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Starting the Third Decade: Reaching Further and Deeper

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It is my great pleasure to write this first editorial for the start of the third decade of the journal. For each editorial, I decide on how I want to organize the manuscripts in the issue. In many cases, I write about each paper in the order that they appear in the journal. In some editorials, I cluster the papers around different themes. In this issue, I explore five themes: science, mathematics, technology, STEM, and university undergraduate studies.

There are four papers that have a science theme. Zhang & Cobern (2020) wrote in response to the Aditomo & Klieme (2020) article about forms of inquiry-based science instructions. They review studies about critical issues regarding teacher guidance and identify patterns across countries. They pose a series of questions that further the discussion raised by the article. Finally, they provide the reader with some future research directions to help clarify and address multi-faceted inquiry teaching. Kurup et al. (2021) investigated informed decision making by Grade 9 students in the UK as they learned about global warming and climate change. An inquiry intervention model was developed to identify beliefs, understanding, and knowledge base. The students in this study developed an understanding of the causes and effects of global warming. The authors note that the regular UK science school curriculum does not contain specific references to socio-scientific issues, and so, this makes it difficult to provide opportunities for informed decision making. This paper makes a strong argument for the revision of science curricula to ensure that there are opportunities to explore the socio-scientific issues where they do not currently exist.

The Guedj & Urgelli (2021) paper investigates the interaction and relationships between school, museums, and other scientific cultural places. They wish to better explain the conditions for various partnerships in science education. They look at the scientific mediation practices between the school and its partners in both formal and informal educational settings. They describe an approach where teachers can investigate socio-scientific questions from new perspectives and recognize the models that they adopt. Rennie (2021) also explores museums through a review of the Pedretti & Navas Iannini (2020) book *Controversy in Science Museums: Re-imagining Exhibition Spaces and Practice.* Rennie reviews how critical exhibitions challenge the nature of science museums and how to transform science museums

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to focus on serious socio-scientific issues. The book is written by knowledgeable and experienced researchers with an interaction between theory, practice, and research to provide leaders with a practical analysis for the future transformation of science museums and critical exhibitions. These two papers further illustrate the importance of science learning in formal and informal places.

There are three papers that explore mathematics at the K-12 level. Lagrange (2021) is interested in the design of modeling activities in mathematics and other scientific disciplines. He looked at how modeling can serve as a foundation of mathematical concepts. He studied a general question and then offered high school students tasks to explore models. He uses a theoretical framework of connected spaces. Even though some of the situations were quite complex, the students were able to understand the models and underlying concepts. He leaves us with a number of questions, specifically which models to use and what tasks to propose. In another paper, Martin et al. (2021) provide an analysis of probability tasks in three elementary school mathematics textbooks in Quebec. They provided descriptive statistical analysis of 267 probability tasks and investigated five tasks in depth. They look at the origin of the tasks, the size of the sample, and the interpretations of the results. They describe the need to support the development of these tasks and the teachers' didactic intentions that guide the learning experiences. In the third paper, Milewski et al. (2021) write about teacher noticing and decision making. They introduce the concept of conditional construals to illustrate the moments when teachers need additional context to judge the appropriateness of a teaching action. They use the identification of these moments to study the type of reasoning used by the teacher so they can be better informed about the information that teachers need to make decisions.

There is one article that focuses on STEM education. Kwon et al. (2021) investigated the effect of project-based learning activities in STEM with middle and high school students attending a 1- or 2-week summer camp. The students completed surveys on problem-solving beliefs and STEM semantics. They found that informal STEM project-learning activities improve their STEM perceptions. They also found that students' problem-solving beliefs could directly influence students' STEM career perceptions. These findings illustrate the importance of STEM activities in informal settings. Imagine their effect if our schools engaged in more STEM project-based learning activities.

There are two papers in this issue that focus on university undergraduate mathematics education. Lane et al. (2021) investigate the use of blended learning (BL), which combines online learning with face-to-face learning. They analyzed student and instructor feedback from surveys and interviews from science courses in university. They found that emotional engagement is a good predictor of student satisfaction and success. They encourage instructors to use collaborative learning strategies and to maintain a personal connection with the students. In the COVID-19 teaching environment, opportunities to enhance student experience and reduce challenges to teaching and learning are very important. This study gives us insights into the blended learning teaching format that could be extended to all online learning environments. In a study of first-year university students in Calculus mathematics classes, O'Shea & Breen (2021) investigated the differences between mathematics at school and at university. Non-routine tasks were used to consider their views on the differences and the type of task on either side of the transition. They found a dual role in use of mathematics tasks: they are used to make the instructor's expectations clear to the students as well as providing opportunities for students to develop mathematical thinking skills. The authors also suggest that these benefits and roles can be found in other mathematical topics other than Calculus.

There are two papers that focus on technology with preservice teachers. Bayage et al. (2021) explored university faculty perceptions on preservice teachers' use of information and communication technology (ICT). The authors found that, although the preservice teachers were exposed to ICT, there remain challenges that inhibit ICT use by the preservice teachers. One challenge is the lack of agreement on how to prepare the preservice teachers to use technology in their classrooms. Embedded in this challenge is the observation that university faculty has different opinions on their own use of ICT and its

implementation in the program. Kahraman (2021) investigated the effects of blog-based learning on preservice science teachers' Internet self-efficacy and their understanding of atmosphere-related environmental problems. Groups of students were asked to perform activities to access documents, prepare a presentation, share findings, and develop a blog. The use of writing in science classrooms is important to facilitate students' conceptual understanding of science concepts. Blogs are a good way to encourage writing about science concepts. This study found that blog-based learning had a positive effect on students' understanding of atmosphere-related environmental problems.

This issue starts our journey into the third decade. We look for ways to extend our reach into other countries, areas of research, and education ideas in formal and informal spaces. We look forward to your participation as a reader, author, and reviewer of the *Canadian Journal of Science, Mathematics, and Technology Education*.

Declarations

Conflicts of interest The author declares no competing interests.

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