepare
3. Not informed of disabled students in classes
4. Concerns about fairness
5. Encounter few disabled students
6. Too many higher priorities
7. Other (please describe): _____

Q22. What would help you to provide more support for disabled students in your work? Check all that apply.

1. Access to professional development funds
2. Time for professional development
3. Help/support from experts or mentors
4. Support from supervisor/administration
5. Support from a community of practice or colleagues
6. Other (please describe): _____

23. Would you like to share any final thoughts about supporting disabled students as an academic librarian? (*Free response*)_____

24. Are you interested in participating in further research on this topic?

Yes: continue to Question 25

No: end of survey

25. Please enter your email so we can contact you about further research on this topic. Your privacy is important, your email will not be shared or associated with your answers to this survey:_____

Appendix C: List-Servs Used for Recruitment

- Academic Library Association of Ohio ([ALAO](#))
- [ACRL Anthropology and Sociology Section](#)
- [ACRL Arts Section](#)
- ACRL [College Libraries Section](#)
- ACRL [Community and Junior College Libraries Section](#)
- ACRL [Community and Junior College Libraries Section](#)
- ACRL [Science and Technology Section](#)
- ACRL [University Libraries Section](#)
- ACRL [Women and Gender Studies Section](#)
- ACRL First Year Experience Discussion Group
- ACRL Services to Graduate Students Interest Group
- American Society of Engineering Educators Engineering Library Division listserv
- Association of Southeastern Research Libraries ([ASRL](#))
- Association of Southeastern Research Libraries (ASERL), Accessibility Interest group
- California Academic & Research Libraries ([CARL](#))
- Colorado Academic Library Association ([CoALA](#))
- Georgia Library Association (GLA)

- Heads of Public Services Discussion Group
- Librarians From Very Small Academic Institutions DG
- MAPS-L@LISTSERV.UGA.EDU
- [MCLS - Midwest Collaborative for Library Services](#)
- New England Library Consortium (NELC)
- Ohio Academic Library Association: 2-year college interest group
Ohio academic library Association: Instruction group
- Ohio Academic Library Association: distance learning group
- Pamnet, listserv for the Physics-Astronomy-Mathematics (PAM) Division of the Special Libraries Association
- STEM Librarian Collective Discord General channel

Appendix D: Participant Demographic Data

STEM Disciplines Supported by Participants: (n = 122)

- 52 participants worked with engineering disciplines (computer science, robotics, mechanical, biological, aerospace, etc.)
- 37 supported mathematics and related disciplines
- 65 supported health sciences (nursing, medicine, kinesiology, etc.)
- 64 supported natural sciences (astronomy, physics, chemistry, Earth science, biology, etc.)

Other Disciplines Supported by Participants:

- 5 supported business-related courses
- 2 supported religion or ministerial courses
- 2 supported behavioral sciences/psychology courses
- 1 supported general education courses

Years Worked in Academic Libraries (n = 122)

- 0-5 years: 27% of participants
- 6-10 years: 21%
- 11-20 years: 30%

- 20+ years: 21%

Institutional Demographics

Participants' Institution Size: (n =122)

- 36% small, less than 5000 students
- 29% medium, 5,000-15,000 students
- 36% large, more than 15,000 students

Participants' Institution Type: (n = 122)

- 53% doctoral granting
- 22% Master's granting
- 6% baccalaureate granting
- 13% associate granting
- 5% were from special-focus and other

Patron Types Supported (n=122)

- 93% support undergraduate students
- 89% support faculty, staff, and personnel
- 68% support graduate students
- 39% support researchers
- 12% support other patrons (public patrons and alumni)

Appendix E: Results Data Tables

Table 1. Participant agreement with statement: “I know a lot about disabilities.” By percentage of participants who support each STEM discipline. Participants may be represented in multiple categories.

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	13 (11%)	5 (10%)	4 (11%)	10 (15%)	4 (6%)
Somewhat agree	68 (56%)	27 (53%)	17 (47%)	38 (58%)	34 (54%)
Neither agree nor disagree	11 (22%)	12 (24%)	12 (33%)	12 (18%)	20 (32%)
Somewhat disagree	13 (11%)	7 (14%)	3 (8%)	5 (8%)	5 (8%)
Strongly disagree	0	0	0	0	0

Table 2: Participant agreement with statement: “Supporting disabled students is important to me.” (n = 121, respondents may be included in multiple categories.)

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	100 (83%)	39 (76%)	29 (82%)	57 (88%)	52 (83%)
Somewhat agree	18 (15%)	11 (22%)	7 (19%)	6 (9%)	11 (17%)

Neither agree nor disagree	3 (2%)	1 (2 %)	0	2 (3%)	0
Somewhat disagree	0	0	0	0	0
Strongly disagree	0	0	0	0	0

Table 3. Table 3. Participant responses to: “I am familiar with the ways disabilities impact students in higher education,” (n=121, data shows percentages of each STEM category).

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	26 (21%)	12 (24%)	7 (19%)	18 (28%)	11 (17%)
Somewhat agree	81 (67%)	32 (63%)	23 (64%)	42 (65%)	44 (70%)
Neither agree nor disagree	8 (7%)	4 (8%)	4 (11%)	2 (3%)	6 (10%)
Somewhat disagree	6 (5%)	3 (6%)	2 (6%)	3 (5%)	2 (3%)
Strongly disagree	0	0	0	0	0

Table 4a. I am confident in my ability to support a *physically* disabled student in a class/in a consultation/in their research. (n=121) Table includes total numbers of individuals for each selection and corresponding percentages of total categories.

