

NEWSLETTER

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TEACHER KNOWLEDGE AND STUDENT MATHEMATICAL THINKING

What research says about teacher knowledge, professional learning, and investing in teachers.

In today's edition, we explore:

- **Three areas of teacher knowledge:** the mathematics, how students learn it, and how to teach it
- **One student response:** what comparing 0.45 and 0.7 asks of a teacher
- **Classroom tips:** four questions to consider during instruction
- **The research:** what studies of teacher knowledge, professional development, and curriculum show

Educators!

Schools have invested in standards, assessments, and curriculum materials. However, in 2024, 39 percent of fourth graders scored at or above Proficient on the NAEP mathematics assessment. Research points to an area that deserves more attention: what teachers know and how they use that knowledge during instruction.

When a student says 0.45 is greater than 0.7 because 45 is greater than 7, the teacher needs to recognize the student's whole-number reasoning, understand the mathematics of tenths and hundredths, and help the student compare the quantities.

Three Areas of Teacher Knowledge

Teachers draw on three connected areas of knowledge:

- **Mathematical Knowledge for Teaching:** understanding units, equivalence, and operations, and why procedures work. Teachers use models to show how the same structure appears across grade levels.
- **Knowledge of How Children Learn:** understanding learning trajectories, student strategies, and misconceptions helps teachers interpret student thinking and plan instruction that builds on what students know (Clements & Sarama, 2014).
- **Pedagogical Content Knowledge:** selecting tasks and representations, facilitating mathematical discussions, and connecting students' strategies to procedures.

Classroom Tips

Questions to consider during instruction:

1. **What is the unit, and what does it represent?** In 0.7, the unit is tenths. In 0.45, it is hundredths.

2. **What mathematical relationship does the model make visible?** A hundredths grid shows that seven tenths is seventy hundredths.
3. **What does the student's response tell us about their reasoning?** Treat it as evidence to investigate, not a diagnosis.
4. **How can students connect their strategies to more efficient procedures?** Ask how the model and the written comparison show the same relationship.

What Does the Research Say?

Teachers' mathematical knowledge for teaching has been positively related to their students' achievement gains in first and third grade (Hill et al., 2005). Content-focused professional development that includes active learning and continues over time is associated with changes in teachers' knowledge and practice (Desimone, 2009; Garet et al., 2001). In a six-state study, textbook choice made little difference in achievement growth, and teachers reported little curriculum training (Blazar et al., 2019)—curriculum investments need to be matched by sustained opportunities for teachers to learn.

Keep developing mathematical thinkers.

More Information

This is a quick overview. To read DMT Insight 37, watch the video, and download the Companion, go to DMT Insights at mathsuccess.io/dmtinsights.

How does your school balance investments in curriculum and in teachers' mathematical knowledge? Share it with us at contact@dmtinstitute.com.

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

