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The Mathematician Educator Special Issue: Mathematical and Computational Thinking

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Editorial Foreword

The theme of this special issue, "Mathematical and Computational Thinking", aligns with the focus of the Mathematics Teachers Conference 2023. Contributors to this issue include speakers from MTC2023, comprising scholars and educators whose work exemplifies and expands upon paradigms of Mathematical and Computational Thinking. They offer insights and practical applications to enhance mathematics education.

Featured in this special issue are five diverse manuscripts that help readers explore the connections between Mathematical and Computational Thinking from various perspectives. Tay (2024) "I am afraid of technology" aptly expresses the common apprehensions that educators and students might have regarding technological integration in mathematics instructions. In contrast, Cheng (2024) "Mathematical thinking: Task Design and Implementation in Primary Mathematics Classrooms" provides concrete strategies for designing and implementing tasks that foster mathematical thinking in young learners. Low, Loh and Wong (2024), through "Using graphic organisers to promote mathematical and computational thinking", examine the efficacy of graphic organisers as tools to enhance these intertwined cognitive processes. Yap (2024) leads the reader to ponder over the question of "What is an Algorithm?", delving deeper into the foundational issue of what constitutes an algorithm, and questioning the impact of real-life applications of algorithms on society — thereby bridging abstract mathematical ideas with practical computational applications. Last but not least, Yeo (2024) "Developing Algebraic Thinking at Primary Levels" focuses on cultivating algebraic thinking skills in primary school students, emphasizing the fundamental role of algebra in both mathematical and computational contexts. Together, these papers present a kaleidoscopic view of selected topics that demonstrate how mathematical and computational thinking can be nurtured across different educational levels and contexts.

Tay (2024) addresses the fear of coding and technology through an educational perspective; in particular, within the context of mathematics teaching. This paper acknowledges the apprehension many teachers have towards incorporating coding into mathematics lessons because of a lack of familiarity, expertise and comfort with computer technology. To help alleviate this fear, Tay leads the readers to first understand the importance of Computational Thinking, which connects well with the more familiar mathematical processes such as problem solving, logical reasoning and data handling skills — all of these being essential in the present digital age. Tay puts forward a pedagogical approach of "full code before step-by-step, complex before simple" to encourage both teachers and students to engage in coding with Excel, leveraging on the existing PRIMM (Predict, Run, Investigate, Modify, Make)

methodology widely used in computer science education. Many examples of activities like Pattern Match, Euclidean Algorithm and Power Series were presented as opportunities for students to code. Tay specifically recommends viewing coding in Excel as a tool not dissimilar to the use of scientific calculators, thus advocating the integration of coding skills in mathematics education to equip students for the future job market.

Cheng (2024) emphasizes the importance of fostering mathematical thinking in primary mathematics education through the use of problem-solving tasks and thoughtful implementation strategies. This paper considers designing of tasks that support students in developing mathematical skills, underscoring the value of using multiple solution methods and representations to deepen understanding and promote the transfer of learning. By engaging students in reflection and sense-making activities, educators can facilitate the development of critical thinking and problem-solving skills.

Low, Loh and Wong (2024) discuss the benefits of using graphic organisers to enhance mathematical and computational thinking skills among students. For example, graphic organisers help students decipher and decode problems, improving their problem-solving skills. Also, they promote computational thinking by encouraging a logical and sequential approach to completing assigned tasks. Flowcharts and cluster diagrams aid in consolidating learning and enhancing metacognitive abilities. Lastly, checklists scaffold learning and self-assessment, thereby reinforcing memory and internalising processes.

Yap (2024) delves into the topic of algorithms, focusing on their significance, types and impact. Yap mentions the growing reliance on algorithms in various sectors, such as machine learning and artificial intelligence. Concerns are raised about the potential adverse effects on society and the need to address the power imbalance created by algorithmic decision-making in the workplace. Lastly, Yap suggests the need for a deeper understanding of algorithms, their implications and the ethical considerations surrounding their use.

Yeo (2024) discusses the development of algebraic thinking of students at primary levels. By exploring different definitions of algebraic thinking, Yeo advocates the use of generalisation and problem-solving approaches to enhance students' algebraic thinking skills. The paper recommends that by integrating arithmetic and algebraic thinking in the early years of primary education, students can develop a strong foundation in mathematics.

References

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