

Perspectives from Undergraduate Life Sciences Faculty: Are We Equipped to Effectively Accommodate Students With Disabilities in Our Classrooms?

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ABSTRACT

Higher education has evolved in ways that may increase the challenges life science faculty face in providing accommodations for students with disabilities. Guided by Expectancy-Value Theory, we interviewed 34 life sciences faculty instructors from institutions nationwide to explore faculty motivation to create disability-inclusive educational experiences. We found that faculty in our sample perceive that providing most standard accommodations is a manageable but often challenging task. Further, faculty in our sample feel that improving accommodations necessitates additional support from their institutions. Most faculty had high attainment value for providing accommodations, in that they strongly believed that supporting students with disabilities is the fair and right thing to do. However, faculty did not perceive much utility value or intrinsic value in their task of providing accommodations, and most reported that providing accommodations can be a substantial burden on faculty. These findings imply that current approaches to providing inclusive educational experiences for students with disabilities rely primarily on the personal belief that providing accommodations is the right thing to do, which likely results in a flawed and inequitable system given that not all faculty equally share this conviction.

INTRODUCTION

In the last 50 years, the United States has seen increasing attention towards supporting students with disabilities¹ to access and succeed in higher education broadly. While this movement is driven in part by moral responsibilities to create more inclusive environments, it is reinforced by legal requirements to support students with disabilities (ADA Amendments Act of 2008, 2008; Americans with Disabilities Act of 1990, 1990; Section 504, Rehabilitation Act of 1973, 1974). Attention toward supporting students with disabilities in science fields is also rising from science education communities, with the recognition that supporting diversity and inclusion in education will strengthen the science workforce (Brewer and Smith, 2011; Olson & Riordan, 2012). Despite the widely recognized need for supporting students with disabilities, the task of ensuring that these students receive appropriate support at higher education institutions can be challenging. Below, we summarize the general system and

Derek Braun, *Monitoring Editor*

Submitted May 30, 2023; Revised Mar 6, 2024; Accepted Mar 13, 2024

CBE Life Sci Educ June 1, 2024 23:ar18

DOI:10.1187/cbe.23-05-0094

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¹We use person-first language (“students with disabilities”) to emphasize that we are referring to individuals first, who happen to have disabilities. Some individuals and communities prefer and advocate for disability-first language, particularly the Deaf community and autism community, to emphasize that their condition is an important part of their identity and culture (Wooldridge, 2023). We respect and acknowledge these differences in preference and have decided to use person-first language in part because we feel as though it is more inclusive to all individuals with disabilities and we as authors prefer that language.

potential challenges faced by the three major actors in the U.S. student-accommodation system: disability resource centers, students with disabilities, and faculty instructors.

Disability Resource Centers

To help serve students with disabilities, nearly every U.S. college or university has an office dedicated to connecting students with disabilities to the accommodations they need in their classes. Throughout this study, we collectively refer to these offices as “Disability Resource Centers (DRCs),” although other terms may include Disability Services, Accessibility Services, Accessibility Resource Centers, and similar variations (National Center for College Students with Disabilities, 2024). While each DRC may have differences in the accommodations process, a student generally must first register with the DRC, providing official documentation (e.g., a medical diagnosis) of their disability as required. The DRC then works with the individual student to identify what accommodations the student might need in their courses and sends a confidential email with those accommodations to each of their faculty instructors (National Center for College Students with Disabilities, 2024).

Many students with disabilities may not register to receive formal accommodations, for reasons that could include limited financial resources required for medical diagnosis, stigma associated with having a disability, or a lack of knowledge about the DRC and what disabilities can be supported. Better supporting *all* students with disabilities is imperative, but in this study, we specifically focus on students who receive accommodations through DRCs.

Despite the near ubiquity of DRC centers on college campuses, there are systemic inequities that impact which students with disabilities receive DRC accommodations. Institutions with higher enrollment of privileged students (i.e., private, highly selective, and expensive institutions, serving fewer low-income students) also have the highest DRC enrollment (Weis and Bittner, 2022). Conversely, students who attend public institutions, community colleges, low-cost institutions, and institutions that serve high proportions of low-income students are less likely to be enrolled with a DRC (Weis and Bittner, 2022), despite the fact that disability status is associated with low socioeconomic status in the general adult population (Goyat *et al.*, 2016).

We can envision several challenges that a DRC faces in expanding access to accommodations for students in undergraduate classrooms, particularly at underresourced institutions. Given budget restraints, inflation, and cuts to state funding for public higher education institutions in recent years, staffing shortages in DRCs are likely common (National Education Association Research, 2022). Indeed, students with disabilities perceive that DRCs are generally understaffed (Toutain, 2019). The need for staff in the DRC is heightened by steadily increasing numbers of students who register for disability or accommodation services: as of 2020, an average of 5% of students are registered with a DRC across all US institutions (Weis and Bittner, 2022).

In addition to lacking sufficient staff, DRCs likely face challenges in managing the evolving dynamics of higher education. DRCs must be responsive to the ways that students’ needs have changed over time, the advancements in technology and tools that can help students with disabilities, and

shifts in instructional practices. A survey conducted in early 2020 across 71 institutions found that 50% of students registered with a DRC identify as having a mental health disorder, while 46% identify as having a learning disability or neurodiverse condition, such as ADHD or dyslexia (Gierdowski *et al.*, 2020). These conditions are largely “invisible,” yet when DRCs were first established, they likely prioritized accommodating physical and chronic “visible” disabilities that were clearly covered by the initial Americans with Disabilities Act (ADA; Americans with Disabilities Act of 1990, 1990). The accommodations to support students with “visible” disabilities are often more immediately apparent: for example, providing ramps for students in wheelchairs, or captioned videos for students with a hearing impairment. However, in the same way that many psychological disabilities are often less outwardly visible, the accommodations that support these disabilities may also be less immediately clear. Given that the majority of students requesting accommodations have invisible disabilities, DRCs must be proactive in identifying appropriate accommodations and employing rapidly advancing technologies for accommodation. However, students report that their accommodations are often not appropriate for their needs, and accommodations may be difficult to standardize for students with highly individualized needs (Toutain, 2019).

A final challenge posed to DRCs is the rapidly changing learning environment and instructional modalities employed in higher education classrooms. For example, in the life sciences there has been a wide push to increase the use of active learning practices to support student learning (Brewer and Smith, 2011; Freeman *et al.*, 2014; Yannier *et al.*, 2021). DRC directors report challenges for students with disabilities (specifically, learning disabilities, and mental health disorders) in active learning classrooms, and note that many standard accommodations are not particularly useful or appropriate for active learning classes (Gin *et al.*, 2020). Changes in teaching modality, such as increased online, remote, and asynchronous education, also make identifying and administering appropriate accommodations for students with disabilities difficult. These modalities pose novel challenges for accommodations, such as using video proctoring software or accessing distraction-free testing spaces (Gin *et al.*, 2022a).

Students with disabilities

If students with disabilities have not had their needs adequately met by the DRC and their instructors, it is often up to the student to self-advocate for their own educational access. However, students may not know what services are available or appropriate to meet their needs in the first place (Toutain, 2019). This lack of knowledge is magnified when students transition from high school to college because the impetus to secure accommodations is now placed on the individual student (Chan, 2016). In the K–12 system, students with disabilities often are placed in an Individualized Education Program (IEP), which are often initiated and developed by a team that can include the students’ parents, teachers, school administrators, psychiatrists, and other medical professionals. In contrast, when students enter college, students are completely responsible to self-identify as having a disability and to self-advocate for accommodations with the DRC and/or their instructors (Chan, 2016).

Faculty Instructors

To maintain student privacy, faculty instructors are unlikely to have access to information from the DRC about the actual nature of the students' disability. Unless the student takes initiative to communicate further with their instructor about their conditions and needs, instructors are only provided with the designated accommodation (Love *et al.*, 2014). Further, the DRC generally does not directly monitor whether the instructor carries out the accommodations, so it is up to the student to communicate with their instructor or the DRC if their needs are not met. Indeed, students with disabilities consistently report having negative experiences with faculty instructors, including instructor resistance to provide accommodations (Toutain, 2019). In these cases, a student's ability to self-advocate for their needs relies on their knowledge of their accommodations rights, and their ability—and willingness—to pursue those rights (Bruce and Aylward, 2021; Pfeifer *et al.*, 2021). Complicating this is the built-in hierarchy between the student and instructor, where challenging the instructor could possibly lead to negative grade repercussions that could counteract the positive benefits of the accommodations.

