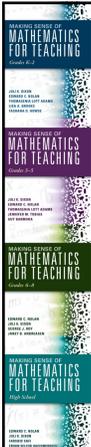


Planning and Reacting: How Do I Best Respond to Student Thinking?

Edward C. Nolan
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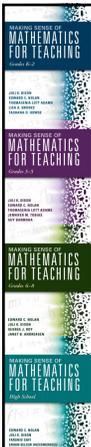
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Session Goals

- Share strategies for planning effective questioning.
- Discuss how to respond to student thinking.
- Highlight questioning in the TQE Process.

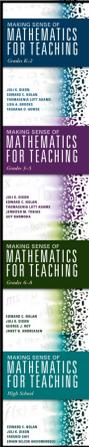
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Questioning

- Why do teachers ask questions?
- What differentiates effective questions from non-effective ones?
- How do we ask effective questions?

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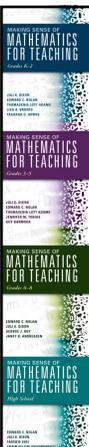


Walk-Through

Now, we are going to “walk through” one possible pathway to develop questioning...

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from Smith, M. S., Stelle, M. D., & Raith, M. L. (2017). *Taking action: Implementing effective mathematics teaching practices in grades 6-8*. Reston, VA: National Council of Teachers of Mathematics.

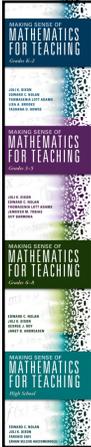


Plan with the TQE Process in Mind



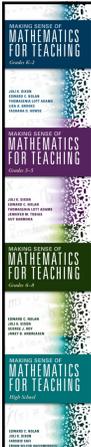
- Select appropriate **T**asks to support identified learning goals.
- Facilitate productive **Q**uestioning to engage students in mathematical practices.
- Collect and use student **E**vidence in the formative assessment process.

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What's the learning goal?

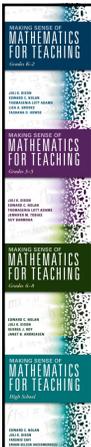
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Solutions to the Task

What solutions do you expect?

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Solutions to the Task

What questions support student thinking as they determine a solution?

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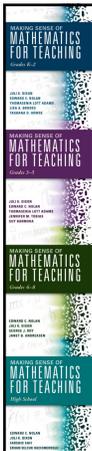
Making Sense of the TQE Process



Questions

Teachers who have a deep understanding of the content they teach facilitate targeted and productive questioning strategies because they have a clear sense of how the content progresses within and across grades.

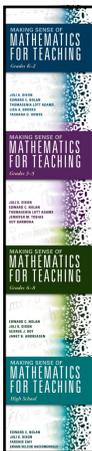
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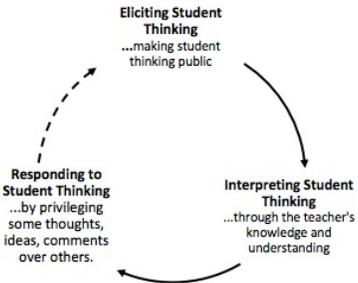
Focusing on Student Thinking

1. Plan multiple question-and response pathways
2. Ask open-ended questions
3. Listen actively to student answers
4. Act to privilege student thinking
5. Reflect on how the lesson engages students

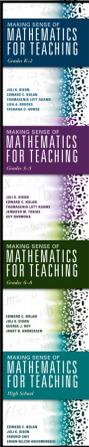
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Using Student Thinking



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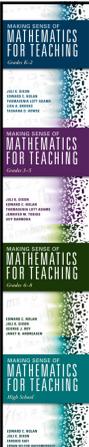


Funneling and Focusing Questioning Structures

When teachers use questioning to lead students to a solution and give less attention to student responses that differ from that line, they are using **funneling** questioning structures.

Students have less opportunity to make their own connections or build their own understanding.

