



EDITORIAL

Rehumanizing the Mathematics Education of Students with Disabilities; Critical Perspectives on Research and Practice

This special issue was inspired by the Critical Approaches to Disability in Mathematics Education working group, founded at the Psychology of Mathematics Education North America conference in Tucson, Arizona, in 2016 by James Sheldon and Kai Rand. A central focus of our small working group is to explore alternatives to the pervasive deficit constructions of students with disabilities in educational research in mathematics. We take up critical disability studies as a methodology, analyzing how ideologies and institutions like schools reproduce particular notions of ability and disability (Minich, 2016). We believe that multiple theoretical frameworks are necessary to understand the relationship between disability and mathematics, and that, in particular, a critical perspective is necessary to analyze the larger ideological and institutional structures that perpetuate a persistent lack of access to mathematical meaning making for learners with disabilities. Thus, we embarked on this special issue that would gather multiple theoretical perspectives on disability as it relates to mathematics education. 5

Moving beyond narrow theoretical and pedagogical prescriptions for students with disabilities, the research and commentary in this special issue includes constructivist, sociocultural, and socio-political approaches to mathematics learning and disability, privileging research by and with individuals with disabilities. Too often, in educational research, people with disabilities are understood as subjects to be studied as opposed to agentic thinkers. To us, this approach to disability is ethically untenable; people with disabilities are people and learners, not collections of deficits or skill gaps. We seek to engage in rehumanizing learners (Langer-Osuna & Nasir, 2016), reframing disability within mathematics to bring the human to the forefront of the educational endeavor, rather than focusing on atomizing and cataloging deficits. We situate this inquiry within disability studies, viewing disability as both embodied and socially constructed (Siebers, 2008). We understand disability as part of human diversity, illuminating disability as both an identity and a political minority group engaged in an ongoing civil rights struggle (Siebers, 2008). We take up these multiple critical perspectives to analyze current mathematics educational research and practices in relationship to disability, asking how critical approaches can reframe “the problem” of mathematics and disability. 10 15 20 25 30

Educational research on individuals with disabilities often implicitly or explicitly views disabilities by adopting a deficit model of the learner. The deficit model locates the “problem” only within the individual student rather than inclusive of the social, discursive, political, or structural contexts. As long as we understand the problem of disability as only within individuals, we lack the ability to understand the role that contexts play in a holistic sense of disability. For example, Lambert (2015) found that a teacher understood a student with learning disabilities as *more* disabled in a procedural mathematical pedagogy and *less* disabled in a conceptual, discussion-based mathematical pedagogy. Similarly, Heyd-Metzuyanin (2013) attributed her struggles as a teacher supporting the mathematics learning of a student with learning disabilities to the *co-construction of disabled mathematical identity*. These examples suggest that disability is both internal and interactional, constructed not only through individual differences, but how those differences are recognized, or not recognized, by teachers and societies. In a review of mathematics research on “low achievement” and disability in the 20th century, Magne (2001) stressed that low achievement is “not a fact but a human interpretation of relations between the individual and the environment” (p. 9). 35 40 45

This issue builds from a small but growing body of scholarship that has problematized disability and mathematics. A small group of scholars have drawn from sociocultural theory to investigate identity in relationship to mathematics and disability (Ben-Yehuda, Lavy, Linchevski, & Sfard, 2005; Heyd-Metzuyanim, 2013; Lambert, 2015). We recognize critical approaches to dyscalculia including work by Borgioli (2008), De Freitas and Sinclair (2015), Lewis (2014), and Magne (2001). DeFreitas and Sinclair, using an embodied perspective on learning, challenged constructions of dyscalculia rooted in cardinal rather than ordinal conceptions of number. Lewis drew on the concept of difference in countering deficit constructions of students with dyscalculia. We also recognize a developing trend in constructivist research that illuminates what students with learning disabilities *do* understand in mathematics, seeking to move beyond deficit constructions of these students (Hunt & Empson, 2014; Hunt, Westenskow, Silva, & Welch-Ptak, 2016). Such constructions have also been applied to other categories of disability such as intellectual disabilities (Göransson, Hellblom-Thibblin, & Axdorph, 2016; Eriksson, 2008; Hostins & Jordão, 2015), autism (Tan, 2017; Tan & Alant, 2018), and visual impairments (Fernandes & Healy, 2013; Figueiras & Arcavi, 2014). Building on this body of scholarship will be important for future work. Critically important for future inquiry is centering intersectionality (Hernández-Saca, Kahn, & Cannon, 2018), such as Sheldon and Rands' (2017) work on queerness and disability. In sum, we echo Tan and Kastberg's (2017) call for mathematics education to expand the use of critical approaches to mathematics and disability. We seek to create a place for disability in equity in mathematics education.