The need to focus on instructor motivation to provide accommodations

All three players in the accommodations system—DRCs, students, and faculty—are critical in the efforts to support students with disabilities, but we argue that ultimately it is up to instructors to administer accommodations. Recent work has highlighted the challenges faced by DRCs (Gin *et al.*, 2020) and by students in science classrooms, particularly where active learning is used (Pfeifer *et al.*, 2023). While some prior work has explored instructor's experiences around providing accommodations (e.g., Love *et al.*, 2014; Bettencourt *et al.*, 2018), the quickly changing needs of students with disabilities and the shifting educational landscape necessitates continued exploration of instructors' attitudes and experiences around providing accommodations for students at US institutions. This is particularly necessary given widespread disruptions of the COVID-19 global pandemic, which both alleviated some accommodation challenges for students with disabilities while also introducing new hurdles (Gin *et al.*, 2021, 2022a).

The hierarchical nature of the academy positions faculty in the highest status actor position, in comparison to staff in the DRC and students with disabilities, making faculty the keystone in the delivery of effective accommodations to students. This power dynamic creates a situation where it can be difficult to enforce regulations and requirements on any faculty, particularly higher-status faculty (Basbug *et al.*, 2023). For example, compliance with safety requirements in institutional laboratory environments is negatively predicted by the status of a faculty researcher, such that “high status” faculty with tenure, more funding, and more publications are more likely to violate Environmental Health and Safety regulations (Basbug *et al.*, 2023). Tenured faculty who perceive that they are valued and protected members of their institutions are less incentivized to focus on “peripheral” tasks (Basbug *et al.*, 2023), which could include devoting time and effort towards providing student accommodations. Thus, we argue that faculty are the most powerful players in either impeding or advancing student accommodations.

Faculty in the US are legally required to provide accommodations for students with disabilities, and studies suggest that the majority of STEM faculty are supportive of the need to provide accommodations for students with disabilities in their classroom (Love *et al.*, 2014; Becker and Palladino, 2016; Bettencourt *et al.*, 2018). However, faculty have cited limitations in the DRC accommodations system, their lack of sufficient disability-related knowledge, and their concerns about fairness, necessity, and maintaining rigor in science courses while providing accommodations. These factors all could explain why students with disabilities report infrequent but consistent encounters with faculty who do not fulfill their accommodations needs (Quinlan *et al.*, 2012; Love *et al.*, 2014; Becker and Palladino, 2016; Bettencourt *et al.*, 2018; Toutain, 2019). Faculty who are only motivated to provide accommodations because they know they are legally required to do so are externally motivated—the carrot-and-stick type motivation of punishments and rewards (Ryan and Deci, 2020). This contrasts with more autonomous types of motivation, which is the motivation to do something because it aligns with your personal beliefs, goals, values (identified and integrated motivation), and/or interests (intrinsic motivation; Ryan and Deci, 2020).

There have been numerous studies on how motivation type impacts academic performance for students, demonstrating that autonomous types of motivation are predictive of academic performance, persistence, success, and well-being (Howard *et al.*, 2021). In the workplace, autonomous motivation results in increased innovative behaviors (Saether, 2019). Researchers have argued that intrinsic motivation is an important motivator for faculty to invest in their teaching activities, given that extrinsic faculty reward structures such as the tenure system often place greater priority on excellence in research activities (Lechuga and Lechuga, 2012). Postsecondary faculty motivation is an under-studied topic compared with student motivation or K–12 teacher motivation (Daumiller *et al.*, 2020). However, a few studies in recent years have specifically considered how intrinsic/autonomous motivation impacts postsecondary faculty, revealing that high autonomous motivation is correlated with self-reported use of more effective teaching practices (Stupnisky *et al.*, 2017, 2018, 2019). Given the evidence that autonomous motivation leads to better performances, it is likely that faculty will do a better job at meeting the accommodations needs of their students if they are highly autonomously motivated to do so.

Therefore, one approach to increasing student access to accommodations in college classes is supporting faculty instructor's motivation and ability to provide those accommodations. To develop strategies to accomplish this, we need to better understand the current perceptions faculty have of their abilities to provide accommodations and the factors that impact faculty motivation to provide classroom accommodations.

Theoretical Framework: Expectancy-Value Theory of Motivation

To explore faculty motivation to provide accommodations, we use Expectancy-Value Theory (EVT; Eccles and Wigfield, 2002, 2020). Though originating as a theory about early student education, EVT has been used to model the value instructors have for teaching in higher education (e.g., Cho *et al.*, 2011;

Matusovich *et al.*, 2014; Doucette *et al.*, 2020; Goodwin *et al.*, 2021). In EVT, an individual's expectations of their ability to succeed at a task and their subjective task value for the task are the most proximal impacts on a person's choices, engagement, and performance at that task (Eccles and Wigfield, 2020).

When applied to our study, expectations of success are the personal expectations an instructor has about whether they can successfully provide accommodations for students. EVT divides subjective task value into four separate constructs: attainment value, intrinsic or interest-value, utility value, and relative costs (Eccles and Wigfield, 2002, 2020). Attainment value is the personal importance of the task as it relates to one's self-concept or identity (Eccles and Wigfield, 2020). We interpret attainment value as being motivated because the task contributes to a personally important goal or aligns with one's core values (similar to the ideas of identified and integrated motivation; Ryan and Deci, 2020). Intrinsic value, also known as interest value, is the enjoyment one gets from doing the task (Eccles and Wigfield, 2020). Utility value is traditionally conceived of as the perceived usefulness of a task as it fits into an individual's present and future goals (Eccles and Wigfield, 2020). Finally, relative costs are the tangible and intangible burdens an individual associates with completing a task, which can include effort costs, opportunity costs, financial costs, and emotional/psychological costs (Eccles and Wigfield, 2020).

When discussing this study at conferences and seminars, the authors found that some individuals were hesitant to accept the notion of separating *attainment value* from *intrinsic value*, because when an activity aligns very deeply with one's personal values and beliefs (high *attainment value*), it can feel uncomfortable to recognize that one may not actually enjoy the activity (low *intrinsic value*). To help disaggregate these concepts, we present our personal feelings about the process of recycling waste as an accessible analogy for the types of task value outlined by EVT. We have extremely high *attainment value* for recycling—that is, we care deeply about environmental sustainability and believe that recycling is a small but very important personal action we can take to address these issues. However, we have low *intrinsic value* for recycling, in that we do not actually enjoy the time we spend cleaning, sorting, or carrying our recycling to the appropriate bin. We do not experience much *utility value* in recycling, because we do not experience financial or other tangible benefits for recycling—though those who live in areas with robust bottle deposit refund systems might. Finally, we do experience minor but notable *costs* in time and effort for recycling. Despite the costs and low intrinsic and utility value for recycling, we are still motivated to recycle because of our high attainment value and theorize that a reason that others in our community may be less likely to recycle is because they have lower attainment value for the practice.

Following this analogy, in this work, we interpret *attainment value* as an instructor's beliefs regarding whether providing accommodations are fair and the right thing to do. *Intrinsic value* is an instructor's enjoyment of the task of providing accommodations for students. *Utility value* is an instructor's perceived usefulness of providing accommodations in terms of financial gain or professional advancement. Faculty might experience *costs* such as spending time providing accommodations instead of other tasks, or emotional strain related to providing accommodations.

Focus on life sciences

We anticipate that the experiences of faculty are highly contextual by disciplinary field. For this reason, we have chosen to focus specifically on life sciences faculty. Life sciences faculty often teach field and lab courses that may present unique barriers for students with disabilities, and subjects taught by life sciences faculty often intersect with current and highly politicized issues, such as evolution (Barnes and Brownell, 2016, 2017), sex and gender (Cooper *et al.*, 2020a; Mercer-Mapstone *et al.*, 2021), reproduction (Edwards *et al.*, 2022), COVID-19 (Couch *et al.*, 2022; Anastácio *et al.*, 2023), and climate change (Carter and Wiles, 2014). Due to the ever-changing nature of biology, and particularly how these topics often relate to current events, there is often a need to incorporate or adapt new course material and activities, which may at times be complicated by the need to coordinate materials with the DRC in advance. Additionally, language commonly used in many biology courses may feel particularly alienating to students with disabilities. For example, using terms like “abnormal,” “diseased,” “disordered,” and “mutation” to describe atypical human conditions in a genetics course can be uncomfortable and distracting for students with disabilities (Hales, 2020). A faculty instructor's commitment to creating an inclusive, accommodating, and supportive environment for students with disabilities may therefore be especially impactful in life sciences classrooms.

Research Questions

Guided by EVT, we aimed to address two questions related to life science faculty's motivation regarding providing accommodations for students with disabilities:

- Do life sciences faculty believe they are able to successfully provide accommodations for students with disabilities?
- How do life science faculty value their responsibility for providing accommodations for students with disabilities?

To address these questions, we conducted semistructured interviews to explore the beliefs, attitudes, and perceptions of current life sciences faculty at research-intensive institutions nationwide regarding providing accommodations for students with disabilities.

