



TSG 23

VISUALIZATION IN THE TEACHING AND LEARNING OF MATHEMATICS

The Organizing Team

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In mathematics education research, visualization is generally referred to as the product and the process of creating, using, interpreting, and reflecting on visual information. It plays an important role in mathematical thinking and most branches of mathematics: there seems to be consensus in the mathematics education community that visualization is a vital component of conceptual understanding, reasoning, problem solving and proving.

The aim of TSG 23 is to interrogate the significance for research in understanding the role of visualization processes in the teaching and learning of mathematics at all levels. Specifically, it is the aim of TSG 23 to not only show-case this research in a global context, but also to map a possible visualization research trajectory or framework that could support scholars with articulating their own visualization research agendas.

To this end, we invite ICME-14 participants to submit contributions that address themes relevant to visualization in the teaching and learning of mathematics.

The following subthemes may assist in framing your submissions. Please note that these subthemes are by no means exhaustive.

- **Visualization as a cognitive process.** This would include visualization and reasoning, justification, argumentation, imagination, and difficulties with visualization.
- **Visualization as a mathematical construct.** This would include visualization and

mathematizing, visualization and generalizing, visualization as a mathematical proof.

- **Visualization and new technologies.** This would include technologies such as interactive dynamic software, 3-D printing, augmented reality, virtual reality and other digital media.
- **Visualization and neurological functioning.** This would include research into neurological activities in the brain associated with visualization processes and their implications to mathematical thinking and teaching-learning processes.
- **Visualization and language.** This would include interrogating the relationships between visualization, signs and language(s), including embodied aspects such as gestures and bodily actions.
- **Visualization in school practice and in teacher education.** This would include research into the explicit inclusion of visualization in school curriculum, practice and assessment, and interrogating the development of visualization skills in teacher education programs.
- **Visualization as a social process.** This would include research about the negotiations on visualization in classrooms as well as diversity aspects across various cultural contexts.
- **Visualization and research methodology.** This would include asking questions about visualization research design and methodological approaches that foster visualization.
- **Visualization and theory.** This would include research into possible overarching theoretical frameworks that could frame and orient visualization research such as embodied cognition theories, learning theories, socio-cultural theories. Do we have a visualization theory?

We welcome contributions based on empirical research, including ongoing studies, as well as theoretical elaborations and reflections on a theme.