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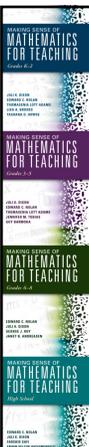


Funneling and Focusing Questioning Structures

When teachers honor student thinking and contributions by asking students to clarify their thinking and the thinking of others, teachers are using **focusing** questioning structures.

Students have the space to share ideas and build their own understanding rather than the teacher directing the classroom discourse in a particular direction.

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Planning a Lesson

Where do you think you are with your questioning?

What do you do to try to get more responses from your students?

Do you feel like your kids are really just looking for the steps to follow?

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MATHEMATICS FOR TEACHING
Grade 6-7

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Grade 6-7

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Grade 6-7

MATHEMATICS FOR TEACHING
High School

Discussing the Plan

$$\frac{x}{3} + \frac{3}{x} - \frac{2}{3x} =$$

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Grade 6-7

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High School

Teaching and Observing

- How do teacher questions define the classroom environment?
- How do planned questions impact the questions asked while teaching?

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Grade 6-7

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Grade 6-7

MATHEMATICS FOR TEACHING
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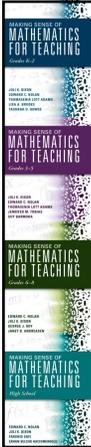
MATHEMATICS FOR TEACHING
High School

Plan with the TQE Process in Mind



- **Tasks** connect to learning goals and help identify student errors.
- **Questions** elicit mathematical understandings and common errors.
- **Evidence** drives scaffolding and guides extensions.

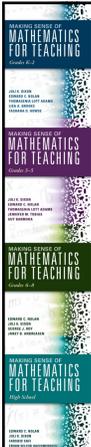
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Funneling and Focusing Question Structures

- When teachers use their own thinking to guide students to solution, they are using **funneling** questioning structures.
- When student thinking guides the lesson, teachers are using **focusing** questioning structures.

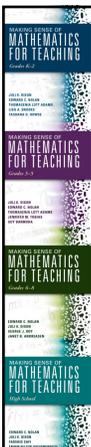
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Supporting Successful Pre-Service Teachers

Ambitious teaching (Lampert et al., 2013) requires teachers to not only use the preconceived ideas developed in their lesson plans but also to incorporate in-the-moment decisions to integrate the focus both on the learning goal and the thinking of the students.

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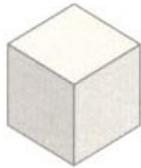


Supporting Successful Teachers

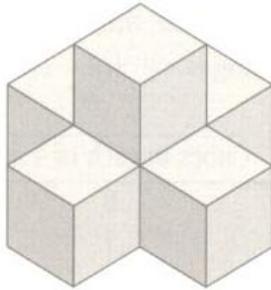
- How do teachers for ambitious teaching?
- How do we plan for and implement ambitious teaching?
- How do we improve our delivery of ambitious teaching?

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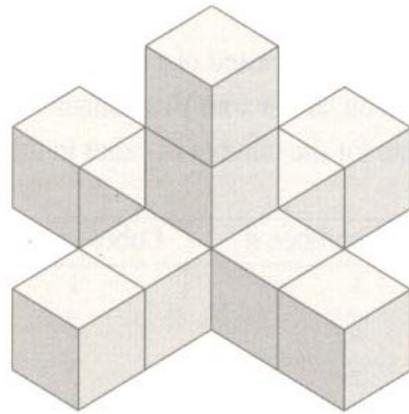
Counting Cubes Task



Building 1



Building 2



Building 3

1. Describe a pattern you see in the cube buildings.
2. Use your pattern to write an expression for the number of cubes in the n th building.
3. Use your expression to find the number of cubes in the 5th building. Check your results by constructing the 5th building and counting the cubes.
4. Look for a different pattern in the buildings. Describe the pattern and use it to write a different expression for the number of cubes in the n th building.

Adapted from “Counting Cubes”, Lappan, Fey, Fitzgerald, Friel, & Phillips (2004). *Connected Mathematics™*, *Say it with symbols: Algebraic reasoning* [Teacher’s Edition]. Glenview, IL: Pearson Prentice Hall. © Michigan State University