METHODS

Recruitment

We previously conducted a nationwide survey that was sent to all science and engineering faculty at Carnegie R1 “Very High Research Activity” institutions in the United States. We focused our analyses on faculty at R1 institutions to target faculty who are likely to teach larger courses and therefore have more interactions with students with disabilities. Faculty at R1 institutions are likely to also have expectations of balancing both their research and teaching workloads and have access to DRCs to support student accommodations. We conducted recruitments for this interview study from a sample of the survey respondents who indicated they were willing to be contacted for follow-up interviews. Specifically, we emailed randomly selected subsets of 50 eligible participants at a time, defining eligibility as current faculty instructors within the life sciences who did not identify as having a disability. We excluded faculty instructors with disabilities because we predicted that their lived experiences would affect their motivations for providing accommodations to

students. Because only 5.4% of science faculty instructors identify as having a disability (Busch *et al.*, 2023), focusing on faculty instructors who do not report disabilities makes this work more characteristic of most life sciences faculty. The recruitment emails invited faculty to share their experiences and challenges in accommodating students with disabilities in their courses (full recruitment information is included in Supplemental Material S1). We aimed to conduct semistructured interviews with at least 30 faculty members, as in previous studies we have found this to be more than enough to reach thematic saturation (Barnes and Brownell, 2016; Goodwin *et al.*, 2018; Cooper *et al.*, 2020b; Downing *et al.*, 2020; Gin *et al.*, 2022b). In total, we sent interview requests to 350 potential faculty interview participants and received responses and conducted interviews with 34 faculty members.

This study was approved by the Arizona State University Institutional Review Board (Protocol #00007435).

Interviews

Interview questions were designed to probe faculty attitudes, experiences, and conceptions about working with students with disabilities and providing accommodations. Interviews also asked faculty about their training regarding accommodating students with disabilities, and how faculty could be better supported in their accommodation efforts. Example questions include: *“To what extent do accommodation requests that you receive impact the teaching strategies you choose to use in your classes? How well do accommodations work with your teaching practices?”* and *“What would be helpful for you, as an instructor, to better support students with disabilities in your science courses?”* The full set of semistructured interview questions is included in the Supplemental Material (S2).

Interviews were conducted over Zoom by a single researcher (L.E.G.) over a 2-wk period and lasted approximately 60 min each. Interviews were audio-recorded and transcribed. ChatGPT-3.5 (OpenAI, 2023) was used to generate pseudonyms for each interview participant, informed by participant’s self-identified gender, race/ethnicity, and age.

Data Analysis

Two researchers (E.C.G. and L.E.G.) read through five interview transcripts, selected by the interviewer (L.E.G.) to display a range of attitudes and perceptions about providing accommodations. These transcripts were used in a round of initial coding, where researchers used in-vivo coding methods to inductively create initial codes while preserving as much of the interviewee’s initial language as possible (Saldaña, 2015). The two researchers then created six categorical themes to organize the initial codes: 1) accommodations can be burdensome; 2) accommodations are manageable; 3) accommodations are unfair; 4) accommodations are fair; 5) deficits of the institutional system; and 6) strengths of the institutional system.

After the categorical themes and initial codes were established, researchers (E.C.G. and S.E.B.) read two additional interview transcripts to verify that the initial codes and organizational format could suitably describe instructor’s perceptions and experiences regarding accommodations.

Three researchers (E.C.G., D.P., and J.H.) used the categorical themes described above as the basis for creating and refining a final codebook through axial coding (Saldaña, 2015). To

accomplish this, the three researchers read selected interview transcripts one at a time and met after each transcript to: 1) discuss whether any new codes needed to be added to the existing theme structure; 2) edit/clarify the existing code names to better describe the meaning behind the codes; and 3) add descriptive memos to each code. These memos served to define each code’s boundaries, capture some of the in-vivo text from interviewees, and provide examples or clarifications to help the researchers use each code consistently. Researchers frequently reviewed all previously coded segments of interviews to ensure consistency and accuracy throughout code and memo development. This process was repeated until saturation was reached and the researchers could use the codebook without needing to create new codes or revise/further define existing codes (Strauss and Corbin, 1998; Saldaña, 2015).

Once saturation was reached, three researchers (E.C.G., D.P., and J.H.) used the final codebook (Supplemental Material S3) to code interview transcripts, including the transcripts that were used during codebook development. Researchers independently read each transcript and met frequently to discuss every coding decision to consensus. After coding was completed, two researchers (D.P. and J.H.) read through the original text of every coded segment for each code, to ensure that researchers were consistent throughout the entire coding process and to ensure that the code names and memos appropriately described the ideas communicated by our interview participants.

After the interview coding was complete, individual codes, and themes were overlaid onto aspects of EVT. For example, codes within the themes of “Deficits” and “Strengths” of the institutional accommodations system were applicable to how faculty perceived their expectation of their ability to provide accommodations for students. Codes within the themes of “Accommodations can be unfair” and “Accommodations are fair” were applicable to participant’s attainment value for providing accommodations to students. Figure 1 provides a full outline of how specific themes and codes were related to EVT.

Positionality and Research Context

The research team consisted of two undergraduate researchers (D.P. and J.H.), a graduate student researcher (L.E.G.), a postdoctoral researcher (E.C.G.), and a tenured faculty member (S.E.B.). Some members of the research team identify as having disabilities and/or have immediate family members who have disabilities and received accommodations. Some members of the research team identify as having anxiety and/or depression. These interviews were conducted in Spring 2022, at a time when most universities had been back to in-person instruction for a full year following the disruption of the COVID-19 pandemic. The pandemic catalyzed many changes in academia, including greater reliance on technology for remote or asynchronous teaching, as well as increased use of accommodations and changing needs for students with accommodations throughout the pandemic. Throughout our study design and analyses, the undergraduate researchers were able to offer their perspectives as students who had participated in in-person, remote, and asynchronous courses before, during, and after the disruptions of the COVID-19 pandemic. The graduate student, postdoc, and faculty member all had experience teaching and providing accommodations to students before, during, and after the pandemic.

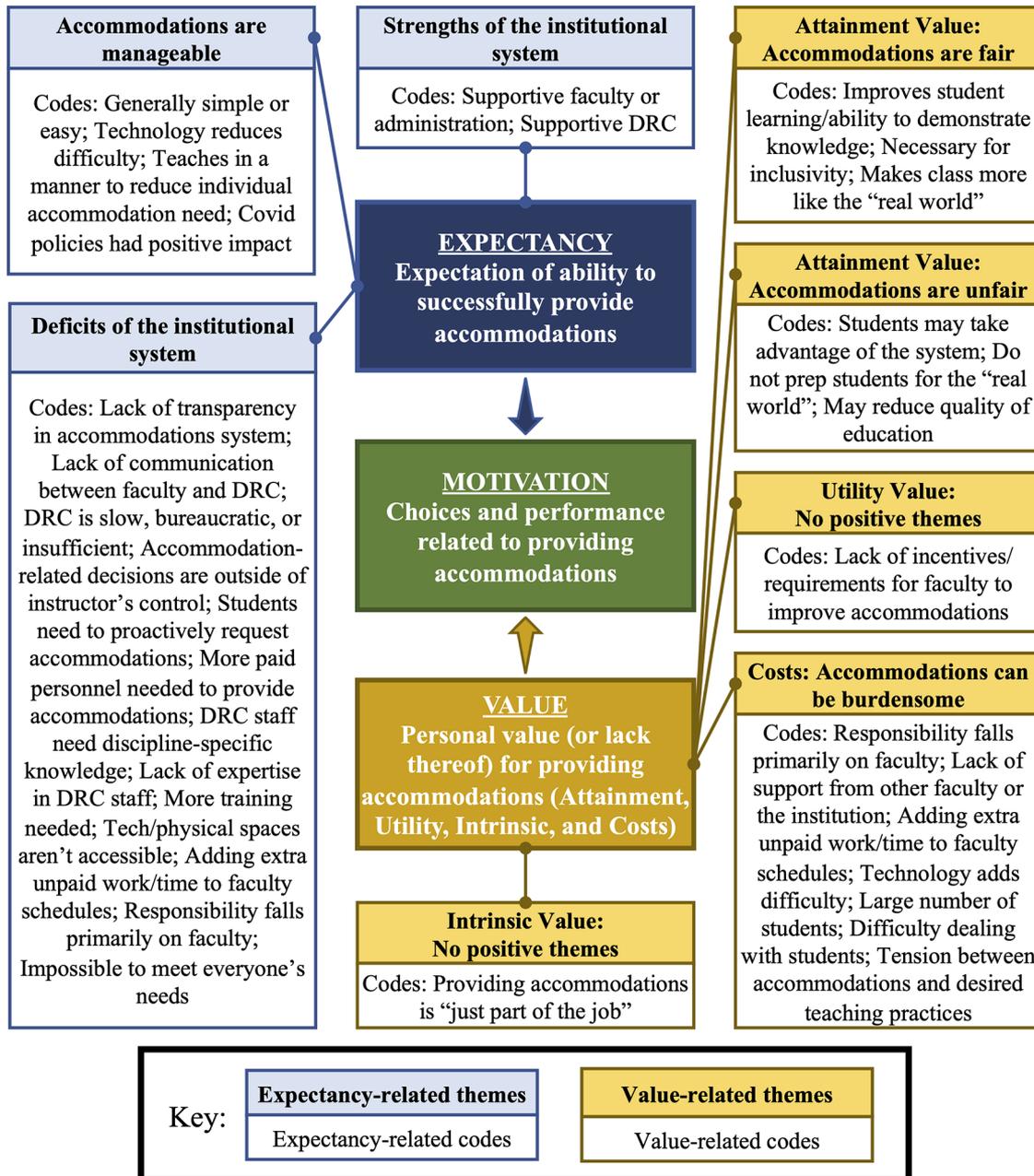


FIGURE 1. Codes and themes related to EVT of instructor motivation to provide accommodations for students with disabilities.

