

Book Review / Compte rendu

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Mathematizing Student Thinking: Connecting Problem Solving to Everyday Life and Building Capable and Confident Math Learners by David Costello. Pembroke Publishers Limited, 2022, 154 pages. ISBN: 9781551383569 (softcover), ISBN: 9781551389561 (PDF)

David Costello's *Mathematizing Student Thinking* attempts to revolutionize students' mathematics thinking processes. This book centers around developing a contextual and practical mathematical concept in students' real-life contexts. The nine chapters are broken down into understanding the problem, creating a mathematical model, analyzing and assessing the model, and reflecting on the entire problem-solving process. In ideal situations, students take a rudimentary approach to problem-solving that disregards underlying concepts, as posited by the author. This dynamic becomes the foothold of the content, persuading students to integrate analysis, assessment, and reflection into resolving daily issues.

Costello has written this book as a holistic approach to solving problems, including ways that teachers and students can apply mathematical concepts and models. The author has held multiple roles, including school administrator for a school in Prince Edward Island, Canada, and curriculum consultant.

The central theme of this book is the student's approach to problem-solving, as defined in the first two chapters. Costello identifies the critical actions and failures in the classroom context that contribute to problem-solving being a chal-

lenge in traditional education. Students often focus on resolving problems as they occur while overlooking the deeper underlying causes, which are essential for a more comprehensive and effective approach. In the first chapter, Costello encourages readers to redefine problems by identifying three essential components: the initial state, which consists of the given information and conditions of the problem; the goal state, which represents the desired solution or outcome; and the obstacles, which are the challenges students must overcome to transition from the initial state to the goal state, fostering a deeper understanding of mathematical thinking. This provides an overview of the problem and explains how it can be analyzed from a mathematical perspective.

Chapters 2 to 5 offer a guide that encapsulates the development of mathematical modeling, situational analysis, and an understanding of ill-defined problems. In this regard, Costello delineates the distinct roles of both teachers and students in cultivating a comprehensive understanding of problem-solving measures. Teachers act as facilitators, guiding students through problem-solving stages by framing complex, real-world problems, fostering mathematical discourse, and encouraging iterative re-

finement of mathematical models. Meanwhile, students are expected to take an active role in defining problems, analyzing contextual variables, and refining their mathematical models to ensure practical applicability. These chapters emphasize the educator's critical role in structuring learning experiences that incorporate social-emotional learning skills and cultural influences, ensuring that students develop both the cognitive and affective competencies necessary for effective problem-solving.

The final three chapters are dedicated to analyzing, assessing, and applying the mathematical models deemed viable for students. Costello advocates for a comprehensive analysis and reflective approach to student work, emphasizing its importance in solving complex, real-world problems effectively. In Chapter 8, Costello discusses the various forms of assessment, including formative and summative, that are used in regular education programs. The author contends that applying mathematical models will alleviate students' problems, as mentioned in the summary of the final chapter. Costello writes, "However, we have experienced a collective problem over time in mathematics. We have students who are doing math simply by following a process by rote" (p. 143). There needs to be a change in the learning process, and Costello has taken note of this issue with great concern.

Theoretically, Costello advances various arguments that focus on real-world problems. He establishes the premise that students can adjust their thinking processes through a problem-based learning approach. Essentially, he takes the position that real-world issues inspire students to apply math based on authentic contexts while considering alternatives to resolving said issues. This idea is best captured in the following excerpt: "When we provide our students with opportunities to connect mathematics to their everyday lives and to use mathematics to make sense of the world, we give our students an opportunity to understand concepts and apply problem-solving techniques to situations" (p. 6). Costello's position reveals the teacher's influence in creating an environment where problem-solving is integrated into the application of concepts learned in class. Theoretically, this transforms the ideologies proposed

and developed into a problem-based learning undertaking.

David Costello's perspective introduces a distinctive approach to mathematics education. However, his approach stands in contrast to traditional educational theories, such as behaviorism, which views learning as a change in behavior shaped by external stimuli and reinforced through environmental contingencies (Skinner, 1953). Costello's model emphasizes a student-centered approach that urges learners to actively engage in problem-solving by incorporating analysis, assessment, and reflection. Additionally, while cognitivism underscores mental processing in learning, Costello's methodology extends beyond mere cognitive engagement, advocating for the practical application of mathematical concepts in real-life scenarios and integrating social-emotional support throughout students' learning process. Costello's approach distinguishes itself by significantly emphasizing the practical application of mathematical thinking, a thought process that combines theoretical foundations with real-world applications.

Additionally, Costello demonstrates that mathematized thinking evolves into a collective experience. The book fosters an in-depth understanding of mathematical concepts, encouraging students' critical thinking and metacognitive skills by guiding them through the stages of problem-solving. This premise is echoed by Suh et al. (2017), who in this excerpt argue, "Wolfram states that the mathematics involved in the real world requires recognizing where mathematics is applicable; translating practical problems into mathematical problems; and interpreting and evaluating the outcomes (p. 2)". Therefore, integrating practical problems will address the challenge of using abstract mathematics teaching methods. In addition, students will have an improved learning experience because of the tangible nature of mathematical modeling. Further, this assertion factors into the iteration of teacher roles depicted across all chapters of the book to address how educators direct students' assimilation of mathematical models within the context provided. His argumentation on mathematical modeling aligns well with Chi's (2026) research findings. Chi (2026) explored Canadian generalist teachers and Chinese mathe-

matics specialist teachers' experiences in Xu and Connelly's SSHRC Partnership Grant Project. His extensive field work with a Canadian teacher and a Chinese math specialist teacher highlighted that Canadian generalist teachers pay more attention to students' learning process and experience, but Chinese mathematics teachers focus more on developing students' mathematics foundation or in Costello's words, mathematical modeling. Costello's highlight on mathematical modeling and foundation has implications to teacher education programs in Canada especially for primary generalist teachers.

Costello's book delivers an insightful introspection on the critical nature of math education by offering guidelines for a holistic problem-solving process for real-world problems. The book articulates the roles of students and teachers in this undertaking and iterates the need for contextualization and critical thinking when engaging in practical applications that align with contemporary educational paradigms. Costello's work then becomes a premise for educators to implore students to adopt and recognize the value of mathematical concepts with an approach that emphasizes applicability. This approach can potentially transform how math is taught and learned, ultimately equipping students with the skills and the confidence to address complex problems in their academic and professional lives. This book highlights the importance of both a strong mathematical foundation and support for students' social-emotional learning. It does not present these as opposing concepts but rather emphasizes that both can coexist. As Chi and Drake (2023) argue, we should adopt a both/and approach rather than an either/or mindset.

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