



TSG 17

PROBLEM POSING AND SOLVING IN MATHEMATICS EDUCATION

The Organizing Team

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Topic Study Group 17 in ICME-14 is concerned with mathematical problem solving and problem posing in relation to the teaching and learning of mathematics. Mathematical problem solving has been the focus of a long line of inquiry in mathematics education for more than 70 years, dating back at least as far as the pioneering writings of George Pólya. *How to Solve It*, his seminal publication in 1945, launched several decades of systematic research and curricular development aimed at understanding and promoting mathematical problem solving as a key component of school mathematics. As a consequence of this focused attention on problem solving, mathematics curriculum documents and school mathematics textbooks have consistently emphasized problem solving as a key instructional objective and an important component of students' mathematics learning. By comparison, mathematical problem posing is a much younger field of inquiry in mathematics education. Though attention to this topic has grown rapidly in recent decades, and national curriculum frameworks in many countries have incorporated problem posing as an instructional focus, interest has far outpaced the formation of a solid foundation of systematic research and development. The juxtaposition of these two topics in this TSG thus merges a mature field of inquiry with a more nascent one, while recognizing that both are of great interest to both the research and practice communities of mathematics education at this time.

With this background in mind, the overall aims of Topic Study Group 17 at ICME-14 are:

1. To present an overview of extant research and development regarding students' mathematical problem solving and problem posing;
2. To identify new trends and developments in research and practice on these topics; and

3. To engage participants in critical reflection on these topics toward an agenda for future research and development.

We welcome theoretical, methodological, empirical, or developmental contributions (paper or poster proposals) that are relevant to issues such as the following at any educational level (primary school, lower secondary school, upper secondary school, and university):

- ✓ What do problem-posing and problem-solving activities involve and why they are important in learning mathematics?
- ✓ How has problem-solving research and development evolved in terms of themes and methodological issues?
- ✓ How have different conceptual frameworks been used to explain development of mathematical problem-posing (or problem-solving) competencies?
- ✓ How has the relationship between problem solving and problem posing in mathematics education been studied, and what has been learned?
- ✓ How are problem posing and problem solving characterized in contemporary mathematics curriculum standards and frameworks as objectives for all students?
- ✓ How do contemporary mathematics textbooks treat problem posing and problem solving?
- ✓ How are problem posing and problem solving treated by teachers in mathematics classrooms? What are key features of instructional models or approaches to effective problem-posing and problem-solving activities in the mathematics classroom?
- ✓ What are effective models or approaches to assisting and supporting teachers to incorporate problem posing and problem solving in their mathematics instruction?
- ✓ What have we learned about how to assess students' mathematical problem-posing and problem-solving competencies?
- ✓ In what ways are problem posing and problem solving implicated in the characterization or development of mathematically talented students? Or students who have difficulty learning mathematics?
- ✓ In what way does widespread availability of information technology affect the learning objectives and tasks of problem posing and problem solving in the mathematics classroom? (How) does the systematic use of digital technologies shape and influence the processes involved in posing and solving mathematical problems? Are particular technological tools effective in promoting students' problem posing or problem solving?

- ✓ What are key theoretical and methodological challenges in defining, measuring, and investigating the nature and development of mathematical problem-posing and problem-solving competencies?
- ✓ What might we learn about any of the above issue by considering and comparing research and practice traditions and approaches regarding mathematical problem solving and problem posing across countries?

We expect that participants will engage in the review process prior to the conference. We will select and organize presentations in order to enable deeper levels of critical discussion during the ICME-14 conference.