


## How Do I Privilege Student Thinking through Questioning?

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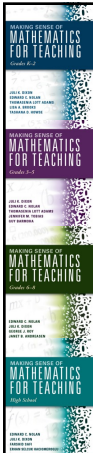
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## Session Goals

- Share strategies for planning effective questions.
- Discuss how to use questioning to meet the needs of your students.
- Link teaching outcomes to positive visions of learning.

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## Role of Questioning

Questioning can provide teachers a structure for **helping students through hints and clues as well as probing student responses** to understand their thinking (van den Kieboom et al., 2014).

Teacher questions need to build on one another, allowing **students** **“to identify thinking processes, to see the connections** between ideas and **to build new understanding** as they work their way to a **solution that makes sense to them**” (Ontario Ministry of Education, 2011).

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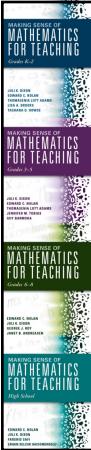
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## Questioning

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

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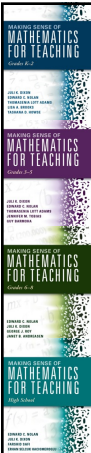
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## PROBLEM

Susie had  $\frac{1}{4}$  of a pan of brownies. She ate  $\frac{3}{4}$  of what she had. How much of the original pan of brownies did Susie eat?

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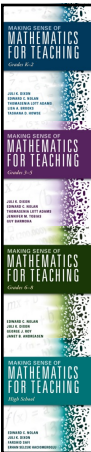
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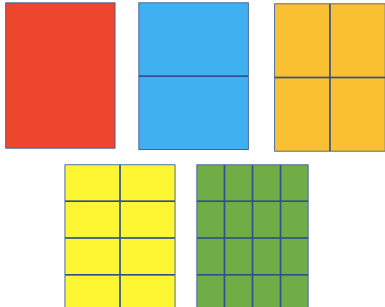
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## Fraction Kit



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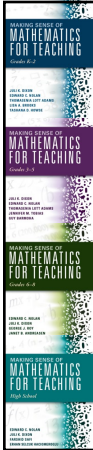
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## Plan with the TQE Process in Mind



- 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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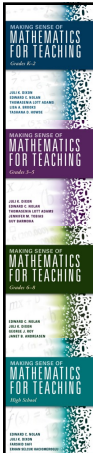
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## What's the learning goal?

Solve real world problems involving multiplication of fractions by using visual fraction models or equations to represent the problem.

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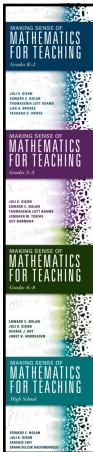
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## Exploration

What would uncovering possible student errors look like?

What would you look for when asking students to determine the amount of eaten brownies?

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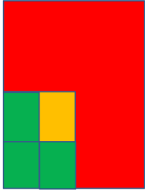
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**Solutions to the Task**

What solutions do you expect?

$\frac{1}{4}$	$\frac{3}{4}$	
$\frac{1}{16}$	$\frac{3}{16}$	

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**Solutions to the Task**

What solutions do you expect?

What questions will you ask to generate all these solutions?  
What answers do you expect from these questions?

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**Anticipating Questions**

Teachers anticipate what may happen in the lesson, creating a **“hypothetical learning trajectory”** (Simon, 1995, p. 135) for the lesson. Effective planning can provide high-cognitive-level questions that are difficult to create while teaching. This is why planning is so important to effective questioning (Nolan, Dixon, Roy, & Andreasen, 2016).

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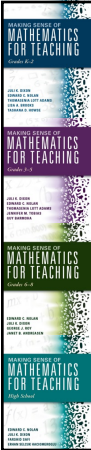
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## Focusing on Student Thinking

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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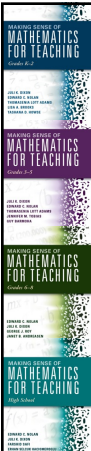
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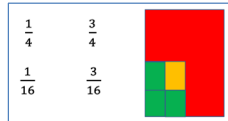
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## Anticipated Questions

- How do you identify the fractions that you are using from your diagram?
- How much is eaten? How much is left?
- What are you measuring? What are you answering?
- What operation is being modeled in your solution?



