



High School Mathematics Reimagined, Revitalized, and Relevant **Executive Summary**

Far too many students, including those who have excelled in school mathematics, have been influenced by their high school mathematics experiences to believe that learning mathematics is not an engaging subject and they don't see themselves as a doer or user of mathematics in their future. *High School Mathematics Reimagined, Revitalized, and Relevant* offers a profound shift that reimagines and revitalizes how mathematics is taught, ensuring it remains relevant to the needs of all students. This new publication from the National Council of Teachers of Mathematics (NCTM) sets forth a bold vision for this transformation, aiming to make high school mathematics education more engaging, inclusive, and applicable to every student as they face the challenges and opportunities of the 21st century.

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The Case for Reimagining High School Mathematics

The current state of high school mathematics often fails to inspire or adequately prepare students for the future. Many students leave high school with a sense of relief, having completed their required mathematics courses but with little enthusiasm or belief in their mathematical abilities. This disconnect is widespread and not the fault of teachers or students but a result of a century-old antiquated system that needs rethinking.

The core issue is that the traditional high school mathematics curriculum, instruction, and assessments often alienate students, focusing on procedural knowledge and short-term memorization of algorithms at the expense of creating meaningful engagement with making sense of and applying mathematical concepts.

To address these challenges, NCTM proposes a reimagined approach to high school mathematics that centers on student experiences, relevance, and lasting value. This new approach prioritizes creating a learning environment where students can readily see the purpose and applicability of mathematics in their lives and potential careers and at every step along their journeys for each and every learner.

Relevance: Engaging Students through Mathematical and Statistical Modeling

Mathematics becomes relevant when students are engaged in mathematical and statistical modeling. This approach goes beyond traditional word problems because it involves students in real-world scenarios where they must develop, test, and refine models to better understand relevant complex problems. For example, students might be asked to model the spread of a disease, analyze environmental data, or optimize logistics for a business. These tasks not only enhance the appeal of mathematics but also involve students in developing the necessary skills and experiences to question and comprehend real-life issues.

Mathematical modeling is not just about solving equations; it's about deciding which mathematical tools to apply, generating and interpreting results, and communicating what you have learned effectively. Mathematics learning enables students to cultivate critical thinking skills and a deeper comprehension of their surroundings. It also shifts the focus from rote learning to active problem-solving, fostering exploration, questioning, and innovation among students.

Reimagining Mathematics Content Connections

There is a need to reimagine the content of high school mathematics in order to make it more coherent and interconnected. Traditionally, mathematics learning is seen as a series of isolated processes intended to build upon each other. This approach often makes it difficult for students to develop their understanding of the concept or see the connections between concepts. NCTM proposes organizing the curriculum around the five Crosscutting Concepts that are relevant across different areas of mathematics:

- **Patterns and Generalization:** Identifying patterns in various contexts and making generalizations that can be applied to solve problems.
- **Variability and Change:** Understanding how quantities vary and how to model these changes mathematically.
- **Functional and Structural Thinking:** Making decisions on how to represent situations mathematically, whether through functions, structures, or other models.
- **Comparison, Difference, and Equivalence:** Using mathematical tools to compare, contrast, and establish equivalences in various contexts.
- **Making and Interpreting Predictions:** Using data and mathematical models to make informed predictions about future events.

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Building connections through these Crosscutting Concepts will support students in developing a more integrated understanding of mathematics, enabling them to see and apply their understanding to new concepts and contexts in the classroom and their everyday lives.

Revitalizing the Student Experience

Revitalizing the student experience in mathematics classrooms is crucial for fostering engagement and positive attitudes. This involves moving away from the traditional “I do, we do, you do” teaching and towards more student-centered approaches that encourage exploration, application, discussion, and sense making. In a reimagined mathematics classroom, students are not passive recipients of knowledge but active participants in the learning process. They work with others, engage in meaningful discussions and questioning with peers, and tackle challenging problems and applications that require deep thinking.

Technology plays a crucial role in this revitalized approach. It can be used to create dynamic, interactive learning experiences that make abstract concepts more concrete and accessible. Teachers and students must be given access to available technologies to allow exploration, sense making modeling and to advance the development of student understanding and application of mathematics.

Moving Ahead: A Call to Action

It is not enough to do slight modifications of curricula, pedagogy, and expectations; a systemic change is needed at all levels—from individual classrooms to state and national education policies. Transforming high school mathematics education is a significant undertaking that requires the commitment of educators, policymakers, and the broader community. NCTM’s vision for reimagined, revitalized, and relevant mathematics education is a continuous journey, not a destination. It requires continuous collaboration and reflection to ensure that mathematics education evolves to meet the needs of all students in a rapidly transforming world.

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Key Actions for Stakeholders

- **Educators:** Embrace the reimagined approach by incorporating mathematical modeling and crosscutting concepts into their teaching practices. Create a classroom environment that fosters exploration, discussion, and the use of technology to enhance learning.
- **School and District Leaders:** Support teachers in implementing the new approach by providing professional development opportunities and resources. Ensure that the curriculum is aligned with the vision of reimagined mathematics education.
- **Policymakers:** Advocate for policies that support the transformation of mathematics education, including the integration of technology and the focus on real-world problem-solving. Allocate resources to ensure that all students have access to high-quality mathematics education.
- **Community Members:** Engage with local schools to understand the changes in mathematics education and support efforts to make mathematics more relevant and engaging for students.

The journey to reimagining high school mathematics is challenging, but the potential rewards are immense. By making mathematics education more relevant, engaging, and inclusive, we can equip students with the skills they need to succeed in the 21st century and beyond. The time to act is now; together, we can transform mathematics education for the better.

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To learn more about *High School Mathematics Reimagined, Revitalized, and Relevant*:

nctm.org/HSreimagined



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