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CERME 14: Thematic Working Group 16
Learning Mathematics with Technology and Other Resources

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Scope and focus of the Working Group

The focus of this thematic working group is to explore the potential and limitations of incorporating digital technology and other resources to enhance students' learning of mathematics.

The Working Group will focus on exploring the use of digital and non-digital technology for learning mathematics. It will encompass non-digital resources such as textbooks, worksheets, tools, and manipulatives while examining the interplay between these and digital resources. The group will also evaluate the role of emergent digital tools for educational research.

Our goal is to gain a comprehensive understanding of the current state of the art of technology in mathematics education. Therefore, we are looking to establish an overview, focusing on themes such as theoretical and methodological advancements, emerging digital tools for learners and researchers, and good practices. We aim to suggest significant future directions for technology-rich mathematics education, including a research agenda. TWG 15 addresses a similar global topic but focuses on teaching rather than on learning.

Call for paper and poster proposals

To promote coherence and academic progress, the TWG 16 has identified four main themes for papers and posters. Within these themes, authors are requested to explicitly address the mathematical topics and concepts intended to be learned with the tool.

1. *Theoretical advancements* in the design and implementation of digital technology for mathematics learning and assessment.
   Some important questions related to this topic are: How do theoretical frameworks and technological tools work together in the area of research on mathematics learning? What new theoretical perspectives are developed, and how are they used to help researchers investigate mathematics learning and assessment with technology and other resources? How can we harmonize different theoretical viewpoints? What design principles and heuristics can be used to guide the design of productive activities for mathematics learning and assessment?

2. *Methodological advancements* in the implementation of digital technology for mathematics learning and assessment.
   Some important questions related to this theme are: How do methodological approaches and technological tools work together in the area of research on mathematical learning? What new methodological perspectives are developed, and how are they used to help researchers investigate mathematics learning and assessment with technology and other resources? How are emerging digital tools such as artificial intelligence or eye tracking used to investigate mathematics learning and assessment?

3. *Emerging digital tools* (e.g., augmented and virtual reality, 3D printers, eye-trackers, artificial intelligence) for mathematics learning and assessment.
   Some important questions related to this theme are: How are technologies such as augmented and virtual reality, 3D printers and 3D pens used to support mathematics learning? What is the potential of data analytics, machine learning, artificial intelligence (AI) for mathematics learning and assessment? What are effective methods for designing activities using emerging digital tools that provide unique mathematical experiences for students?

4.   *Good practices* (e.g., embodiment, game-based learning, playful and digital-based outdoor approaches) for mathematics learning and assessment.
   Some important questions related to this theme are: What are effective methods for designing activities that provide embodied mathematical experiences for students? How are digital technologies used to facilitate an embodied approach to mathematics learning? How do different theories on game-based learning or playful learning add a better understanding of learning mathematics with technology? How do game-based learning, playful and digital-based outdoor approaches transform/change/challenge mathematics learning and assessment? How can students participate in designing educational games for learning mathematics?

Any paper/poster of relevance to the overall focus of the group will be considered.

Papers and poster proposals *must use the CERME template*, and conform to the guidelines at https://www.cerme14.it/. CERME 14 uses an electronic submission system https://www.conftool.pro/cerme14/. The authors submit the initial version of their paper on the website (uploading it both as a .doc and a .pdf file, and providing the required information, in particular the TWG number).

Reviews and decisions

Each paper will be peer-reviewed by two persons from among those who submit papers to this TWG. Please expect to be asked to review up to two papers yourself. The group leaders will decide about the acceptance of posters.

Important dates

- **See** https://www.cerme14.it/ **for important dates**