

# Learning & Teaching

*Mathematics Teacher: Learning and Teaching PK-12*, is NCTM's newest journal that reflects the current practices of mathematics education, as well as maintains a knowledge base of practice and policy in looking at the future of the field. Content is aimed at preschool to 12th grade with peer-reviewed and invited articles. *MTLT* is published monthly.

ARTICLE TITLE:

AUTHOR NAMES:

DIGITAL OBJECT IDENTIFIER:

VOLUME:

ISSUE NUMBER:

## Mission Statement

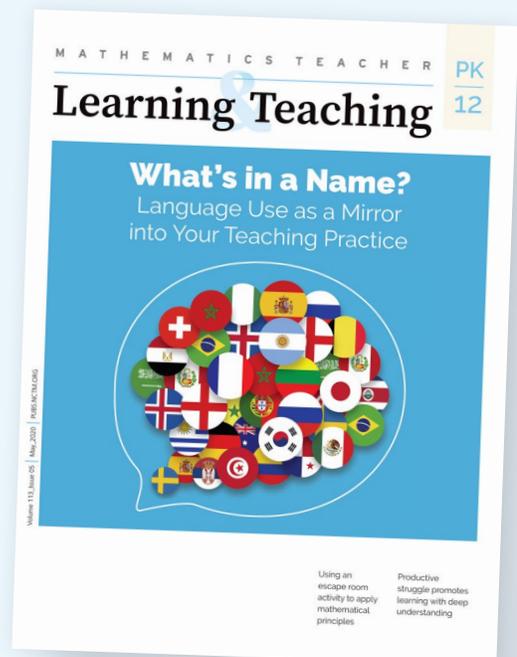
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Approved by the NCTM Board of Directors on July 15, 2017.

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# Extending Curiosity and Wonder With “What if . . . ?”

Ear to the Ground features voices from several corners of the mathematics education world.

Michael Wiernicki

**My Dad was** a creative problem solver. “What if I try . . . ?” and “If I do \_\_\_\_\_, I wonder what will happen?” seemed to be his default questions. They served him well as he solved problems he encountered as an electrician and everyday problems around the house.

These same questions are perfect to use in the mathematics classroom because they allow students to be creative in two ways: (1) by encouraging flexibility in how they go about solving problems and (2) by providing opportunities to create problems that extend the original problems.

Students are more apt to generate creative ideas when engaged in rich, problem-solving tasks. Rich tasks provide opportunities for *ALL* students to engage in the task, generating a variety of mathematical reasoning and strategies that can be used to help students make connections. “What if . . . ?” is a great follow-up

to these types of problems because it gives us an opportunity to hear the mathematical genius of children. One simply has to look at how the brain develops to get a sense of why the child possesses the brain of a genius. An infant has twice as many brain connections as an adult, and young brains continue to build new brain connections as they grow (Armstrong, 2023). All students have the opportunity to learn more than we can teach if we take the time to listen to their ideas.

“What if . . . ?” is my favorite of my Dad’s two questions. Here is how I used it. First, I engaged my students in a rich problem, The Toll Booth Robbery ([link online](#)) problem from my website/blog ([link online](#)) of problem-based learning tasks (see the supplementary materials [[link online](#)] for more). Students first decided on a question: How much money was robbed? Next,

they measured, investigated, and modeled a solution. Groups then shared their strategies and solutions, and I helped students connect their strategies to mathematical ideas like patterns, place value, and computation. It’s time to launch the “What if . . . ?”

To get students thinking in terms of “What if . . . ?,” they need permission to explore possibilities, challenge assumptions, and think creatively. Table 1 may provide students with a structure to help them, initially.

Students first use some private think time to explore the questions in the table and then choose one to focus on. Students then share their ideas with a partner/group. When it is time for the class to share, it may take a minute for students to get started. Be patient and listen. As students begin to share their “What if . . . ?” questions, their creative ideas will begin to snowball. When students notice that we care about their ideas,

they keep thinking! As “What if . . .?” becomes a more consistent routine, students will begin to ask themselves this question to generate strategies while working on tasks—not even waiting until the end of the lesson.

In recent work with fourth-grade students exploring The Card House Build problem (link online) from my website/blog of problem-based learning tasks, students engaged in “What if . . .?” Their responses generated a lot of excitement about doing more mathematics:

- What if there were two layers in the card house?
- What if we used the same number of large decks of cards?
- What if we made a card house model of our school?

Now, students wanted to know if they would have time to investigate their questions. Of course!

It is impossible to do good mathematics—or enjoy it—without being curious, asking questions, seeking out patterns, probing for underlying reasons and structures, and wondering “Why

does that happen?” or “What if . . .?” (Zager, 2017). Using “What if . . .?” at the end of a lesson keeps students thinking as they create new problems to solve by extending student curiosity and creativity and building interest in mathematics.

What if you wanted to dive deeper into the world of “What if . . .?” Continue the conversation with the resources on my website (link online). [—](#)

**Table 1** Helping Students Think in Terms of “What if . . .?”

Question	Brainstorm a list	Choose one or two ideas that you are most curious about	Insert the idea into a “What if . . .?” sentence starter
Which part(s) of the problem context could we change?			
What assumptions can we challenge?			
What new ideas can we add to the context?			

**REFERENCES**

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doi:10.5951/MLT.2025.0213