FINDINGS AND IMPLICATIONS

Participant information

Of our 34 study participants, most (82%) identified as white and just over half (56%) identified as women. All interviewees were currently or had recently been faculty at institutions classified as “R1: Very High Research Activity,” through several discussed experiences at other institutions throughout their interviews. Most (94%) had over 2 years of teaching experience, and the majority (88%) typically taught larger classes, with enrollment over 50 students. Half (53%) only taught upper-division classes, 35% only taught introductory biology classes, and 12% regularly taught both upper-division and introductory courses.

Over half (56%) held primarily teaching-focused instructor/lecturer faculty positions.

Expectations for Success: Faculty believe they can provide basic accommodations, but need more support to improve accommodations

Our first research question addresses faculty instructors' expectations of being able to successfully provide accommodations for students with disabilities, because EVT posits that individuals are more motivated to engage in a task that they believe can successfully be accomplished. The majority (76%) of interview respondents expressed that accommodations were

generally easy or manageable to provide, at least in theory. Faculty described a few different systems that made accommodations manageable. For some, specific technology or their learning management systems helped automate accommodations—for example, automated captioning of recorded lectures, classroom technology that made video recordings easy, or learning management systems that allowed faculty to add extended time on all assignments and exams at once for students who needed extended time accommodations. Faculty also described their own instructional practices that reduced the need for providing individual accommodations—for example, making slides, notes, and lecture recordings available to all students, rather than just the students who had a relevant accommodation. Some DRCs requested copies of syllabi or information about the course structure, so the DRC was aware of accessibility-related practices built into the structure of the class, as Mark describes:

“Every now and then I’ll have a student that will say, ‘Oh, I need this.’ And I’m like, ‘All right, well, that’s already something we do in the class.’ ... You get an email [from the DRC] for each student saying, ‘You have a student that requires the following accommodations. No changes need to be made to your course.’ And I’m like, ‘All right. Great. Easy for me.’” —Mark

When these accommodations were built into the course structure, faculty instructors either could ignore the specific accommodation request or reach out to students who had official requests for the accommodations to let the students know that their need would be covered with standard course policies.

Notably, many faculty in their interviews referenced how the COVID-19 pandemic shifted their teaching practices to improve accommodations or make accommodations easier to provide for students. For example, Amanda described how pandemic-era policies resulted in changes to her course design such that many traditional accommodations are provided to *all* students, rather than just the students with disabilities:

“Extended deadlines are reasonable to provide, and during the pandemic, I have shifted [to using extended deadlines] for all my students. And then [another] accommodation would be a copy of prepared notes, so I always post the slides that I use, and I always post prelab videos that are captioned. So, some of [the accommodations] are part of how I’m arranging my course anyways. So, they feel easy to provide because they’re a part of that.” —Amanda

Accommodations provided “in bulk” reduced the administrative burden of providing these materials and accommodations to students individually. This was helpful particularly for faculty who taught larger classes, who could feel overwhelmed by the number of individual accommodations they would otherwise need to provide.

Faculty also highlighted the strengths of their DRC and/or institution more broadly in supporting faculty to provide accommodations. These strengths included systems in place to automate reminders for faculty to submit exams to proctoring centers, or DRC staff who were quick to clarify accommodations or to help faculty figure out the best way to accommodate

students through nontraditional academic situations, such as group exams. For example, while faculty at other institutions described struggling to keep track of notifications that came in sporadically throughout the term, Amy explained how her DRC had created a system to overcome this hurdle:

“Now, every time I get notified about another letter, it sends me to the central repository where I can see all the letters. So, even if I did miss [a notification], it would get me back in [the repository] ... And it’s very clear: ‘Check, check, you read this one. Check, you read this one.’” —Amy

While many faculty did not report much interaction with their institutions’ DRCs beyond receiving accommodations or proctoring-related notifications, those who had directly interacted with their DRC often described helpful, efficient experiences that positively impacted the instructor’s ability to successfully accommodate their students.

Despite recognizing the strengths and support from their institution, and their assertion that most accommodations are manageable or easy to provide, faculty also highlighted times when they were limited in their ability to provide accommodations. Some faculty were frustrated by a lack of transparency in the accommodations system and insufficient communication between faculty instructors and the DRC. Though faculty appreciated the need to protect student privacy, they felt this lack of information limited their ability to customize accommodations to best support their students. Juan explains:

“I wish I had more information because [in accommodation requests, we] see just one line, which is ‘extended time.’ ... [I want to say to students] ‘You don’t have to disclose [your disability] but let me know how we can make this a learning space so that you learn molecular biology and I learn how to help you.’” —Juan

Faculty also described needing more information about how to better accommodate students because they perceived that their DRCs, at times, insufficiently supported students. This was in part due to the bureaucracy, wait-times, and administrative hurdles that they perceived students faced at the DRC, which could disproportionately disadvantage underprivileged students:

“I would like more information about how to help students get accommodations and how to speed up that process and make it more available to students who do not necessarily have the parent support or monetary resources that seem necessary... Because they’re struggling while the system is delaying helping them.” —Katie

Like Katie, many faculty described that students often faced long waits to get their accommodations processed at the DRC. Within our interview sample, we found that faculty varied in their approach to handling accommodations for students from whom they had not yet received formal DRC notifications. Some explained that they had no problem providing accommodations for students who approached faculty and explained their needs, even if they had not received a formal DRC notification. However, other faculty felt strongly that it would be

impermissible or unfair to accommodate students without official notice from the DRC. This was the case for Melissa, who placed responsibility on the students who she felt were not always sufficiently doing their part to request accommodations in time:

“The other thing is also making sure that the students do their part, because some stuff I need the student to do before, because [the students will say], ‘Oh yeah, I have this accommodation.’ I’m like, I have not gotten your paperwork yet. And if I don’t have your paperwork, [the accommodation] doesn’t exist. So, I need this paperwork.” –Melissa

In part due to the long wait times and bureaucratic hurdles, most faculty emphasized the more basic need for a greater number of paid personnel to assist with accommodations, perceiving that the numbers of students who need accommodations has expanded without sufficient investment in DRC staff. Faculty also expressed the need for DRC staff to have more focused expertise related to their scientific disciplines, and highlighted how the process of supporting specific disabilities in lab courses or field sites may be different than the process of supporting the same disability in a humanities classroom. Some faculty perceived that DRCs need to be better prepared to adapt to the rapidly changing environment of science classrooms, where both the content and approaches to teaching science evolve alongside the field:

“We’re constantly updating our materials because [the biology field is] always changing... Something that was appropriate last year, or last semester, is not appropriate now. The university must invest in that infrastructure of highly trained professionals that also interface well with instructors. [Now the DRC tells me] ‘This is what has to be done,’ when it doesn’t work with the content. We need to both be flexible.” –Melissa

When asked what they needed to better support their students with disabilities, nearly all faculty suggest that more training or instructional feedback from experts would improve their ability to provide accommodations for students, as exemplified by Kevin:

“The most critical thing would be to have an office with staff with actual free time who would be willing to spend time working together on improving [support for students with disabilities]. Basically, having instructional designers and experts who would be willing to say, ‘I have 2 hours... Let’s talk about your class and figure out how to improve it.’” –Kevin

Faculty also discussed a practical lack of physical spaces and effective technology that present challenges to effectively providing accommodations to their students. These included a lack of elevators (particularly in tiered lecture halls) or ineffective lab or active learning spaces for students with mobility conditions, poor-quality classroom projectors that are difficult for students with visual disabilities, and the need to have high-quality technology in every classroom to streamline processes like video-recording and captioning lectures. Amanda illustrates how these challenges can result in sometimes failing to meet student accommodations:

“When I record videos, I have to share a video to my course [learning management system] and then wait an undefined period of time before I can caption those videos and I’m not notified [by the system]. And things like that make it easy for those [accommodations] to fall through the cracks. Sometimes I forget, and that video isn’t captioned.” –Amanda

Amanda’s example also serves as a reminder that faculty juggle a high number of responsibilities among their teaching, research, and service roles. It is likely that frequently switching between tasks that relate to each of these responsibilities results in higher stress and increased mistakes for faculty (Mark, 2023).

