


## Planning Questions and Responding: How Do I Privilege Student Thinking?

Edward C. Nolan  
@ed\_nolan  
[ednolan@dnamath.com](mailto:ednolan@dnamath.com)



© 2023 Ed Nolan

---

---

---

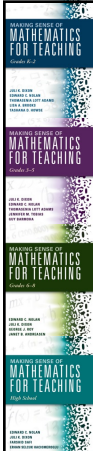
---

---

---

---

---



## 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.

© 2023 Ed Nolan

---

---

---

---

---

---

---

---

## 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).

---

---

---

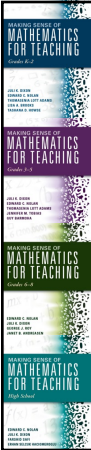
---

---

---

---

---



## Questioning

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

© 2023 Ed Nolan

---

---

---

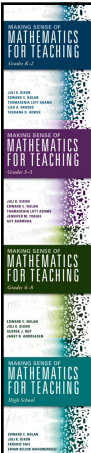
---

---

---

---

---



## 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?

© 2023 Ed Nolan

---

---

---

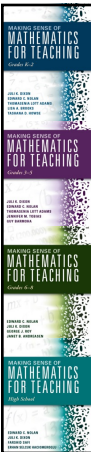
---

---

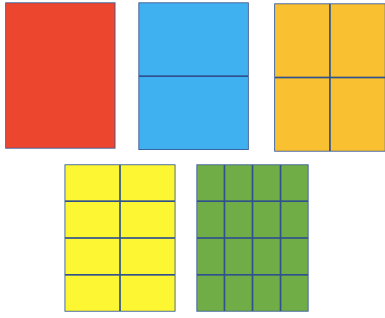
---

---

---



## Fraction Kit



© 2023 Ed Nolan

---

---

---

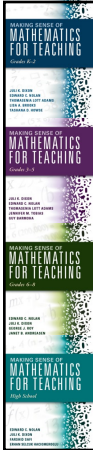
---

---


---

---

---



## 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.

© 2023 Ed Nolan

---

---

---

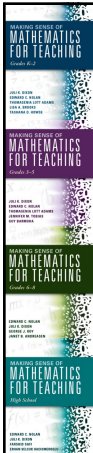
---

---

---

---

---



## What's the learning goal?

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

© 2023 Ed Nolan

---

---

---

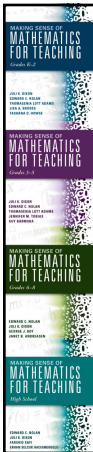
---

---

---

---

---



## Exploration

What would uncovering possible student errors look like?

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

© 2023 Ed Nolan

---

---

---

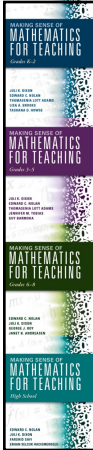
---

---

---


---

---



## Solutions to the Task

What solutions do you expect?



© 2023 Ed Nolan

---

---

---

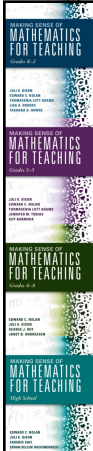
---

---

---

---

---



## 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?

© 2023 Ed Nolan

---

---

---

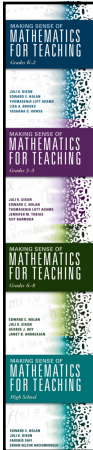
---

---

---

---

---



## 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).

© 2023 Ed Nolan

---

---

---

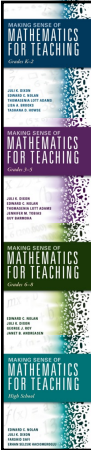
---

---

---

---

---



## 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

© 2023 Ed Nolan

---

---

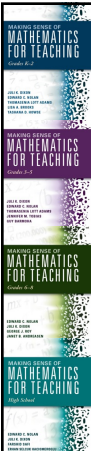
---

---

---

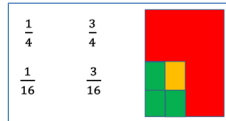
---

---



## 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?



© 2023 Ed Nolan

---

---

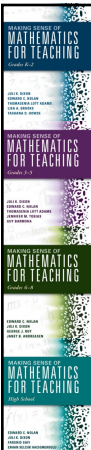
---

---

---

---

---



## 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.

© 2023 Ed Nolan

---

---

---

---

---

---

---

## 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).

---

---

---

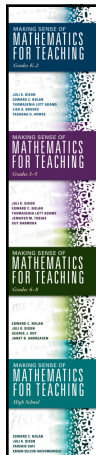
---

---

---

---

---



## 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?

© 2023 Ed Nolan

---

---

---

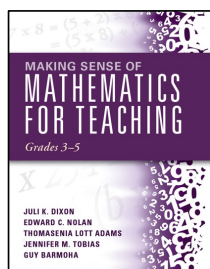
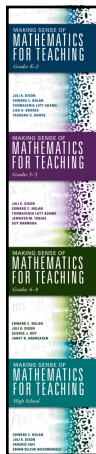
---

---

---

---

---



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

© 2023 Ed Nolan

---

---

---

---

---

---

---

---

## 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?
- What are you measuring? What are you answering?
- What operation is being modeled in your solution?

© 2023 Ed Nolan

---

---

---

---

---

---

---

---

## 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).

---

---

---

---

---

---

---

---

## 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.

© 2023 Ed Nolan

---

---

---

---

---

---

---

---

## 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.

---

---

---

---

---

---

---

---

## 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?

© 2023 Ed Nolan

---

---

---

---

---

---

---

---

## 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

© 2023 Ed Nolan

---

---

---

---

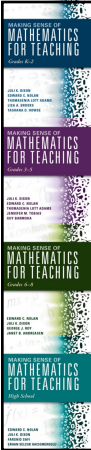
---

---

---

---





## 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.**

© 2023 Ed Nolan

---

---

---

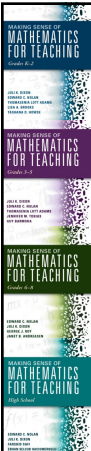
---

---

---

---

---



## And as a Summary...

How does this apply to our work?

What are the takeaways that you can use?

© 2023 Ed Nolan

---

---

---

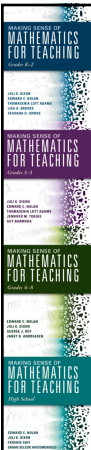
---

---

---

---

---



## Planning Questions and Responding: How Do I Privilege Student Thinking?

Edward C. Nolan  
@ed\_nolan  
[ednolan@dnamath.com](mailto:ednolan@dnamath.com)



© 2023 Ed Nolan

---

---

---

---

---

---

---

---