



15th International Congress on Mathematical Education

7-14 July 2024 • ICC Sydney, Australia
Come and be counted

Topic Study Group 3.5: Visualization and embodiment in mathematics education

Strand A

Team details

Co-Chairs

Marcelo Borba (São Paulo State University [UNESP], Brazil; mborba@rc.unesp.br)

Anna Shvarts (Universiteit Utrecht, Netherlands; a.y.shvarts@uu.nl)

Members

Daniela Götze (Technische Universität Dortmund, Germany)

Tracy Logan (University of Canberra, Australia)

Kassa Michael (Addis Ababa University, Ethiopia)

IPC Liaison

Nelly León (Universidad Pedagógica Experimental Libertador, Venezuela)

Overview

Visualization in mathematics has ancient roots, yet the acknowledgment of its importance for education came rather late. Research shows that visual images do not contribute to mathematics learning by students simply looking at them, but can support mathematical understanding and reasoning when appropriated into active interaction or generated by students. Embodied approaches support this claim as they show how the entire body of a student and a teacher are involved in thinking mathematically: through gestures, voice modulations, motor actions, etc. Digital technologies play a pivotal role in making those topics highly relevant in contemporary education: digital videos, interactive environments, and virtual and augmented reality provides educators and students with new





15th International Congress on Mathematical Education

7-14 July 2024 • ICC Sydney, Australia
Come and be counted

opportunities that need to be conceptualized from the perspectives of visualization and embodied interactions.

The aim of TSG 3.5 is to promote the significance of understanding the role of visualization and embodied processes in teaching and learning mathematics. TSG 3.5 offers a venue to discuss a broad range of topics related to visualization and embodied processes at all educational levels, including but not limited to the impact and role of digital technologies, methodological considerations and highlight research about different cultures and contexts. The group embraces various approaches to visualization and embodiment. It aims to map the range of those views in relation to mathematics education and reveal further open research questions and research trajectories.

Areas of interest

We invite a wide scope of contributions which investigate or develop:

- Visualization in teaching and learning mathematics: visual cognitive processes, mathematical sketches and technological environments that support visualizing mathematics, the use of visuals in social interactions and classroom practices.
- Embodied processes in mathematics education: sensory-motor interactions, eye movements, postures, physiological processes, and multimodal discourse, including gesturing and language in their relation to grasping mathematics.
- Theoretical approaches to visualization and theories of embodiment: conceptualizations of how visual processes are related to teaching and learning and theories that conceptualize mathematics teaching and learning through the lens of embodiment.
- Methodology(ies) for studying visualization and/or embodied processes in mathematics education: eye-tracking, motion tracking, logging, qualitative multimodal analysis, and other methods in studying mathematics teaching and learning.
- Design of the (dynamic) visuals and of the environments for embodied interactions: design-based research and other forms of investigations of how digital and material environments and artifacts can support mathematical understanding and reasoning.

We also point to more specific areas of interest that may be taken as ideas by the participants.

- Digital videos for mathematics: the power of dynamic visualization and animation and their use in the classroom and open-school environments.
- Cognitive aspects of visualization and their relation to embodiment: spatial abilities, spatial reasoning, and others in learning and teaching mathematics.





15th International Congress on Mathematical Education

7-14 July 2024 • ICC Sydney, Australia

Come and be counted

- Visualization and embodiment after COVID-19: the medium of mathematics education through lenses of post-pandemic transformations.
- Contextual/cultural aspects of visualization and embodiment: diversity of strategies in engaging with visual materials and sensory-motor routines depending on the population, such as cultural differences, particularities of the students with specific sensory-motor profiles etc.

Please note these themes as a source for inspiration. Please feel free to go beyond them.

How to make a submission to this Topic Study Group

Submissions for Topic Study Group Papers and proposals for Posters open 28 April 2023 via the official ICME-15 website, icme15.org. The website also contains a timeline of dates for the activity of the Topic Study Groups in the lead up to the Congress.

For questions about this TSG, please contact the Co-Chairs using the email addresses provided.

