

NEWSLETTER

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WHAT DO STUDENT RESPONSES TELL US ABOUT THEIR MATHEMATICAL UNDERSTANDING?

Using the DMT assessment framework to plan instruction.

In today's edition, we explore:

- **The DMT framework:** four aspects of mathematical knowledge
- **One topic, four tasks:** what $36 + 27$ can show
- **What to teach next:** using student responses to plan instruction

Educators!

A correct answer tells us something about what a student can do. Examining the student's strategy, representation, and explanation provides additional evidence about the quantities, units, and mathematical relationships the student understands.

The DMT assessment framework helps teachers examine four aspects of mathematical knowledge: skills and procedures, problem solving, conceptual understanding, and reasoning and justification.

Classroom Tips

1. **Start with the units and quantities.** Ask, "What does each number represent? What units did you use?"
2. **Ask before deciding.** When the reasoning is unclear, ask the student to explain or show another representation.
3. **Plan from the evidence.** Decide whether the next step is work with a relationship, instruction on a procedure, feedback on an error, or practice.

A Classroom Example

In the 2016 article, first-grade teacher Kelli Rich asked students to represent numbers in more than one way with base-ten pieces during a unit on place value. Tasks like these show whether students treat ten as a unit and recognize that 4 tens and 3 ones and 3 tens and 13 ones represent the same quantity.

One Topic, Four Tasks: 36 + 27

Each task examines a different aspect of the same mathematics.

DMT category	Task
Level 1: Skills and Procedures	Calculate $36 + 27$.
Level 2: Problem Solving	A class collected 63 cans over two days. They collected 36 cans on Monday. How many cans did they collect on Tuesday? Show how you determined the missing quantity and explain how the quantities are related.
Level 2: Conceptual Understanding	Use a bar model or place-value representation to show how 36 and 27 compose 63. Explain how ten ones can be composed into one ten.
Level 3: Reasoning and Justification	A student says, "I added 30 and 20 to get 50, then 6 and 7 to get 13, so the total is 63." Explain why the strategy works. Would it work for other two-digit numbers, whether or not the ones compose another ten? Justify your answer.

What Do We Teach Next?

Begin by examining the quantities and units in the student's work. What strategy did the student use? What relationships does the representation show? When the reasoning is unclear, ask the student to explain or represent the quantities another way.

Use this evidence to determine whether students need additional work with a mathematical relationship, instruction on a procedure, feedback on an error, or practice to develop fluency.

What Does the Research Say?

In *Assessing Student Understanding: A Framework for Testing and Teaching* (Brendefur et al., 2016), we described how first- and fourth-grade teachers used the DMT framework to select tasks that reveal different aspects of students' understanding. Eliciting and using evidence of student thinking is one of the effective mathematics teaching practices described by NCTM (2014). This work informs DMTI's approach to designing assessment tasks and using student responses to plan instruction.

Keep developing mathematical thinkers.

More Information

Read DMT Insight 23 and download the Companion at mathsuccess.io/dmtinsights.

To share a classroom example or a question, contact us at contact@dmthinstitute.com.

For more information on professional development and curricular resources, visit mathsuccess.io.



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