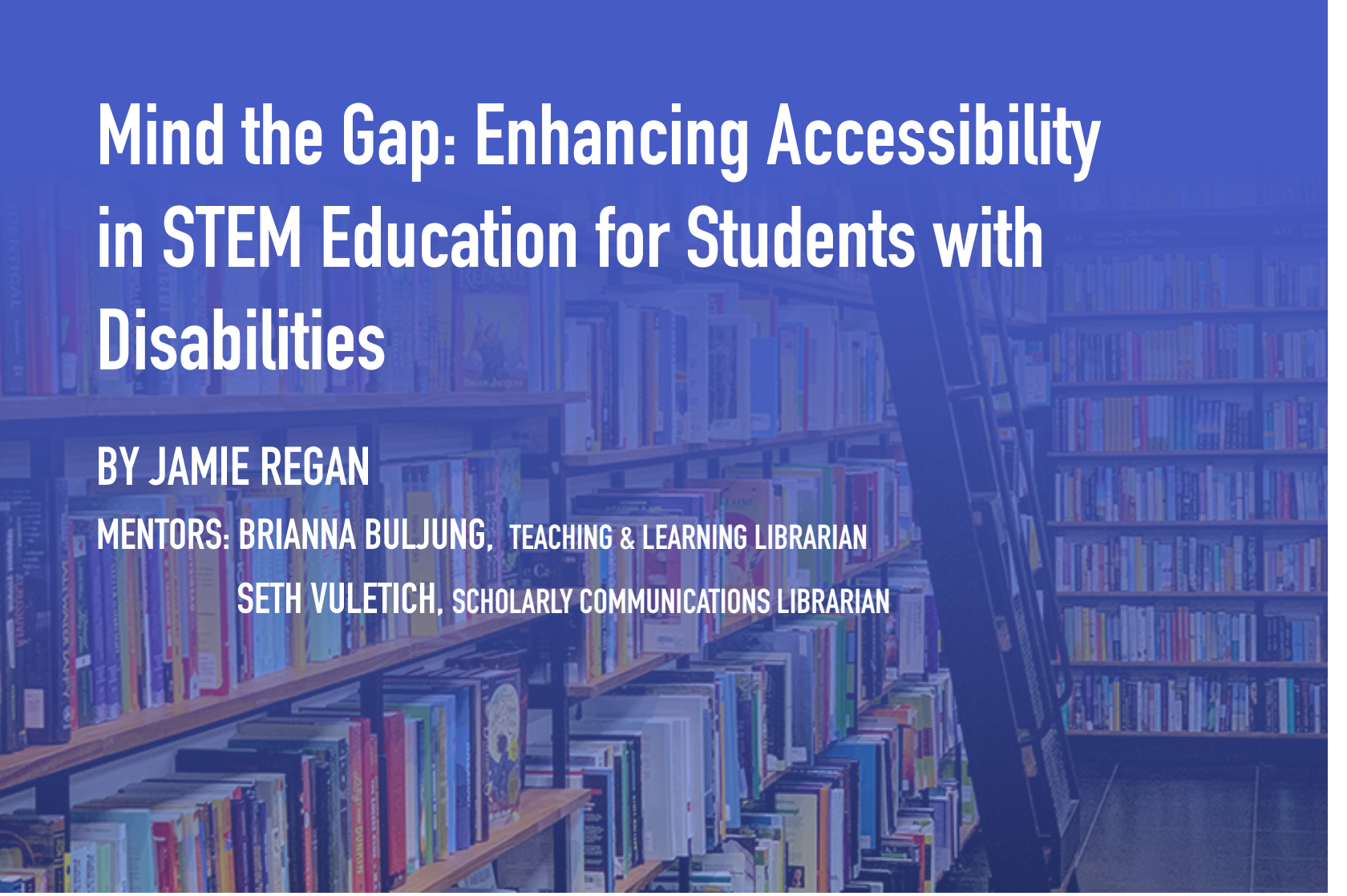
Mind the Gap: Enhancing Accessibility in STEM Education for Students with Disabilities



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Introduction

In science, technology, engineering, and math (STEM) higher education, students with disabilities face unique challenges. Recognizing this, a research team was formed to tackle the challenge of finding ways to make STEM higher education more accessible for students with disabilities. This initiative aims to facilitate a smoother transition for these students from high school to college.