Heather, who felt she needed more proactive help from the DRC or instructional designers to improve accessibility in her classes, explained that she intentionally overlooks some accessibility guidelines within her learning management system, because she has not perceived that it is needed by her students and because her university does not pressure her to:

“I went to all these trainings, ‘How your PowerPoint should be [formatted for accessibility],’ blah, blah, blah. And we have this green sign [in the learning management system to indicate that an uploaded file meets accessibility standards]... I’ve never heard complaints from students that they cannot see something on the slides... So, are all my PowerPoint presentations marked with green? I know they’re not. Do I do anything about that? No, I do not. Am I pushed to do something about that? Not yet at least.” –Heather

Heather later explains in the quote below that her decisions to not prioritize providing accommodations and putting effort into making her classes more accessible is due to her perception that these actions would involve an undue amount of work. However, she is willing to accept help and adopt “easy” practices to make her classes more accommodating for students with disabilities:

“So, if [providing accommodations] doesn’t take a lot of effort, we’re not evil. If it’s pretty easy to do [we’ll do it]. If it’s complicated... Redesigning your course is difficult. If somebody’s coming and telling me, ‘Okay, give me your PowerPoint and I will adapt it for students with disabilities,’ [then I would say], ‘Perfect, go. Do this.’... I have enough to do.” –Heather

In her statement, Heather makes the point that choosing to not provide accommodations could be considered “evil,” yet also asserts that she will not go out of her way to make her class more accommodating if it requires too much work. This provokes the question: where would a faculty instructor draw the line to justify *not* making their class more accessible when it does require extra work?

A few other faculty voiced the perspective that meeting the needs of everyone (with and without disabilities) in their classes is an impossible task, so while they generally felt they could fulfill their requirement of providing requested accommodations, it is necessary to accept that not all students will be completely satisfied, as explained by Matthew:

“I think I have all the tools necessary to accomplish the mission [of providing accommodations] here. Like I said, I can’t tailor-make everything for everyone. There are usually 120 individuals and trying to fulfill everyone’s wish list is impossible. You can’t please everyone. That’s the bottom line.” –Matthew

Matthew, similar to Heather in the quote above, seems to minimize the needs of students with disabilities—Heather by demonstrating her view that it is not worth putting excessive effort in to provide accommodations, and Matthew by comparing student accommodations to a “wish list.” Accommodations are not a wish list or merely a students’ preference—they are what is deemed necessary to reduce barriers for students with disabilities to access and engage in their education.

Our first research question considered faculty’s “expectancies for success,” or belief that they can successfully provide accommodations for students with disabilities in their classes. In summary, faculty felt that many accommodations are manageable to provide, although there was disagreement as far as whether it was possible to provide suitable accommodations for every situation. Faculty also recognized many barriers that sometimes limited them from improving the accessibility of their classes and ensuring that their students were receiving the best accommodations possible to support their learning.

Value for Providing Accommodations

Our second research question considers the different ways that life science faculty value or do not value the task of providing accommodations. In EVT, an individual’s value is theorized to influence their motivation to engage in the task. “Value” is operationalized through four distinct factors, known as “task values”: attainment value, utility value, intrinsic value, and perceived costs. Below, we consider how faculty described each task value, as it relates to their overall task of providing accommodations to students.

Attainment Value: Faculty have conflicting feelings about whether accommodations are fair to provide. Most of our interview participants (91%) made it explicitly clear in interviews that they feel accommodations are generally fair to provide to students with disabilities. Participants explained this viewpoint in a few different ways. Some explained that accommodations simply support students with disabilities to better learn the course content, as Rachel explained:

“I came to see pretty quickly that these accommodations really were just allowing students to achieve the same amount and demonstrate their learning, it was just a slightly different way for a number of them.” –Rachel

This perspective on the utility of student accommodations aligns with the established definition of accommodations—as the American Psychological Association interprets the ADA, “accommodations simply provide an alternate way to accomplish the course requirements by eliminating or reducing disability-related barriers (American Psychological Association, 2012).”

Many faculty also expressed very strong beliefs that accommodations are morally right to provide and are necessary to support equity and inclusivity in the classroom, as Mark describes:

“...Part of [the reason people go to college] is to broaden their horizons and deepen their thinking and to communicate as a more engaged and learned citizen. If you’re cutting people out of that [by not providing accommodations to students with disabilities], then you’re missing out on voices that have different perspectives that are probably going to propel civilization forward.” –Mark

Finally, a few faculty instructors expressed the viewpoint that some accommodations make learning and coursework more like what students might experience “in the real world”, after students graduate and enter the science workforce. For example:

“It’s not a big deal to give students extensions. In my world, I ask for extensions constantly. Like I did [for this interview].”
–Tracy

Even though nearly all faculty in our sample expressed that accommodations were generally fair, over half (60%) also expressed conflicting feelings and highlighted circumstances where they felt that accommodations may not be fair. Some faculty were concerned that certain students may be using accommodations to get extra advantages that could help them succeed over their peers who did not use accommodations, as Greg expresses:

“Sometimes I wonder if there are some students who game the system to get extra time without really having any kind of a real disability... [it’s] the demographics of the students who get it. It’s mostly what I would visually identify as relatively upper-middle class, better-off students... It just makes you wonder if they’re trying to get an added advantage on their med school application.” –Greg

The perception from faculty that students may be trying to get an unfair and undeserved academic advantage by using accommodations has been documented in news and opinion articles (e.g., Williams and Ceci, 1999; Flaherty, 2017) and as a barrier preventing students from disclosing and using accommodations (Mamboleo *et al.*, 2020; Pfeifer *et al.*, 2021). However, we were unable to find evidence in the literature to support Greg’s suspicion that students without real disabilities are systematically “gaming the system” to receive academically advantageous accommodations, though it is a possibility. Despite Greg’s observation that most students with accommodations appear “relatively upper-middle class, better-off students,” the degree to which this is factually true is also not easily determined. National statistics suggest that low socioeconomic status is correlated with higher rates of disability in the general population (Goyat *et al.*, 2016). However, there are barriers to registering with university disability resource centers that likely disproportionately prevent students with fewer financial resources from accessing accommodations, such as the need to pay for evaluations and take extra time to complete paperwork and visit doctors (Cawthon and Cole, 2010). While universities with larger numbers of financially well-off students also have more students enrolled with the DRC (Weis and Bittner, 2022), we saw no statistical differences in self-reported financial status for those registered with a DRC in a 2022

nationwide survey of undergraduate students ($n = 657$ DRC students, $n = 890$ non-DRC students; Goodwin and Brownell, unpublished data). However, it is possible that DRC students who come from more privileged backgrounds are more likely to engage in conversations with their instructors about getting their accommodation needs met, which, if true, could contribute to Greg's perception that better-off students have a greater advantage in the accommodations system.

Other faculty in our study highlighted their concern that providing accommodations was doing a disservice to students who have disabilities, in that they felt that accommodations do not prep students for "real world" employment in science careers. Karen explained:

"One thing that I worry about... is the long-term fairness for the student, as a person, [to be] able to have a successful career that they want... What if they want a job and accommodations are not [available]? ...They do have some professional development for some of the students, [to help them] develop some strategies [for] when they leave the protected environment of the university... [But their employers won't say:] 'Oh yeah, sure. You didn't meet that deadline. That's okay. We'll give you time and a half on that deadline.'" –Karen

Some faculty instructors who shared Karen's concern about student preparation for future scientific careers drew a distinction between "visible" disabilities, such as physical and sensory conditions, which they felt would be reasonably accommodated for in a student's future career, and "invisible" disabilities. Emily said:

[Accommodations are reasonable for] my student who is hard of hearing, I guess, because it's a visible diagnosis. For me, it's really all about making sure that these students are eligible for a job, and that will be very obvious when someone is hiring her. If [my hard of hearing student] is able to do all of the same work in the same timeframe and all I need to do is provide an audio caption, I think that's reasonable. [Less-obvious accommodations such as extra time extensions] seem less reasonable to me because I think they would significantly interfere with the job that I would be asking them to do in the real world. –Emily

Faculty in our study with this concern worried that students with invisible psychological (including mental health or learning conditions) would not receive accommodations for those disabilities in the workforce, and therefore were not sure that it is ideal to provide those accommodations in the classroom. Given that the bulk of students who now register with a DRC report mental health and learning disabilities, this perception applies to most students who receive accommodations. Under the ADA, employers are required to provide accommodations for employees with invisible disabilities, just as universities are, though in practice this requires self-advocacy and can be met with resistance (Hickox and Hall, 2018; Abney *et al.*, 2022). Changes to workplace structures during the COVID-19 pandemic increased accessibility for employees with disabilities broadly, and there are calls to continue allowing for these workplace modifications to support people with disabilities in science careers (Mattison *et al.*, 2022). Though progress to supporting people with disabilities in the workplace is still needed, it is reasonable to expect that accommodations such as flexible

work arrangements could be a part of a students' future career (Abney *et al.*, 2022).