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	16 (13%)	5 (10%)	5 (14%)	11 (17%)	8 (13%)
Somewhat agree	73 (60%)	32 (63%)	22 (61%)	41 (63%)	35 (56%)

Neither agree nor disagree	16 (13%)	8 (16%)	5 (14%)	5 (8%)	11 (17%)
Somewhat disagree	14 (12%)	5 (10%)	4 (11%)	7 (11%)	9 (14%)
Strongly disagree	2 (2%)	1 (2%)	0	1 (2%)	0

Table 4b. I am confident in my ability to support an *invisibly* disabled student in a class/in a consultation/in their research. (n=121). Table includes total numbers of individuals for each selection and corresponding percentages of total categories.

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	11 (9%)	2 (4%)	2 (6%)	7 (11%)	5 (8%)
Somewhat agree	63 (52%)	27 (53%)	16 (44%)	36 (55%)	30 (48%)
Neither agree nor disagree	24 (20%)	13 (25%)	10 (28%)	13 (20%)	14 (22%)
Somewhat disagree	20 (17%)	8 (16%)	8 (22%)	8 (12%)	13 (21%)
Strongly disagree	3 (2%)	1 (2%)	0	1 (2%)	1 (2%)

Table 5. I am confident in my ability to make digital materials accessible. (n=121)

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	34 (28%)	17 (33%)	14 (39%)	20 (31%)	18 (29%)
Somewhat agree	67 (55%)	28 (55%)	17 (47%)	33 (51%)	35 (56%)

Neither agree nor disagree	7 (6%)	5 (10%)	3 (8%)	4 (6%)	3 (5%)
Somewhat disagree	11 (9%)	1 (2%)	1 (3%)	8 (12%)	5 (8%)
Strongly disagree	2 (2%)	0	1 (3%)	0	2 (3%)

Table 6. Participant agreement with “I am confident in my ability to use appropriate (non-ableist) language when interacting with disabled people or discussing disabilities,” by percentage of each disciplinary category. (n=121)

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	28 (23%)	12 (24%)	7 (19%)	17 (26%)	12 (19%)
Somewhat agree	63 (52%)	27 (53%)	17 (47%)	34 (52%)	33 (52%)
Neither agree nor disagree	23 (19%)	8 (16%)	10 (28%)	11 (17%)	15 (24%)
Somewhat disagree	5 (4%)	3 (6%)	1 (3%)	1 (2%)	2 (3%)
Strongly disagree	2 (2%)	1 (2%)	1 (3%)	2 (3%)	1 (2%)

Table 7. I am confident in my ability to identify ableist microaggressions or prejudice in higher education settings. (n=121)

Answer	All STEM	Engineering	Mathematics	Health Sciences	Natural Sciences
Strongly agree	19 (16%)	5 (10%)	5 (14%)	12 (18%)	6 (10%)
Somewhat agree	66 (55%)	31 (61%)	18 (50%)	34 (52%)	39 (62%)

Neither agree nor disagree	22 (18%)	10 (20%)	10 (28%)	10 (15%)	13 (21%)
Somewhat disagree	13 (11%)	5 (10%)	3 (8%)	8 (12%)	5 (8%)
Strongly disagree	1 (1%)	0	0	1 (2%)	0

Appendix F: Definitions of Disability-Related Terms

- “Disability” and Types of Disabilities

As stated by the Center for Disease Control (CDC), disability is “any condition of the body or mind (impairment) that makes it more difficult for the person with the condition to do certain activities (activity limitation) and interact with the world around them (participation restrictions) [93]. There are many types of disabilities, such as those that affect a person’s: vision, movement, thinking, remembering, learning, communicating, hearing, mental health, and social relationships” [93]. The authors selected and included this definition to help survey participants understand the broad scope of disability.

- Physical Disabilities

In the survey, the researchers defined physical disabilities by providing examples with the following statement: “Physical disabilities include: visual impairments, mobility impairments, hearing impairments, etc.”. More specifically, physical disabilities consist of inhibited movement of one or more limbs that can be temporary or permanent that are caused by a variety of factors such as injury, illness, or heredity [94].

- Invisible Disabilities

Invisible disabilities, which are also called non-apparent or non-visible disabilities, were described in the survey by providing participants with examples as a means of defining the

term; here are the examples: “Invisible disabilities include: Autism, ADHD, mood disorders, anxiety, dyslexia, dyscalculia, other learning disabilities, chronic or recurring illness, etc..”

A more thorough definition is provided by the Invisible Disabilities Association’s website: “[a]n 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” [95].

- Microaggressions

Respondents were asked about their ability to identify ableist microaggressions (Q16), which the survey defined as “harmful/insensitive/insulting assumptions, actions, questions, or statements that target marginalized people; they can be intentional or unintentional and generally happen in casual, everyday situations.” Disability scholars and advocates argue that, while microaggressions are less often discussed in the context of disability than racism or sexism, ableist microaggressions are equally common and have similarly negative impacts on disabled people [96], [97], [98]. Research has shown that experiencing microaggressions can impact an individual’s self-perception and confidence, self-esteem, mental health, and sense of belonging [99], [100], [101], [102]. Impacts may be more acute for individuals who possess intersectional, multiply marginalized identities [103].

- Ableist language

Respondents were also asked about their ability to avoid using “ableist language” (Q15), which was defined as language that “devalues or discriminates against disabled people.” Ableist language is a specific type of microaggression that uses words to diminish the humanity of disabled people, make them feel stigmatized, tokenized, “less-than,” and disrespected. As Ravishankar (2020) describes, ableist language has historically been used to “dehumanize, stigmatize, and institutionalize people” [104]. Because language continuously changes, educators should regularly seek out disabled perspectives on ableist language. One excellent resource is the now discontinued [Autistic Hoya blog \(www.autistichoya.com\)](http://www.autistichoya.com) by Lydia X. Z. Brown, which provides in-depth discussions of ableism and language from an Autistic perspective [105].