Students with disabilities transitioning to higher education often encounter barriers that impede their academic progress. These challenges are even more pronounced in STEM fields, where accessibility and accommodation needs are often unmet. The transition from high school to college marks a significant shift in the student's support structure, often leaving them to navigate a complex and unfamiliar new world. This transition may be a factor in low enrollment rates for students with disabilities; only 10% of undergraduate, 7% of graduate, and 1% of doctoral-level STEM majors [1] report having a disability, even though individuals with disabilities comprise 13.5% of the US noninstitutionalized population [2]. Only 3% of the STEM workforce reports having a disability [3].

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Students with disabilities also have worse outcomes in higher education compared to their peers, only 16% of students with disabilities graduate with a bachelor's degree, in contrast to the 52% graduation rate of students without disabilities [4]. This disparity highlights the need for higher education institutions to address the challenges faced by students with disabilities, especially in STEM fields. This gap affects the student's academic and professional development but also contributes to the underrepresentation of this demographic in the STEM workforce. There is immense value in having representation in industry and a diverse faculty and staff on campus, as it can positively impact a student's belief that they can succeed.

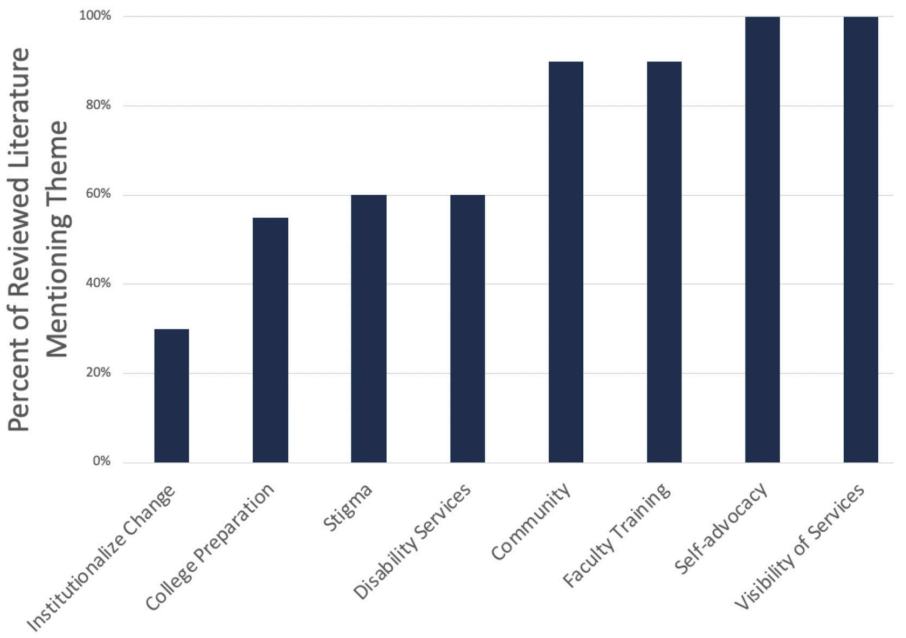

Figure 1 *The common themes found during the literature review.*

Research and Methodology

The project explores various dimensions of this issue, including the disparities in STEM education and the institutional barriers faced by students with disabilities. The team started with a literature review to find problem areas and initiatives implemented by other institutions. A vital component of the research is the perspective of current students and high school educators. To obtain these perspectives we designed and administered two surveys. One survey was designed for Colorado School of Mines students to learn about their experience and discover what they think would have helped them. The second survey was designed for high school faculty who work with students with disabilities to find out what high schools are doing to help students and hear from them how to aid students with disabilities better. The data is being analyzed and will inform the development of resources and support systems that are more attuned to the challenges faced by students with disabilities.

