Topic Study Group 1.10: Teaching and learning of discrete mathematics

Strand B

Team details

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Overview

Discrete mathematics is the branch of mathematics that deals with objects and structures which are finite or countable, as opposed to continuous. Topics typically studied in school mathematics include graph theory, combinatorics, recursion, matrices, and game theory. However, new topics are emerging that include coding, computational and algorithmic thinking, discrete probability, and logic. Many of these topics are used in computer science, as well as in other fields such as engineering, economics, and operations research. Discrete mathematics is an essential part of mathematics education because it offers students opportunities to develop problem-solving skills and mathematical reasoning without the need for extensive background knowledge. Furthermore, it engages students in

mathematical processes such as mathematical modelling, experimenting, proving, conjecturing, generalizing, and pattern recognition.

Aims and Scope

The objective of TSG1.10 is to exchange information and experiences, among educators and researchers, about recent advancements in teaching and learning discrete mathematics from elementary to post-secondary levels. We are interested in building upon previous research in the field by presenting new studies and educational innovations, and are particularly interested in exploring the diverse methods and approaches used to teach and learn discrete mathematics globally, with a focus on curriculum development, pedagogy, trans-disciplinary perspective, assessment, and theoretical frameworks. We recognize that the teaching and learning of discrete mathematics encompasses a wide range of aspects, including mathematical concepts and practices, such as modelling, problem solving, or computational thinking. We are also aware that it may provide opportunities to delve into other significant topics in the field of mathematics education.

In terms of content, in this TSG we characterize discrete mathematics broadly as consisting of a variety of topics, including topics traditionally associated with discrete mathematics (graph theory, combinatorics, recursion, sequences, puzzles and games, voting, fair division), as well as topics that might be considered relatively new to school curriculums (discrete probability, group theory, computational number theory). Furthermore, various mathematical practices could be associated with discrete mathematics, including algorithmic and computational thinking, mathematical modelling, experimenting, justifying, generalizing, optimizing, proving, and more. Finally, there may be other areas of mathematics education that are particularly relevant to the teaching and learning of discrete mathematics, such as promoting equity and inclusion, facilitating classroom discussions, preparing pre-service teachers, training in-service teachers, and addressing affect and beliefs.

Areas of interest

We envision that this TSG will include submission of papers and posters on any of the wide range of topics discussed above, focusing on any level of schooling. We welcome papers that are related to the teaching and learning of discrete mathematics, which may include, but are not limited to:

- Research on student thinking about relevant concepts in discrete mathematics;
- Research on teaching and practices of computational thinking and algorithmic thinking;
- Research on teaching discrete probability;
- Research demonstrating effective instructional strategies in teaching discrete mathematics;

- Research-based ideas for innovative activities and pedagogical interventions in classrooms at a variety of age levels;
- Research-based ideas for incorporating technology into the discrete mathematics classroom;
- Explorations of discrete mathematics as a setting in which to investigate mathematical practices;
- Explorations of discrete mathematics as a setting in which to investigate other relevant issues in mathematics education;
- Ways of thinking (or habits of mind) that may be productive in discrete mathematics, such as combinatorial reasoning, algorithmic or computational approaches, or recursive thinking;
- Curriculum and educational policy issues related to discrete mathematics;
- Discrete mathematics as entry point into university mathematics; and
- Discrete mathematics as an enrichment of elementary and secondary mathematics curricula.

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.