Indeed, the first article in this special issue is grounded in a critical approach, presenting a dialogue between a mathematics education scholar, Steven Greenstein, and a disability studies in education scholar, Susan Baglieri. Their discussion begins with the question: What is possible in the mathematics education of students with disabilities? They discuss how pedagogy is viewed differently in special education and mathematics education and question why students with disabilities are rarely viewed through a constructivist lens. These authors position students with disabilities as capable learners who can connect their own knowledge to mathematics through “occasions to wonder” (Duckworth, 1995) and issues of social justice (Gutstein, 2005). In this way, mathematics becomes a vehicle for thinking, reasoning, and making sense from a standpoint of illuminating the prior knowledge of students with disabilities (e.g., Hunt & Empson, 2014). Constructing shared understandings of students with disabilities as competent problem solvers, as opposed to passive subjects whose thinking needs to be altered, can allow teachers to recognize students with disabilities as “people with reason, capability, and desire for intellectual engagement” (p. 23, this issue).

In the second article, Deena Goldstein uses sociocultural theories of mathematical identity (Cobb, Gresalfi, & Hodge, 2009; Martin, 2000) to develop understandings of the mathematical identities offered by a classroom for DHH and hard-of-hearing students (DHH). Goldstein found that the DHH students were given access only to a procedural curriculum, with little room for meaning making. Goldstein also reports on an interaction between a teacher and a DHH student in which a teacher made negative assumptions about the competence of the DHH student based solely on her disability, which demonstrates ableist, deficit constructions of DHH students persisting in schools. Goldstein questions how DHH students can construct agentic identities in mathematics with access only to procedural learning, and in the context of deficit constructions of deafness. By centering identity, she works toward rehumanizing DHH learners of mathematics in educational research.

In the third article, Katherine Lewis and Dylan Lane describe their collaborative research that explores dyscalculia from an insider's perspective. Using a Vygotskian approach to disability (1993), Lewis and Lane describe how Lane, a statistics major with dyscalculia, compensates for difficulties with fractions. These authors identify misconceptions not as items to be fixed but as areas that Lane has compensated for and moved beyond. Lewis and Lane provide an existence proof of an individual with dyscalculia who has excelled in mathematics, not by being “fixed,” but by finding her own strategies, and then moving on to more advanced mathematics. The article illustrates how participatory research—including individuals with disabilities within the research process itself (Oliver,

1992)—provides unique insights into disability, opening a space for research to be in service of those being studied (Barnes, 2002).

The final article, by Ishtiaq Ahmed and Theodore Chao, offers a critical analysis of assistive technology for students with visual impairments. The authors draw on a disability studies framework to critique how assistive technologies can either dehumanize students with visual impairments as deficient or humanize their unique ways of approaching mathematics. Utilizing a critical analysis of 14 studies, the authors found that a vast majority of current work on assistive learning technologies focuses on substitution (e.g., replacing visual information with audio feedback) or augmentation (i.e., changes to the original tasks to address accessibility issues with all students), privileging sighted mathematics over a more comprehensive and inclusive depiction. The ways in which students with visual impairments approach and do mathematics is marginalized because these assistive technologies simply replace one sense viewed as deficient for another, or connect students with visual impairments to the mathematics of sighted peers as opposed to their own unique knowledge. Ahmed and Chao call for the expansion of mathematics to include multi-modal communication as opposed to technologies that simply replace visual information. Will the next generation of mathematics education scholars move toward curriculum that does not just allow access at a minimum, but that allows a person with a disability, in this case blindness, to collaborate and create new mathematical thinking?

We argue that critical approaches to disability and mathematics are necessary to improve the conditions in which students with disabilities engage with mathematics, and can expand understandings of the discipline of mathematics. We urge scholars and practitioners to call out the ableism which assumes that students with disabilities need more procedural mathematics; these assumptions are undergirded by approaches that treat disability as a medical condition removed from diversity. Disability must be studied with the complexity of research around diversity and equity, understanding not just what is learned, but how mathematics learning shapes identity, and how broader social contexts affect classrooms.

As the authors of this special issue, we argue that treating people with disabilities as a sum of their deficits, as nonthinkers, is to dehumanize them. For too long, mathematics education has been part of this dehumanizing process, largely ignoring people with disabilities in scholarship (Lambert & Tan, 2017; Tan & Kastberg, 2017) and assuming that special education alone holds the keys to disability. Here, we and the authors of the articles in this special issue assert that people with disabilities are the experts, that meaning making is mathematics for all people, and that the inclusion of people with disabilities as the creators of their own inquiry will transform mathematics.

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