

The 13th International Congress on Mathematical Education

A Reflection by Cassie Harrelson

As a result of attending the 13th International Congress on Mathematical Education (ICME-13) in Hamburg, Germany I reflected upon several things I wanted to bring back to my colleagues in the United States. I was a part of the Topic Study Group titled, “Activities for, and research on, students with special needs.” The format of the conference allowed researchers to present their ideas in twenty minutes with approximately five additional minutes for questions. For this overall reflection I will visit two major takeaways and two specific ideas for implementation into practice for my colleagues who are currently practitioners working with students with disabilities.

Takeaways

One major takeaway, it seems most countries struggle with inclusion models for students with disabilities. Several participants shared that students are often tracked and educated in special schools or classrooms away from their peers. However, there were several who stated that in their countries they do not define students as having “special needs,” and use the term, “math difficulties.” For example, a researcher from Singapore shared they simply do not label students as having, “special needs,” and they have high expectations for all students. However, she saw this as problematic as some students require more support than is currently being provided for them in the general education classroom.

Another major takeaway, it seems there is a lack of empirical evidence on strategies or activities that show evidence or research of supporting students with disabilities. Russell Gersten from the Instructional Research Group in the United States, shared a study he conducted in 2009, “Research on Early Prevention of Mathematical Learning Disabilities,” in which a panel proposed eight

commonly known strategies to support struggling learners in mathematics. Only two of the proposed eight strategies have strong empirical evidence: (1) *Instruction during the intervention should be explicit and systematic.* This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review. (2) *Interventions should include instruction on solving word problems based on common underlying structures.*

Gersten stated several on his expert panel were somewhat surprised that, after a comprehensive search, they could not locate research on the topic of motivation (be it intrinsic or extrinsic) in mathematics. Like Gersten, several members of our topic study group shared the following concern. There is a need for more research to support the effectiveness of the eight strategies and related instructional activities aimed at producing positive results. In summary, this study brings to the surface the critical need to research intervention methods in mathematics for students with learning difficulties.

Research to Practice

One specific study of interest from Singapore examined the effects of concrete-representational-abstract (CRA) instruction on conceptual and procedural understanding of the manipulation of algebraic expressions of secondary students. Singapore is well known for the success of its mathematics education; however, there are no published data for students with Math Difficulties/Disabilities (MD) in Singapore. The identification of students with MD is relatively uncommon and there are no official guidelines on terminology or criteria for MD other than where an intellectual disability or comorbidity with dyslexia, autism or attention deficit disorder may exist. However, this study concluded that the integration of manipulatives and pictorial representations into explicit instruction through the CRA sequence served to improve the effectiveness of the

intervention and revealed more positive outcomes for the secondary students as measured by progress monitoring using curriculum-based assessment data.

A study of interest to me, and one I intend to replicate in my role as a district-level instructional coach, came out of Utah State University. The study examined teachers' use of a Place Value Iceberg Intervention Model as a tool for identifying students' mathematical difficulties and for planning and monitoring interventions.

Although the Iceberg Model that evolved from the Freudenthal Institute's and the need for a Place Value Intervention was not a new concept, the way in which the study was conducted provided some insights on how to effectively support student growth along with developing teacher understanding of a critical phase of learning in mathematics. In the study, 13 teachers provided 10 sessions of intervention to 37 fourth grade students. It is important to note that the teachers identified the students as having math difficulties, and none were classified as learning disabled or qualifying for special education services.

Teachers received two days of training in intervention practices, administration of the Place Value Iceberg Assessment and utilization of the Iceberg component site for activities and lessons.

Following the training, each teacher provided ten 45 minutes sessions of one-on-one tutoring to three students. During the first and last sessions, teachers administered the pre and post Place Value Iceberg Assessment (PVIA). Teachers used the pre PVIA to identify students' needs and develop tutoring plans that targeted one or two components of the Place Value Iceberg. Teachers selected, from an Iceberg website, lesson strands and game-based activities focusing on the components being targeted.

Results indicate that the participating students made significant gains in their place value understanding, even in areas on the Iceberg model that weren't targeted in the intervention.

Teachers reported that use of the model increased their awareness of place value components and enabled them to identify and target specific areas of student's difficulties. Teachers also indicated that they appreciated the opportunity to discuss the intervention process with other colleagues.

In summary, attending the ICME-13 was a fabulous experience for me to gain the international perspective on supporting students who have math difficulties or special needs. I am optimistic for the work that is being done around the world on improving outcomes for students who struggle in mathematics and look forward to learning more from the colleagues I met in this experience.

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