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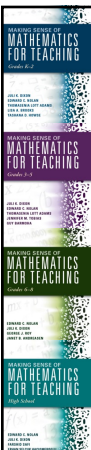
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## Making Sense of the TQE Process



### 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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## Planning Questions

A lesson must **follow a script**, as teachers should remain flexible and open to student thinking and ideas whenever possible (Shahril, 2013).

Planning questions is an important element of effective instruction, given that "**teachers need to plan a route and strategy** in order to use questions productively and develop students' thinking based on the learning objectives of their lessons" (Tienken et al., 2009, p. 42).

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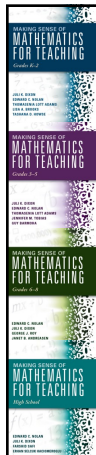
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## Creating an Image

- How do the questions you plan define your classroom environment?
- How do your planned questions impact the questions you ask while teaching?

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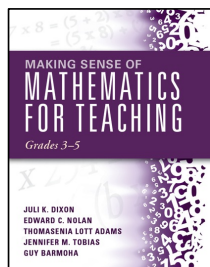
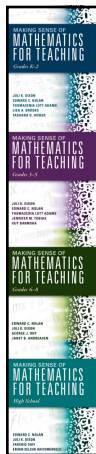
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## Making Sense of Mathematics for Teaching Grades 3-5

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## Questions Asked in Video

**Asked**

- How are we going to take  $\frac{3}{4}$  of the pieces when we only have one piece?
- You have one orange piece. How is that helping you think about this?
- How much did she eat? And how do you know that?

**Anticipated**

- How do you identify the fractions that you are using from your diagram?
- How much is eaten? How much is left?
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## Enacting Questions

Teachers need to be able to **ask questions guided not only by the task at hand, but in consideration of students' present abilities, as well as those they need to develop in the future** (Thompson & Zeuli, 1999).

Lessons should **provide opportunities for students to use their own reasoning** in performing mathematical tasks (Lobato, Hohensee, Rhodehamel, & Diamond, 2012).

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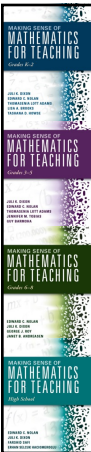
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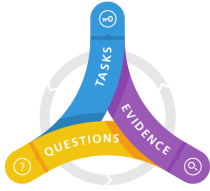
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## Plan with the TQE Process in Mind



- **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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## Enacting Questions

In their studies with preservice teachers and middle school-aged students, Coles and Brown (2016) describe the **challenge of linking a vision of what teachers expect from their lessons to expressing that vision in planning and enacting lessons**. They learned that questioning provides evidence for how well students understand the learning goal and may determine how to adjust lessons to meet the needs of students. The **goal of mathematics learning is “a convergence of teacher intentions and student mathematical activity”** (p. 149), using questioning to elicit and interpret student thinking.

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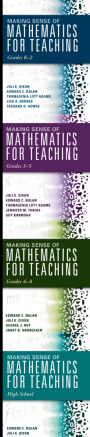
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### The Process in Action

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

*What is the same w/ in my denoms?  
What is different?  
How can I multiply by a quantity to get common denoms without changing value of expression?*

What is the same within my denominators?  
What is different?  
How can I multiply by a quantity to get common denominators without changing the value of the expression?

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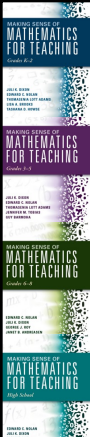
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### The Process in Action

**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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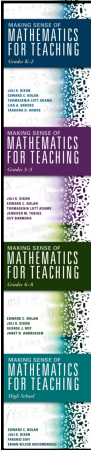
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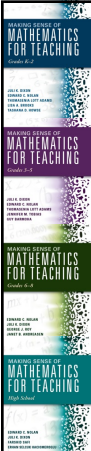
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## And as a Summary...

How does this apply to our work?

What are the takeaways that you can use?

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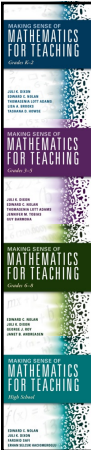
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