

Navigating the Seas of Mathematics Education: New Waves in Research to Improve Student Learning

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This issue focuses on research in the domain of mathematics education. Although mathematics has been a subject of study for many centuries, mathematics education is a relatively new field of scholarly inquiry, having been established as an independent field of research only in the early twentieth century. The most significant milestone was the establishment of the International Commission on Mathematical Instruction (ICMI) in 1908. Since 1969, ICMI has organized the International Congress on Mathematical Education, a quadrennial international meeting whose aim is to present the current states and trends in mathematics education research and in the practice of mathematics teaching at all levels.

In its first century, the field of mathematics education has prospered, particularly so in the past four decades. As a field of study, mathematics education deals with theories, practices, policies, curriculum, and issues regarding the teaching and learning of mathematics. It is a multidisciplinary and interdisciplinary field, adopting methods and perspectives from other disciplines such as psychology and education to study issues in mathematics education. Research in mathematics education is quite varied, ranging from studies of young children to adults, from large-scale experimental designs to single-subject case studies, from local studies in a single classroom or school to international studies that stretch across the globe, and from studies by a single researcher to studies by researchers collaborating across nations.

In recent years, mathematics education has found its way into daily conversation, not simply due to intrinsic importance, but also because of large-scale efforts to reform mathematics teaching and learning and widely-publicized results of international comparative studies of mathematics performance. Indeed, mathematics education has gained a certain prominence in the broader educational discourse. Around the world, the reform of mathematics education has often led broader educational reform. Within this global context of broad educational research initiatives, we are pleased to present this Special Issue on Mathematics Education to international readers.

The eight articles collected in this Special Issue speak about mathematics teaching and learning, as well as the sociocultural contexts of teaching and learning. Although these articles may appear diverse in their research methods and mathematical topics, they collectively reveal work that is new and interesting in the mathematics education research community. This issue includes an investigation of the effectiveness of remedial instruction on the number sense of elementary students, an assessment of middle school students' understanding of steepness and proportional reasoning, a study of the development of effective cognitive and metacognitive instructional strategies in problem solving for high school students, and a comparison of middle school students' strategies when solving problems about speed across two countries. These studies provide valuable information on what is accessible to students through interventions and effective classroom instruction.

Given the important interactions between teaching and learning, special attention is often given to the importance of teaching and teacher preparation. How teachers teach mathematics and how prospective teachers learn mathematics in preparation for their future teaching remain hot topics in the mathematics research community. In that vein, this Special Issue includes an evaluation of curriculum-focused professional development programs for elementary school teachers, an investigation of changes in prospective elementary school teachers' geometric discourses, and an assessment of K-12 prospective teachers' proof constructions in Euclidean geometry. These studies provide information on how, and how well, prospective teachers learn geometry, as well as how the design of professional development projects can help teachers gain mathematical content knowledge and strengthen their instructional practice.

The implementation of the Common Core State Standards (CCSSM) in the United States holds great potential to introduce new knowledge to our field, but also raises new concerns related to equity in mathematics education. Touching on these concerns, this special issue includes an examination of the sociocultural and sociopolitical character of mathematical learning, and how it has been directly linked to conceptualizations of the mathematics proficiency of undergraduate students in the United States.

In summary, this Special Issue represents a collective work that facilitates conversations among education researchers, curriculum developers, teacher educators and teachers. Such conversations serve a common purpose, that is, to better serve mathematics learners. Historically, mathematics education researchers have drawn broadly on the work and perspectives of multiple disciplines. Although the articles in this Special Issue lie squarely in the domain of mathematics education, the fundamental issues they address are similarly broadly relevant to other disciplines. Readers are encouraged to contact Dr. Jinfai Cai (jcai@udel.edu) with questions and discussion about mathematics education.

Acknowledgements

When this Special Issue was edited, Jinfai Cai was supported by grants from the National Science Foundation (NSF) (DRL-1008536) and the Spencer Foundation. He is grateful for the continuous support of research from these foundations. Any opinions expressed herein are those of the author and do not necessarily represent the views of NSF or Spencer Foundation.