

Developing Well-Prepared Special Educators of Mathematics: Inclusive Teacher Education

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Authors' note: In this paper we use identity-first language, i.e., 'disabled student,' which emphasizes that disability is inextricably linked to personhood and a natural part of the human experience. This guidance arises from disabled self-advocates. Our intention is to represent disability more neutrally and help shift conceptions of disability toward a more positive cultural notion.

The integration of mathematics methods and content into special education teacher candidates' preparation is essential. There are over 7.3 million students in U.S. schools who qualify for special education services under the Individuals with Disabilities Education Act (IDEA), over 65% of whom spend the majority of their day in general education settings (National Center for Education Statistics, 2021). This means that *all* teachers - general and special educators - are responsible for teaching academic mathematical content.

In teaching mathematics content, all teachers are identity workers who "contribute to the development of students' mathematical identities" (Association of Mathematics Teacher Educators [AMTE], 2017). AMTE's *Standards for the Preparation of Teachers of Mathematics* (2017) emphasize "special education teachers... play critical roles" in ensuring that all students learn and understand mathematics. This means all teacher education programs should provide teacher candidates the skills to become well-prepared beginning teachers of mathematics. Despite this, candidates in special education teacher preparation programs often have minimal coursework related to the teaching and learning of mathematics.

Through the Lens of Inclusivity

Teacher educators must balance many demands as they design teacher preparation programs, including pedagogical and content knowledge, requirements of external accountability, and the ever-expanding role of teachers. One ongoing critique of teacher preparation has been the failure to prepare general and special educators alike to teach academic content particularly to disabled students, citing disabled students' poor performance on standardized tests (Center for Academic Progress, 2020). While the equation is certainly more complex than linking student test scores to teacher quality, access to academic content should not be a question for any student. Teacher preparation programs that focus on instructional methods and knowledge for addressing diverse students are likely to produce better-prepared teachers. One approach is to center teacher preparation practice on the concept of inclusivity, which is central to ensuring PK-22 student access to general education as well as to building just and equitable communities and societies. This requires an examination of teacher preparation program structures and systems to ensure teacher candidates are prepared

to teach proactively with access and inclusivity as the rule, rather than the exception (Cochran-Smith & Keefe, 2022).

We undertook revision of an existing special education teacher preparation program, leveraging inclusivity as the central concept of the program, and engaged in interrogation of practices that perpetuated “structural ableism” (Cochran-Smith & Keefe, 2022) or otherwise served to “other” groups of students by making clear how they are a distinct and separate group within a classroom community. For example, in many programs, teacher candidates are prepared to design instruction and later retrofit the lesson and the learning to meet disabled students’ learning needs. To avoid students being “othered,” we revised all courses to teach/support teacher candidates to design instruction with the premise that *all* learners are diverse and when instruction is *universally* designed, learning is inherently more accessible and inclusive.

Making Mathematics Inclusive

We used self-study and inquiry (Marin, 2014) as we undertook revision of the graduate program, revising processes, structures, and individual courses, including the math methods course. The course *Teaching Math to Students with Disabilities* was originally designed from a deficit perspective, focused on assessing students’ abilities and identifying weaknesses and gaps in their knowledge. The original course design presented a status quo approach to teaching mathematics in special education contexts where disabled students often have less access to standards-based mathematics than their peers (Jackson & Neel, 2006). This deficit approach was a mismatch with the program’s new focus on inclusivity. The math methods course needed to be reimaged to showcase inclusivity and provide the instruction necessary to ensure that teacher candidates left the program as well-prepared beginning special educators of mathematics.

After consultation with other math educators who teach methods courses in special education contexts, we chose to focus the course around the Mathematics Teaching Practices (NCTM, 2014) and the framework of Humanizing Disability in Mathematics Education (Tan, et al., 2019). The course focused on supporting students to engage in grade-level mathematics content through the use of instructional routines and the Universal Design for Learning (UDL) framework, a learning framework that aims to “improve and optimize teaching and learning for all people based on insights into how humans learn” (CAST 2018). Lambert (2021) suggests that a modified version of UDL, UDL Math, can meaningfully include students with disabilities in math class through “multiple means of engagement, representation, and strategic action” (p. 660). Teacher candidates were engaged in mathematics *and* pedagogy in the course. The reading list was carefully curated to include diverse voices and perspectives and to highlight the experience of underrepresented students (e.g., disabled students, multilingual students, LGBTQ+ students) and promote inclusivity and rigorous mathematics for all students. The mathematics and the classroom examples highlighted the ways mathematics can be used to provide *windows and mirrors* (Style, 1996) that include diverse voices and perspectives and work to center all students in the learning.

We also sought to improve the field experience with a focus on consistent, clear, and content-specific feedback to ensure that program graduates leave as well-prepared special educators of mathematics. An essential element of this revision was the content-specific focus of observations. Teacher candidates were required to design standards-based math lessons on grade level content using the UDL framework. As Lambert (2021) notes, UDL is a supportive framework for mathematics and can be used to ensure all students are engaged in grade level content that is both inclusive and equitable. In addition, Padilla and colleagues (2019) argue that students receiving special education services can and should have IEP goals focused on effective mathematics teaching and grade level standards. With the goal of inclusivity and equitable, rigorous math instruction, we required teacher candidates to design, implement, and reflect upon standards-based mathematics lessons using the UDL framework. We assessed teacher candidates' lesson planning and delivery using an observation rubric developed with a focus on internal and external accountability measures of the program.

With end-of-program expectations as a guide, we created an observation rubric that encompassed the following program elements:

- lesson planning and delivery;
- subject-matter knowledge and cross-cutting connections;
- UDL;
- safety, care, and concern for students; and
- accessibility and inclusivity for all learners.

Teacher candidates were provided the rubric prior to the observation and used to it guide their lesson planning. Then, it was used to structure and standardize observations during the lesson and organize feedback after the lesson in the form of actionable next steps and key elements for future work. Use of the rubric helped to maintain objectivity and consistency in observations and feedback to teacher candidates. The content of the rubric allowed observers to support the development of teacher candidates' pedagogical knowledge - specifically, their mathematical knowledge for teaching – through instructive feedback.

Implications

Inclusivity took center stage as an urgent priority in the wake of the Coronavirus pandemic, fueled by the compounded effects of historically unjust/inequitable structures, policies, and practices (Keefe, 2022; Simon, 2021; Westheimer, 2022). As a result, many schools and universities have examined internal structures for ways in which they may perpetuate oppressive conditions. Yet, while equity is a philosophical centerpiece of many teacher preparation programs (Cochran-Smith & Keefe, 2022), it is not always actionable within teacher education programs. For math teacher educators, justice-oriented practices must be rooted in a belief that all children can engage in rigorous mathematics and supported by structures such as UDL Math (Lambert, 2021) that center instruction around the student. This ensures more equitable outcomes for all

students, particularly in the area of mathematics, where perceptions of fixed ability can limit students' academic potential and contribute to inequity (Boaler, 2013). Embracing inclusivity as a central concept within mathematics teacher preparation and instantiating it within content and methods coursework and clinical practice can help shift teachers' pedagogy toward more actionable, justice-oriented practice.

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