Literature Review Findings

During the literature review, articles were surveyed to understand what researchers have found and common themes to explore. Figure 1 shows some of the most common themes found during the literature review. Many articles cited students needing to learn how to advocate for themselves and communicate effectively with their professors and disability support services. Often, students with disabilities feel isolated in their new environment and have trouble finding friends and a new support system; studies found that helping students to find a community through mentorship programs and student organizations helped to improve their experience and made them more likely to do well in college.

There is also a disparity in awareness and support for students with disabilities in higher education institutions. Professors often do not have the training or awareness to accommodate students with disabilities. Institutions may also only meet the basic requirements set by the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act, which makes resources and spaces accessible but not inclusive or equitable. This is a significant change for students who have been working with teachers and specialized staff throughout their primary and secondary school careers; they also experience the disparity between the robust support of the Individuals with Disabilities Education Act (IDEA), which no longer applies in higher education and the ADA and Section 504 which govern higher education institutions.

Within the literature, there are many opinions on what high schools can do to help students. Some high schools created programs for students with disabilities which taught them the skills they need to pursue a college education and a degree in STEM, while others worked to pair high school students with mentors who could support them and offer advice about post high school life. An essential part of these high school initiatives is teaching students independence and how to advocate for themselves so that they can successfully navigate life.

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There are also examples of ways that colleges have worked to make a more inclusive campus. An example that has seen success on many campuses is a summer bridge program. These programs bring high school students to campus to learn about campus life

and resources that can help them be successful. The participants take college classes and attend workshops so that they can get a feel for college life and better prepare for their college experience. These programs also help students to build a community before they begin their chaotic freshman year. An essential part of these programs that often gets overlooked is the need to continue to support the participants throughout their college career.

Many studies agree that Universal Design for Learning (UDL) is an essential methodology for all educational institutions. UDL is a concept that highlights the need for educational resources and courses to be accessible and inclusive for all. This concept considers that all students are unique and have unique needs that may need to be officially documented. If courses implement UDL, then all students can benefit from accessible course materials, flexibility, and variety in approach and instruction, even if they do not have a disability. [5]

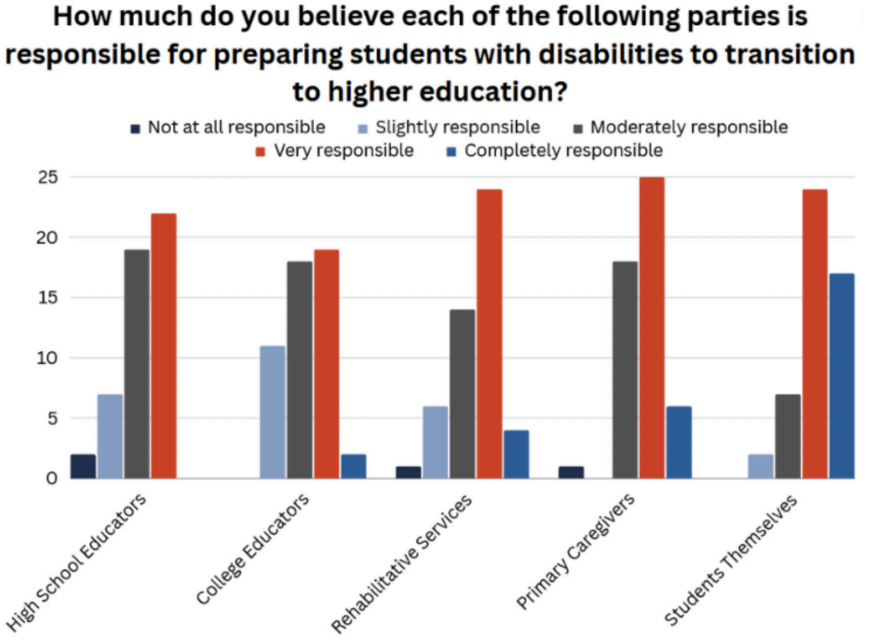

Figure 3 *Student responses to the question regarding responsibility for preparing students for college.*

Preliminary Survey Results

Early survey results show that students and high school professionals are in agreement on many questions. As seen in Figures 2 and 3, students and faculty both have similar beliefs about who is most responsible for preparing students with disabilities for college, with many of the faculty and students agreeing that caregivers and high school educators are most responsible, along with the students having a responsibility to prepare themselves. Educators must work with students and their caregivers to ensure they are prepared for college.

