Topic Study Group 3.16: Mathematics and interdisciplinary education/STEM education

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Team details*

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Overview

This Topic Study Group aims to involve educational researchers, teachers, mathematicians, teacher educators, and others in a discussion of the impact of integrated mathematics curriculum in school education. In particular, we want participants to share experiences and explore issues related to the integration of mathematics with one or more of the other STEM school subjects – science, technology and/or engineering. Since most educational jurisdictions present school curriculum as separate subject areas, we wish to investigate issues related to student learning outcomes and to teacher design and implementation of mathematics in integrated STEM education in school contexts.

An international focus on STEM education has led to the design and implementation of a wide variety of approaches to curriculum and pedagogies in schools. While several publications have presented examples of integrating the STEM subjects in school curriculum, others have questioned the impact

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on the learning of the individual subject areas, particularly mathematics. While there is evidence of improved student engagement in mathematics using real-world STEM projects that require the use of the other STEM subjects, what evidence do we have that students learn mathematics more deeply? There currently appears to be contradictory evidence as to the promotion of academic achievement in mathematics through integrated STEM curriculum approaches.

Internationally, government agencies and research funding bodies have invested in projects investigating the design and development of suitable integrated STEM tasks in the professional learning of teachers, and in the development of resources for school leaders, but have these investments made a difference to student learning in mathematics? Many other questions arise when reviewing the literature about mathematics and interdisciplinary/STEM education including (but not limited to):

- How do we find the balance between teaching deep knowledge in the individual subjects and teaching how disciplines can be connected and integrated, particularly when addressing real-world problems?
- What would be the role of each of the STEM subjects in an integrated STEM curriculum in schools?
- How are the processes and practices used in mathematics (e.g., modeling, argumentation for supporting claims, looking for patterns and structure) similar to those used in Science, Technology, Engineering and in what ways can these be used to strengthen integrated approaches?
- What are the differences in practices and processes across and within STEM disciplines that need particular attention when designing and implementing integrated tasks for learners?
- What support do teachers and school leaders require to design an integrated STEM curriculum that promotes mathematics learning?
- What topic areas in the mathematics curriculum lend themselves to successful student learning through STEM projects or integrated tasks?
- Which mathematics skills and dispositions are best developed through engagement with STEM projects or integrated tasks?

Areas of interest

We invite submissions of papers and posters addressing the above questions or those connected to the teaching and learning of mathematics through integrated or interdisciplinary approaches in schools.

Two previous topic study groups have investigated “interdisciplinary mathematics education” (ICME-13, Hamburg) and “mathematics and interdisciplinary education” (ICME-13, Shanghai) with a publication emanating from the Hamburg discussions. Similarly, we want to invite contributions to this topic study group that could be elaborated after the conference into a chapter for a publication on the role of mathematics in integrated STEM education.

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.