Finally, many faculty in our study were concerned that accommodations were unfair because they may reduce the quality of education for students. In some cases, faculty instructors described accommodations that they perceived to be an educational disadvantage for students:

"I talk to my students and say, 'Guys, you have your extra time. You will get it. But you need to understand that this is trade-off. You can be in class and be able to ask me questions, or you can get your extra time in disability offices. So, think what works better for you.'" –Heather

We think it likely that many readers may disagree with the "trade-off" described by Heather in the quote above—indeed, other faculty that we interviewed described workarounds to the same issue, including making sure the DRC could contact them if the student had questions or proctoring students with extra time accommodations themselves. Heather's perception of the situation above as a "trade-off" could be due to a lack of awareness of potential workarounds or could even be an effort to penalize students for using their accommodations by giving an unfair disadvantage (i.e., not being able to ask the instructor questions) to students who choose to use their accommodations.

However, faculty also described situations where accommodations may reduce the quality of education that have less-obvious solutions. For example, some faculty described scenarios in course-based undergraduate research experiences (CUREs; Auchincloss *et al.*, 2014; Brownell and Kloser, 2015) where students with accommodations may not be able to fully benefit from the course design as intended. Erin says:

"[In our CURE] it is difficult when students are absent because the cells [and experiments] don't wait.... We try to have backup videos for people who miss, but because it is authentic research, a lot of the work can't be made up later... [Students] become a passive participant in the lab because they miss out on the activity." –Erin

CUREs, field courses, and other lab and experiential-type courses with real research components pose unique challenges to providing accommodations to students with disabilities in a way that allows the student to fully engage in the experience the course is meant to provide, because some standard accommodations by nature conflict with the course design that meets the pedagogical and research goals (Cooper *et al.*, 2017). Similar to some of the challenges faced by students with disabilities in undergraduate research experiences (Gin *et al.*, 2022b), it becomes less certain what the best accommodation should be when the learning experience is associated with the completion of a research project and the need to be physically present to do so in a time-restrictive manner.

Utility value: Faculty do not believe providing accommodations is useful to the instructor themselves. In contrast to the many ways that faculty displayed their attainment value regarding providing accommodations for students, we did not find any examples of faculty deriving utility value from providing accommodations to their students. While instructors may

believe that it is useful to society to provide accommodations for students, or useful for the students to receive accommodations, these are examples of attainment value (feeling that something is the “right thing to do”) rather than personal utility. Examples of personal utility value that faculty could hypothetically gain from providing accommodations are extra financial compensation, special recognition or consideration in promotion, or having a reduced workload or saving time as a result of providing accommodations. In contrast, many faculty highlighted the lack of these aspects when they were asked what would motivate them to invest in learning to better provide accommodations in their classrooms. Kevin says:

“It would be valuable to have financial incentives to have [faculty] complete training courses [on providing accommodations for students with disabilities], but I actually think the most valuable thing would be to occasionally give people course releases. Instead of actually teaching a class, give [faculty] a chance to deeply engage with pedagogy on some subjects.” –Kevin

In addition to financial incentives or course releases, faculty in our study suggested that they would have higher buy-in to invest in providing accommodations if it were a required part of their job, resulted in a certificate, or could be listed as part of service or teaching accomplishments or otherwise recognized. Such incentives are already used effectively to engage faculty in other forms of professional development (Herman, 2013), and could be used to motivate and reward faculty for improving accessibility in their teaching.

Faculty did discuss saving time on providing individual accommodations via class-wide policies, which reduced the administrative burden by making an accommodation a standard part of their class. Emily explained:

“When it comes to quizzes or exams, I’ve started doing take home exams and giving 24 hours for people to take them, because I can’t handle [accommodations when] it’s like ‘this student gets this amount of time, this student gets that amount of time’. I can’t do it. So, I just give everyone 24 hours now.” –Emily

However, we do not consider the above example to be a true instance of “personal utility” by way of saving time for the faculty instructor, because administering 24-hour home exams does not usefully contribute to Emily’s current or future goals, which is how utility value is defined (Eccles and Wigfield, 2020). Instead, Emily is taking an action that reduces the time-related administrative costs an instructor would spend on providing many different individual exam accommodations to students.

Intrinsic value: Faculty do not express that providing accommodations is personally enjoyable. In a similar vein, no faculty in our sample described instances of deriving personal intrinsic value from the act of providing accommodations to students. We would interpret intrinsic value for faculty as an increased enjoyment or appreciation of their work as a direct result of the actual process of providing accommodations. Faculty did discuss having fulfilling interactions with students with disabilities, and emphasized their appreciation of the impor-

tance and need to provide accommodations—but as before, we classify this sentiment as attainment value.

In most cases, faculty described the routine act of providing accommodations as necessitating extra administrative work related to their learning management system, lecture slides/recordings, or communicating with students. While it is possible that some may enjoy those activities, this sentiment was not described by our interview participants.

The best characterization of how faculty felt about the actual act of providing accommodations was described by several interview participants using nearly identical language as “just part of the job,” as exemplified by Tyler and Elizabeth in the quotes below:

“Oh, I’m totally happy to get [an accommodations letter for a student]. I mean, not ‘happy’. I mean, it’s just part of my job.” –Tyler

“It’s just something I need to do. It’s no different to me than a student writing to say, ‘Can you explain this process to me differently?’ It’s just a part of the job, so I don’t really have any feelings about it per se.” –Elizabeth

Faculty instructors emphasized in our interviews that they understood that providing accommodations was a responsibility and duty within their role as teachers because accommodations are part of ensuring that all students in their classroom can learn.

Costs: Faculty express that providing accommodations can be a high burden. Despite acknowledging that providing accommodations is part of the instructional job, most faculty (88%) offered numerous examples of the high burden that the duty of providing accommodations adds to their job. Faculty highlighted the final responsibility of providing accommodations lies with the instructor, rather than the DRC or other institutional support systems, and that there is little oversight to ensure that they are complying with providing accommodations. Erin summarized this:

“It’s the instructor’s responsibility to work with the student to implement the accommodations, and it’s our responsibility to figure out how to best use those accommodations in class. And if it’s a complicated accommodation, it’s our job to... initiate those conversations and get those accommodations implemented in a reasonable and equitable way.” –Erin

While faculty in our interviews accepted this responsibility as part of their job, they also expressed frustration at the lack of support provided to them by their institution, the DRC, their departments, and other faculty. Kevin explained:

“I feel honestly annoyed, but not annoyed at the students. I’m annoyed that the institution doesn’t provide me more resources and support to do the additional work that’s required to serve the students [with disabilities].” –Kevin

Some faculty expressed discouragement and dissatisfaction for the perceived lack of effort from other faculty members to enact supportive classroom policies for students with disabilities, which they felt contributed to an overall unsupportive

department culture for students with disabilities. A few faculty were concerned that they would be negatively judged by other faculty within their department for being too supportive of students with disabilities, which they perceived could have professional repercussions. Emily said:

“I wouldn’t want my class to be perceived as easier... There’s still some impression with faculty that you have to be hard on [students]... If only my class was accommodating, it would look bad to some of those people... As a new faculty, I wouldn’t want to be seen as super weird and different.” –Emily

Many faculty highlighted the constraints of their time and energy within their positions. High faculty workload and the number of responsibilities on faculty’s plates has been a highly-discussed topic appearing in blog posts, Twitter threads, news articles, and journal commentaries (for examples, see McKenna, 2018; Lashuel, 2020). An informal study of 30 faculty members at Boise State University found that faculty reported working over 60 hours a week, with 30% of that time spent in meetings or on emails, and the rest on activities including teaching, research, service, and professional development (Flaherty, 2014). In our study, multiple faculty participants explained that because they already feel stretched thin within their positions, spending energy on accommodations for students with disabilities can feel like a direct trade-off between their other activities. Kevin says:

“[My job is] a 40 hours-per-week job supposedly, but it’s really an 80 hours-per-week job. Doing anything new means either doing something else worse or doing more work that you don’t get paid for.” –Kevin

If accommodations take extra time for faculty instructors, and faculty have limited, finite time to devote to their teaching, spending a large amount of time providing accommodations may result in faculty spending less time on curriculum development or course preparation—potentially having a detrimental impact on their overall course instruction.

