



15th International Congress on
Mathematical Education

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

Topic Study Group 3.7: The role and the use of technology in the teaching and learning of mathematics at primary and lower secondary levels

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Overview

Digital technology can significantly enhance learning and teaching mathematics by offering students new mathematical experiences with engaging media enabling immediate feedback and allowing teachers real-time monitoring of students' activity. The aim of the TSG3.7 is to share, discuss and advance knowledge and understanding of key aspects of the role and the use of technology in primary and lower secondary mathematics education, by continuing the discussion of the questions and perspectives that arose in the corresponding two TSGs that worked separately at ICME-14 in 2021. Four foci will frame its content:





Students' learning of and engagement with mathematics through the use of digital technology

Although students' learning with technology has been researched for several decades now, there is still a need to better understand how digital technology impacts students' learning of mathematics, especially in the early years. Moreover, new technologies (touch technology, augmented/virtual reality, digital platforms) open new ways for exploring mathematical concepts and increasing student engagement, and research on learning outcomes of students' interactions with these technologies is needed. Besides, in the early years, the articulation of digital technology and non-digital resources in supporting students' learning is an important research theme.

Teachers' practices, digital competencies underpinning these practices and pre- and in-service teacher training

The importance of the teacher's role in how technology is used in mathematics classrooms is now widely acknowledged. This role consists of designing instrumented tasks, managing and monitoring students' activities and assessing students' learning. Moreover, the increased use of Learning Management Systems (LMS) has extended the teacher's role beyond the mathematics classroom. Thus, the evolving role of the teacher remains a topical issue. Besides, the gap between the potential of digital technology and its slow uptake by many teachers leads to investigating explanatory factors, among which are cognitive, but also affective dimensions, which leads to focus on teachers' digital competencies and their development within teacher training programs.

Digital technology and mathematical content

Interactions between the tools and mathematical knowledge have been investigated addressing the question of how the tool mediates knowledge and how this mediation changes the knowledge itself. It is therefore legitimate to question whether and how mathematical content taught in primary and lower secondary schools is affected by the use of digital technologies. The introduction of computational skills to mathematics curricula in many countries are an example of such an impact.

Theoretical and methodological advances

A number of theoretical constructs and methodological approaches have been developed to investigate the role of digital technologies in mathematics learning, as well as teachers' difficulty to integrate them. They remain yet compartmentalized in local theoretical traditions. Recently, initiatives





emerged to allow circulation and translation between work in different local traditions, through literature reviews or networking of theories and methodologies. The TSG will provide room for discussing how the community has taken the problem inherent to multiple perspectives.

Areas of interest

1. Students' learning of and engagement with mathematics through the use of digital technology and resources

- How do students interact with digital technologies (e.g., how do they choose their actions, how do they receive and interpret feedback, how do they engage with digital technologies)?
- How are digital and non-digital resources articulated and how do they support students' learning?
- What evidence exists of changes in student motivation and learning resulting from the use of digital technologies and resources?

2. Teachers' practices, digital competencies underpinning these practices and pre- and in-service teacher training

- How are teachers' practices impacted by the use of digital technologies? How do they design technology-based tasks? How do they orchestrate technology-based mathematics lessons?
- Which competencies do teachers need to develop to efficiently use technology in their mathematics classes?
- What are effective methods to design and evaluate teacher training programs aiming at the development of teachers' digital competencies?

3. Digital technology and mathematical content

- What new approaches to the teaching and learning of mathematics are enabled by digital technology?
- What new content is introduced into mathematics curricula in relation to digital technologies and resources (e.g., computational thinking, introduction to data science)?
- What are the affordances of, but also constraints and challenges linked to the use of the new and emerging digital technologies (e.g., touch technology, augmented and virtual reality,





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artificial intelligence, robotics)? What is their contribution to the teaching and learning of mathematics?

- What role can online or hybrid learning play in the post-COVID-19 mathematics classroom?
- What technology-enhanced pedagogical approaches and strategies are employed in the mathematics classroom to increase access and promote accessible and inclusive mathematics learning for all children?

4. Theoretical and methodological advances

- What new theoretical lenses are emerging, and how do they inform our understanding of students' learning, teachers' roles, or the impact of technology on mathematical content at stake?
- Which new methodological approaches are necessary to shed light on the issues related to the use of new digital technologies (e.g., monitoring the use of technology beyond the classroom)?

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.