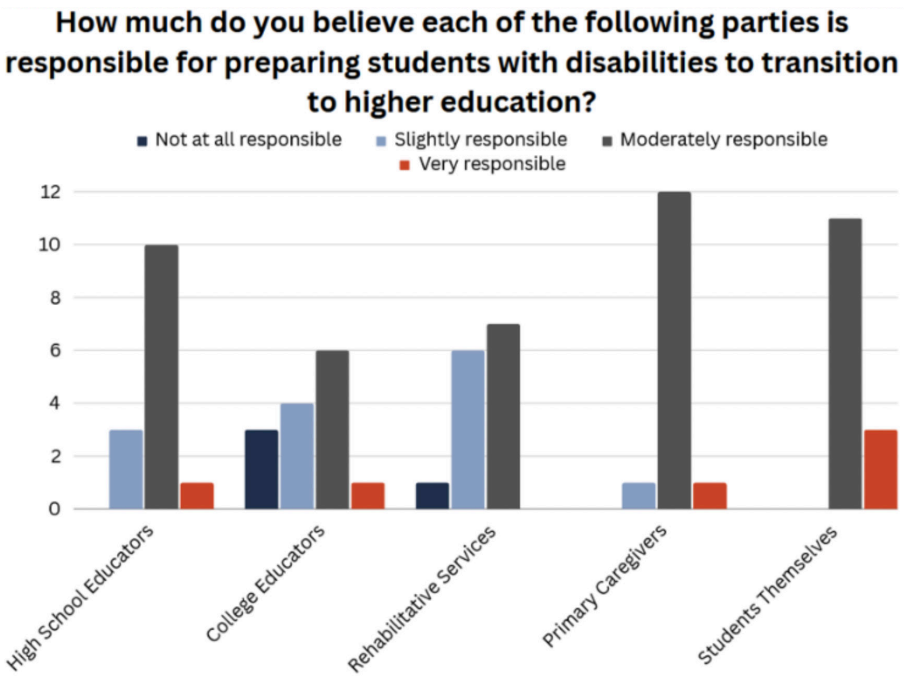

Figure 2 *Faculty responses to the question regarding responsibility for preparing students for college.*

The student survey asked what resources could help students with disabilities transition to college; the answers supported the findings from the literature review. Figure 4 shows that students stated that a mentor and a summer transition program would have been most helpful for them in the transition from high school to college. This supports the research found on mentorship programs for students with disabilities and programs that teach students the skills they need to be successful in college. Higher education institutions should implement transition programs that include

mentorship to help their students with disabilities succeed.

Both surveys ask the respondents to give advice to a student with disabilities who is transitioning from high school to college, some of the advice given is shown in the phrase cloud in Figure 5. Both surveys had similar responses encouraging students to advocate with themselves and communicate with professors and staff to ensure all their needs are met. This indicates that students need to learn self- advocacy at some point in college or the start of their careers.

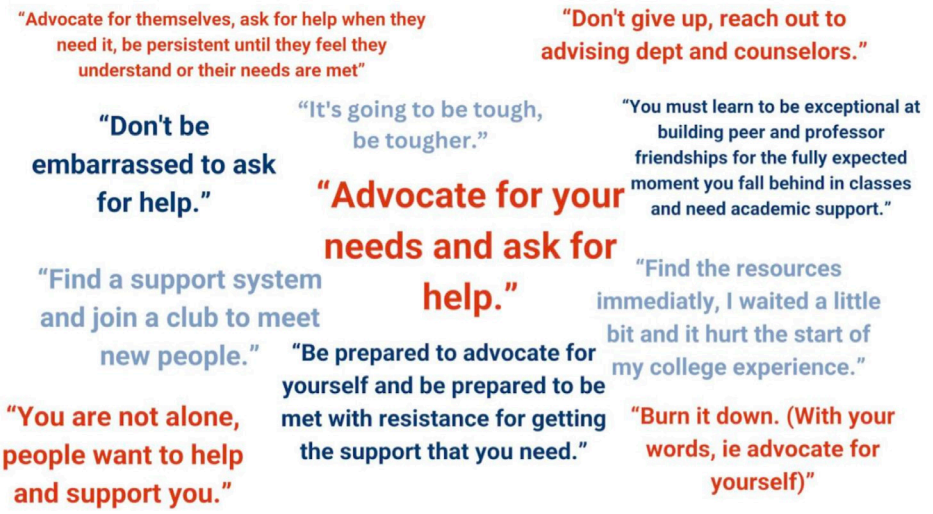

Figure 5 *A phrase cloud of some of the advice received from faculty and student respondents.*