Some faculty described situations where the technology they had access to was insufficient to assist them in providing accommodations. For example, Mohamed illustrates an issue that several faculty instructors expressed regarding the lack of automation to support students with accommodations related to assignment or exam timing in their learning management systems:

“At the moment for each and every assignment, you have to physically go in and log in the student who gets extra time... So, if you have got five different activities taking place a week, then for all of those you constantly have to input [the extra time] over and over again.” –Mohamed

In contrast, other faculty, including Jason, highlighted that their institutions provided access to learning management systems that could easily address the exact issue raised by Mohamed:

“[If I get an accommodation about a student’s] required time, that’s easy within our [learning management system] to go in and do the adjustment [so that] anything that is timed within

the class, it’s going to shift [the time on every assignment] for them all at once. Which is nice, because just 2 years ago we were having to [change the allotted time] for every single assignment.” –Jason

Similarly, faculty at some institutions described an array of technological systems that automated the process of providing accommodations, such as systems to keep DRC notifications organized and automated systems to record, transcribe, and post videos of classes. Faculty at other institutions discussed that needing to manually accomplish these very activities due to their lack of access to such technology meant that providing accommodations could be a large time-burden on their workload. Therefore, the degree to which time and a lack of technology was a cost to faculty varied widely, depending on their institutions.

The large administrative needs were often a result of high numbers of students who need accommodations, and this volume of students can be in and of itself burden for faculty. Large numbers of students without sufficient support resulted in several faculty sharing that accommodations could sometimes unintentionally slip through the cracks:

“There’s a high burden on faculty to navigate all the different accommodations we have in each of our classes... [DRC notifications for each student] come randomly within the first week or two of the semester. I teach three core classes, each with 60 students, so I do not remember all of them. I definitely don’t. I try to keep track of who might need extra time and things like that, but it really is a burden.” –Emily

Given the high number of students with disabilities that faculty accommodate, several faculty instructors described the additional burden of dealing with the occasional students with disabilities who were less cooperative or were not proactively communicative about their accommodations. Rachel, for example, contacts each of her students when she receives their accommodations email from the DRC, and invites the student to meet with her or to communicate further over email to schedule extra time accommodations in advance. It can therefore be frustrating and stressful for Rachel when students do not communicate with her to confirm whether the accommodated exam time or location will work with their schedules:

“I have had some students who have been very resistant to talking about [their accommodations] ... And then there’s almost no communication until it’s time for something like an exam [where they need accommodations], and then it’s very hard. It was a little frustrating, because we were in a position where last-minute we were trying to find an appropriate room and an appropriate time, because [the student wasn’t] communicating well about, ‘Oh, I have another class right after, so double time means I have to start earlier or take it at a different time of the day.’” –Rachel

A few instructors described other situations they found stressful or perceived to be inappropriate—for example, negotiating accommodations with a student’s parent, rather than the student themselves:

“[The issue] ended up being a student with a parent and I do not interact with parents. I will interact with students, but the

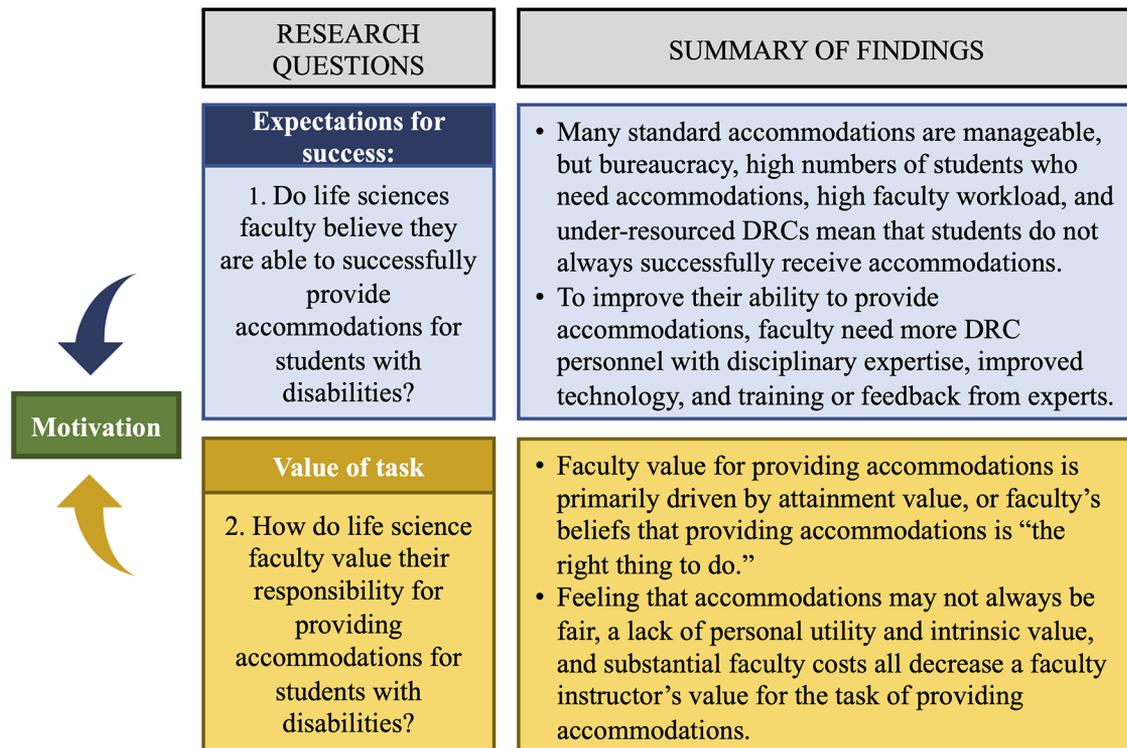


FIGURE 2. Summary of findings regarding faculty expectations of their abilities to successfully support students with disabilities and their perceived value of the responsibility of providing accommodations for students with disabilities.

parent was crossing boundaries and I needed the DRC to stop that from happening.” –Melissa

Melissa’s situation hints at the challenges for students with disabilities in transferring from K–12 education, where parents have the ability to be powerful advocates for their children, to higher education, where parents are generally unable to directly engage in the accommodations process (Chan, 2016). As demonstrated by both Rachel and Melissa above, successfully receiving accommodations is almost entirely reliant on a student’s ability to productively communicate and self-advocate (Pfeifer *et al.*, 2021).

Finally, faculty described situations where providing accommodations conflicted with their preferred instructional styles. This included an instructor who expressed slight frustration that they could not use the whiteboard as much when some students were attending in-person and others were remote, or another instructor who preferred required in-person instruction without accommodations for remote learning because it was more enjoyable to teach to a fuller classroom. In many cases, faculty discussed this frustration while simultaneously expressing the perception that accommodations can decrease the quality of education for students—for example, Jeffrey explains:

“I don’t want to record if people see it as an alternative not to come into class. The goal of the class is to have people come and do things and talk with each other... You can’t even get that via Zoom synchronously. And you certainly can’t get that by watching a recording... So, the recordings on average worsen the experience.” –Jeffrey

Providing accommodations just to the students with disabilities—for example, just sharing lecture recordings with students with accommodations, in Jeffrey’s case, could allow instructors to keep teaching as they prefer to the rest of their students, but likely would require increased administrative work (i.e., sending the video individually to specific students, rather than just posting it for everyone). Therefore, faculty may be required to choose between giving up their preferred instructional practices or spending more time on their teaching activities to provide individual accommodations.

CONCLUSIONS AND IMPLICATIONS

We found that instructors’ expectancy of their ability to provide accommodations for students and their value toward the task of providing accommodations are complex and nuanced. While faculty perceived that most accommodations are straightforward to provide, faculty acknowledged situations where, when stretched for time, accommodations may “fall through the cracks” (Figure 2).

While we found that the COVID-19 pandemic may have equipped instructors with more tools to address accommodations for students with disabilities, it is clear from our findings that faculty instructors overall still feel more support is needed. Prior research exploring student experiences with accommodations corroborates the idea that educational changes brought on by the pandemic did not solve many accommodations issues. Specifically, an interview study of students with disabilities at the beginning of the pandemic indicated that most faculty failed to provide accommodations when the teaching modality was altered (Gin *et al.*, 2021) and a survey a year later showed

that even the accommodations for remote learning were not adequate (Gin *et al.*, 2022a). This is particularly important given that educators and universities are legally required to provide students with disabilities with the accommodations they need to be able to fully engage in higher education (Americans with Disabilities Act of 1990, 1990). This current study joins others (e.g., Toutain, 2019; Gin *et al.*, 2021, 2022a; Pfeifer *et al.*, 2023) in providing evidence that we are not fully meeting this legal obligation.

Faculty members' sense of value for providing accommodations was generally driven by a strong desire to support students with disabilities (Figure 2). Faculty mostly conveyed that providing inclusive and equitable educational experiences was a part of their job. However, the different perceptions that faculty have about what "equitable educational experiences" means is associated with different outcomes—for example, faculty who interpret "equity" as more similar to "equality" tend to lecture more, while faculty who interpret "equity" as "inclusion" tend to use more active learning practices (Russo-Tait, 2023). Therefore, it is possible that even faculty who express that "equity" is important in their classes may have different philosophies about providing accommodations based on their different definitions of equity. The struggle about the question of whether and when providing accommodations is "fair" to students with and without disabilities was very apparent in many of our faculty interviews. Further, faculty expressed a lack of utility and intrinsic value in their task of providing accommodations, recognizing that their jobs were very demanding, and that providing accommodations could add significantly to their workload without directly resulting in personal benefits (Figure 2).

