



Hidden in Plain Sight: Students with Disabilities in STEM Education

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Abstract

We are not experts in this field. We are learners. We are a group of a teacher education professor and three future teachers focused on STEM equity, and who have become painfully aware of the exclusion of disability from discussions on equitable STEM teaching and learning in the United States. This paper is a review of the literature experiences of learners with disabilities. We examine the underrepresentation of people with disabilities in STEM fields through the lenses of STEM, disability, and education. Our goal is to encourage other educators and researchers to broaden their equity lenses to regularly include disability, rather than viewing it as an issue siloed to special education and disability studies. We write this paper with the hope of inviting you to be co-learners and co-teachers with us in normalizing the conversation around disability.

Keywords: *STEM, equity, teacher education, disability, ableism, bias*

1. Introduction

The current focus on broadening participation in STEM has led to increased attention to gender and racial disparities and social justice. The STEM pipeline metaphor has been widely critiqued since it's only a "pipeline" for students who represent dominant identities. The underrepresentation of people with disabilities in the STEM fields is a persistent problem and is under-researched relative to other inequities in STEM [2], [5], [7], [15]. What can we do to build and diversify STEM pathways? Such efforts must be built on a strong foundational body of research, but the amount of currently available research on students with disabilities in STEM is disappointing. Massive gaps in the research are made even more complex and challenging by the widespread underreporting and misreporting of disabilities among adults, making the issue even more invisible.

2. Trends in the Research on Disability, Education, & STEM

A search of the research literature for studies about STEM students and/or teachers with disabilities provided extremely limited and largely outdated results, which is why we describe this issue as either invisible or hidden in plain sight. Our difficulty in identifying helpful research was reflective of the work of Peña [13] who conducted a thorough search of peer-reviewed articles published in four of the top academic journals and found that only 1% of published work in these journals had to do with disabilities; an even more troubling statistic when considered against the trend of increasing college enrollment of students with disabilities. A smattering of articles can be found in the specialized disability/exceptional learners journals. Further, the articles that we found tended to be theoretical, medical and/or pathological in nature, and did not offer the practical information and action steps that could be utilized by practitioners.

Several of the studies we reviewed advocated for qualitative approaches to researching students with disabilities in STEM fields [3], [5], [7], [9]. The importance of quantitative research to promote equitable outcomes for students with disabilities is also recognized: "For decades, literature has documented that practitioners do not find the scholarly literature useful. As such, critical researchers must strive to make study findings accessible and useful to those who create policy and work directly with students with disabilities" [14], p 37. We found almost no literature that was accessible to US general education practitioners.

We can examine the available statistics for enrolling students with disabilities compared to students without disabilities and the types of disabilities. The 2019 National Science Foundation report includes statistics on the types of disabilities, with census data from 2016. And while the digest has sections on the field of *degree* on women and minorities, it does not have a corresponding section on people with disabilities. Problematizing the statistics even further, a longitudinal study [12] reported that roughly 37% of students who are identified as having a disability under IDEA in high school *do not consider themselves to have a disability by age 17*. This suggests the possible degree of underreporting by adults due to any combination of factors including social stigma, workplace constraints, or lack of accommodations.



Teachers in the United States have been struggling more than ever with the pressures of teaching, standardized testing, and decreased funding. For teachers who have a disability, those pressures and expectations are often amplified in ways their colleagues and administrators may not understand or know how to support. While de jure compliance with the Americans with Disabilities Act (ADA) is required by law in the workplace, de facto policies to support the needs of educators with disabilities may not be present. This constraint is more severe in STEM classrooms than in courses in the liberal arts due to the nature of the material being taught. Technology offers tools such as voice-to-text that support text-based content, but subjects where equations are fundamental to student learning do not yet have access to the necessary teaching tools. Representation matters, and students with disabilities need to see themselves in STEM fields and/or in the media to be able to imagine an academic or career pathway in STEM. Even at inclusive schools, teachers may underestimate the intelligence of students with disabilities. Low expectations by educators can directly and negatively impact students' academic performance [1], [4].

2.1 Disability

We found that when the term “disability” was used without qualifiers, it was often used erroneously as a synonym for learning disabilities. This led to damaging generalizations (some found on the websites of national organizations) that equate to “students with disabilities are struggling readers” and “students with disabilities struggle in science.” Much of the literature focuses on the pathology of disability [5]. “if included at all, research often utilizes disability as a singular construct, but doing so obscures significant differences among students with disabilities” [14], p. 29. The US Department of Education and the Office of Civil Rights report on the number of students under the overarching category of “disability.” While disaggregating the data could be problematic in terms of student privacy rights, little in these statistics points providers toward any constructive actions they can take. The National Center for Special Education Research (NCSE) [website](#) [10] lists research that has been funded on math and science, but the link is to a [page that only examines research in math](#). That document begins with the statement “Students with disabilities (SWD) lag behind their peers without disabilities at all grade levels in mathematics.” This represents a deficit-based generalization that is an approach common in the literature [5]. The funded projects listed on the site overwhelmingly represent a focus on learning disabilities.

2.2 STEM

Students with disabilities' limited access to the science, technology, engineering and math (STEM) pipeline are evidenced by notable under-enrollment in STEM fields [7]. University faculty in STEM fields may have a deficit-based “weed out” mentality rather than a lens of inclusive accommodations. Though it may be unintentional, “teachers, instructors, and professors are frequently unable, unprepared, or otherwise ill-equipped to recognize and address the needs of students with disabilities. As a result, course content may be inaccessible” [8]. This can be countered with an asset-based view of students with disabilities that highlights their potential as researchers, more active citizens, and producers of knowledge [6].

2.3 Education

We find that in the United States, there is a general lack of knowledge about the various disabilities that students face. For many students, struggles with anxiety and depression can compound the issue. There is a systemic failure of the school system itself to properly educate teachers on how to both identify students with disabilities and to give them adequate assistance so that they can learn to their potential. Independent Learning Classrooms that support students with disabilities in becoming more self-reliant are systematically underfunded and understaffed. When teachers feel ineffective as educators, it can contribute to their sense of feeling overwhelmed, frustrated, and lead to increased burnout. Another factor that negatively impacts students with disabilities in the US is that parents of students have to opt-in to special education services. Some parents feel shame associated with the stigma of their child having a disability, and do not register their child for services. While children with special needs are entitled by law to receive accommodations, they must be enrolled in specific programs to do so. These accommodations may include additional support staff, so teachers of children with special needs who are not receiving accommodations may struggle to adequately serve the needs of each student in their classes.



3. Conclusion

Many adults understandably choose not to disclose disabilities. We ask you to help us collect data for our primary research designed to contribute to the normalization of disability with a survey that asks adults with disabilities to share their experiences. Please distribute the survey linked [here](#) widely. If you have any questions, know of any additional resources, or are aware of any relevant studies currently underway, please feel free to email the authors and let them know.

4. References

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