One high school educator shared their initiative to help students become more independent and develop communication skills when possible. They stated that they start by helping students to email their teachers or being present to guide meetings; the goal is that by the time the students are ready to graduate, they are emailing their teachers themselves and taking charge in meetings. This initiative could help students prepare for the independence they will experience in college and adulthood.

The faculty also encouraged students to utilize the resources available to them while students advised that being persistent and tough are important traits to have. While most of the advice we received was positive and encouraging, one student respondent stated that students with disabilities should not come to Mines because no one cares about students with disabilities. The results for this respondent require more analysis to see if there is any insight into why this student has had such a hard time. Hopefully there will be some insight that can be used to better student's experiences in the future.

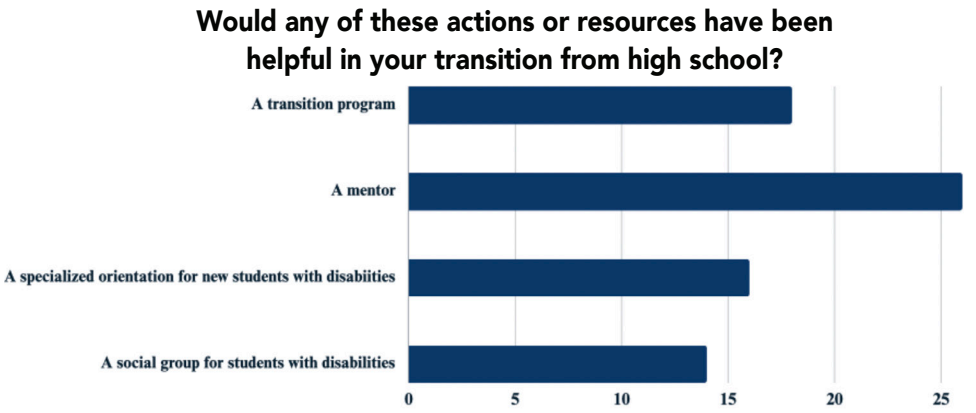

Figure 4 *Student responses to the question "would any of these actions or resources have been helpful in your transition from high school?"*

Impact and Importance

The research conducted by this research team is profoundly impactful due to its broad implications. This study contributes to understanding the unique barriers faced by students with disabilities in STEM higher education. College policies and programs must fill many gaps to ensure that students with disabilities are supported and the campus is accessible.

Moreover, the research highlights the need for more inclusive and effective policies and practices in higher education. It is essential to ensure faculty and staff are adequately trained to teach all students who will sit in their classroom, no matter the student's background. The findings can assist Colorado School of Mines policymakers in enacting changes to address the challenges faced by these students.

Conclusion

The initiative to enhance accessibility in STEM education for students with disabilities is not just about compliance with legal standards but a step toward creating a more equitable and inclusive academic environment. The disparity in educational achievement and representation in the STEM workforce highlights higher education institutions' critical role in ensuring equity and inclusion. The research methodologies have provided valuable insights into the experiences of students with disabilities, emphasizing the importance of self-advocacy,

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effective communication, and community support. The findings from this research can inform and transform educational policies and practices, ensuring that all students, no matter their background or ability, have equal opportunities to succeed in their academic endeavors.

Jamie Regan is a transfer student pursuing a bachelors degree in electrical engineering. She began her career in aerospace by joining the Navy as an aviation electrician where she spent 3 years in Japan working on F-18's. After receiving associates degrees at FRCC and RRCC she decided to transfer to Colorado School of Mines to take her career to the next level by pursuing an electrical engineering degree.

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