What is wrong with relying on attainment value to drive instructor motivation to provide accommodations?

Instructor in our study nearly unanimously perceived significant costs, low intrinsic value, and low utility value toward the task of providing accommodations for students with disabilities. We hypothesize that attainment value may be a powerful yet unstable motivator, as over half of our interview participants grappled with feelings that accommodations could be both fair and unfair for students. Faculty with lower attainment value may be less motivated to make choices that fully support students with disabilities in their classes, resulting in inconsistent experiences for students taught by different faculty. This could result in students needing to self-advocate more, receiving inconsistent or lower-quality accommodations, or failing to receive their accommodations altogether. This situation not only places a greater burden on already-marginalized students with disabilities, but also has the potential to disproportionately disadvantage students with disabilities who have other underserved identities as well. For example, racial/ethnic minority populations can be less likely to engage in self-advocacy in healthcare settings (Delavar *et al.*, 2023), and LGBTQ+ students with disabilities report lower self-advocacy and willingness to disclose their disability to their instructor in science classrooms (Goodwin and Brownell, unpublished data). Undergraduates from different cultural backgrounds—for example, low-income students of color—are less likely to feel comfortable approaching and engaging authority figures at their universities (Jack,

2016). These students therefore are less likely to speak up to their faculty if faculty are not proactive about ensuring accommodations are fully provided in their classes. Future research could directly explore how instructor approaches to providing accommodations impact students with multiple underserved identities.

Relying on attainment value to drive motivation to provide accommodations can also create equity issues among faculty instructors. Faculty with the highest attainment value likely make more of an effort to provide accommodations. However, these faculty therefore would incur higher costs associated with providing accommodations, such as having less time to spend on other tasks. At the same time, they are unlikely to experience professional or monetary utility benefits compared with their colleagues who do not spend as much time on accommodations. A system that relies primarily on goodwill may disproportionately benefit individuals who are more comfortable with taking advantage of those systems and place the burden of responsibility on lower-status and more marginalized faculty. While beyond the scope of the current study, further research could explore if patterns in how faculty spend time on accommodations exist along lines of race/ethnicity, gender, and disability status—particularly how this plays out in tag-team or cotaught courses—potentially disadvantaging minoritized faculty.

Can we increase the utility value and decrease costs for faculty to better provide accommodations?

Systematic changes that support other aspects of the EVT model could strengthen the ability of institutions to provide accommodations reliably and effectively for students with disabilities. For example, an instructor's success in creating inclusive classrooms for students with disabilities could be more heavily considered by tenure and promotion committees, perhaps through certificates of training in inclusive teaching for students with disabilities, or teaching evaluations from experts in disability-inclusive instruction. These professional benefits could result in an increase in perceived utility value for an instructor to put effort towards supporting students with disabilities. Institutions could develop additional forms of incentives and recognition to further increase the utility value of supporting students with disabilities—and perhaps introduce additional ways to penalize faculty who fail to sufficiently support students with disabilities.

Additional institutional changes can specifically decrease costs for faculty to provide accommodations for students with disabilities. This could include investing in more designated staff (e.g., instructional designers, graduate teaching assistants, staff who act as liaisons between departments and the DRC) who can help faculty redesign classes and implement inclusive teaching practices. Additionally, the time-intensive and more administrative responsibilities of managing accommodations could be shifted from the primary instructor to dedicated staff—perhaps from the DRC, or perhaps from dedicated undergraduate learning assistants, graduate teaching assistants, or course assistants for large classes. Faculty in our interviews highlighted the power of effective technology and learning management systems to automate and minimize workload related to accommodations, yet these were not available to or helpful for all faculty.

To what extent is Universal Design for Learning a solution in supporting students with disabilities?

In early discussions of this work with life science faculty and science education researchers, questions were frequently raised regarding universal design for learning (UDL) as a solution for supporting students with disabilities. UDL is a framework to change learning environments such that all students have full access to learn the course material and demonstrate their learning, in theory reducing the need to provide individual accommodations for students with disabilities (Schreffler *et al.*, 2019). This framework offers three UDL principles: 1) to provide varying methods for students to receive and perceive information; 2) to provide students with different options to complete course tasks and demonstrate their knowledge; and 3) to provide different types of opportunities for students to engage in their class (Schreffler *et al.*, 2019; CAST, 2018).

In practice, we see UDL most frequently used in undergraduate science classrooms when instructors provide all students with different ways to receive information (e.g., in-person and recorded lectures, captions, lecture slides, book chapters, informational videos, podcasts). Instructors who allow students to choose between the types of assignments they complete (e.g., written essays, exams, portfolios, and projects) are meeting the second UDL principal of providing students with different options to complete course tasks and demonstrate knowledge. The third UDL principle could be met by allowing students to choose between in-person, remote, and asynchronous attendance, or having the choice to participate in group work and active learning exercises.

We agree that many of these aspects of UDL are likely to be extremely beneficial to student success and learning in the classroom and of practical use for instructors who are designing new courses from scratch. However, fully redesigning one's existing course to meet these UDL principles is likely to be an untenable amount of work for most faculty, who, as discussed in our interviews, are already lacking the time and knowledge to accomplish this task. Sustaining many of the UDL principles could be a high burden on time and effort, and instructors will still need to provide individual accommodations when students' needs are not met by the course design (Burgstahler, 2009).

However, some aspects of UDL can be incorporated in a way that may reduce instructor workload related to providing individual accommodations. For example, many faculty instructors in our interviews expressed that, particularly since the COVID-19 pandemic, they are already offering multiple modalities of accessing course material (in-person attendance, slides, recordings, etc.) to all students, and that providing these resources to all students reduces instructor workload with individually distributing materials just to students with accommodations. However, even when multiple modalities of learning are available, there is no one-size-fits-all solution to supporting students with disabilities in undergraduate classes. More work needs to be done to understand how universal design for learning can be used in a way that best supports student learning and equity across student populations, and how we can support faculty to improve support for students with disabilities, using aspects of universal design when appropriate.

Limitations

Our goal with this study was to describe the experiences of faculty instructors regarding providing accommodations. The experiences represented here belong to one set of faculty, who were intentionally recruited from large research-intensive institutions in order to target individuals who teach larger classes, have the support of a DRC, and were likely to have numerous encounters with students with disabilities. It was clear from the interviews that even within a R1 population, faculty encounter institutional differences in policies, practices, technology, and support regarding student accommodations, all which could influence experiences and motivation toward providing accommodations. Future studies could explore how differences across institution types (i.e., R1, Masters, Primarily Undergraduate, Community Colleges) regarding accommodations might impact the process—for faculty providing and students receiving accommodations. Additionally, institution types vary in the characteristics of the student populations they serve and the different expectations and priorities for their faculty. More work should be done to explore how different institutional accommodation approaches impact students with disabilities who also have other underserved identities. Further studies could also explore how a faculty's status and position (i.e., teaching or research professor, new faculty or tenured faculty) may impact faculty motivation to provide accommodations.

In our study, we spoke exclusively to participants who volunteered to discuss providing accommodations, and our participants were interviewed by an individual who identifies as having a visible disability. Volunteer and social likeability bias are likely to have influenced our study participants to be more positive about providing accommodations/supporting students with disabilities, compared with the general instructor population. Thus, we predict that we underestimated some of the negative attitudes of faculty.

A call to creating a more sustainable accommodations system

Through this study, we have demonstrated both the reliance on faculty to “do the right thing” to effectively provide accommodations for students with disabilities, and the recognition that faculty are already stretched thin, overworked, and experiencing high rates of burnout. These two factors make the accommodations system in higher education inherently fragile and inequitable—both for students with disabilities, and for faculty instructors. This problem is likely to get worse, as increasing numbers of students request accommodations, and faculty resources continue to stretch. If, as a society, we want to offer equitable educational experiences for people with all kinds of disabilities, we need change from a higher level. We need funders to require universities to demonstrate how they are meeting the needs of students with disabilities. We need universities to increase the resources available to supporting faculty in the classroom and provide resources, training, incentives, and rewards for faculty to create accessible classrooms. Without these changes, barriers will persist for students with disabilities in science, limiting our potential to advance science through the diverse perspectives and skillsets of many people with disabilities.

ACKNOWLEDGMENTS

We thank the anonymous faculty instructors who interviewed and volunteered their time and perspectives for this study. L.E.G. was supported by an National Science Foundation Graduate Research Fellowship under award DGE-1311230, and E.C.G. is supported by an NSF STEM Education Postdoctoral Fellowship (AWD00037453). This work was supported by an Inclusive Excellence grant #GT11046 from the Howard Hughes Medical Institute (www.hhmi.org), awarded to Sara Brownell, James Collins, Ariel Anbar, and Paul LePore. Additional support was provided by an NSF EEC award (#2012998) to Kristen Parrish, Sara Brownell, and Katelyn Cooper. 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 or HHMI.

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