

DMT INSIGHTS

Issue 28 · 2026 · by Jonathan Brendefur, PhD and Associates



RETEACHING THAT WORKS: RESPONDING TO STUDENT THINKING

What research suggests about misconceptions, mathematical understanding, and instructional decisions

Introduction

Reteaching is an important part of mathematics instruction. When students struggle with a concept or procedure, teachers need to examine what students understand, how they reason, and which mathematical relationships need further development.

Repeating an explanation or assigning additional practice may help when students need more opportunities to build accuracy and fluency. However, when students apply an incorrect relationship or do not understand the mathematics underlying a procedure, repeating the same instruction may not resolve the difficulty.

This DMT Insight examines cognitive, motivational, and instructional factors associated with reteaching. It considers what research suggests about identifying students' mathematical thinking, selecting representations, providing explicit instruction and feedback, and helping students develop conceptual understanding and procedural fluency together.

Prior Knowledge, Misconceptions, and Monitoring Understanding

Reteaching often assumes that students have the prior knowledge needed to make sense of a lesson the second time. Struggling students may not yet understand the relationships the new mathematics depends on, and repeating the lesson does not give them access to those relationships. Willingham (2009) describes how new learning depends on what students already know: students understand a new idea by connecting it to ideas they already have. Some students also struggle to monitor and evaluate their own reasoning. They may not recognize which part of a problem they do not understand and may keep using a strategy that is not working.

One difficulty with reteaching is that an incorrect answer does not tell a teacher why a student made the error. A student may misunderstand the unit, apply a familiar procedure in a new situation, or struggle to coordinate quantities and representations. Teachers need to examine the student's reasoning before deciding how to respond. When instruction addresses the mathematical relationship underlying the difficulty, students can reorganize their thinking and connect it to more efficient procedures.

Research on students' conceptions supports this view of errors. Smith et al. (1993) argue that many misconceptions are productive ideas applied in contexts where they no longer work, and that learning involves refining and reorganizing those ideas rather than replacing them. In fractions, Ni and Zhou (2005) describe a whole-number bias: students apply whole-number properties to fractions. A student who writes $1/3 + 1/4 = 2/7$ may be adding numerators and denominators as if they were whole numbers. The teacher needs to examine how the student identifies the unit of 1, partitions that unit into equal parts, and recognizes that thirds and fourths must be expressed using the same-sized fractional unit before they can be combined (Figure 1).

The same unit of 1: thirds and fourths



one-third



one-fourth

A response of $\frac{1}{3} + \frac{1}{4} = \frac{2}{7}$

may add the numerators and the denominators as if they were whole numbers.

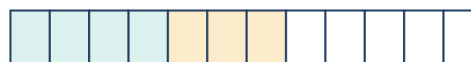
Same-sized units: twelfths



$$\frac{1}{3} = \frac{4}{12}$$



$$\frac{1}{4} = \frac{3}{12}$$



$$\frac{7}{12}$$

$$\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$$

7 units of one-twelfth

Figure 1. One-third and one-fourth represent different-sized fractional units of the same unit of 1. Expressing both quantities in twelfths gives four twelfths plus three twelfths, or seven twelfths.

Key Idea • An incorrect answer is evidence of reasoning. Reteaching begins by determining which unit, quantity, or relationship the student is using.

Motivation and Students' Experience of Reteaching

Students' experiences during reteaching can influence their willingness to participate and explain their reasoning. When students repeatedly complete tasks they do not understand, they may become frustrated or reluctant to try another strategy. Teachers can respond by identifying what students already understand, selecting tasks that address a specific mathematical difficulty, and helping students recognize how their thinking is changing.

Dweck's (2006) work on beliefs about learning offers a useful perspective on how students interpret difficulty and feedback. It is not direct evidence that a particular reteaching method causes a fixed mindset. Bellert (2015) also discusses the possible benefits of effective re-teaching for students' academic self-concept and motivation.

Assessment Evidence and Instructional Decisions

Reteaching also depends on how teachers use evidence from student work and assessment. When an assessment shows that students are struggling but does not reveal the reasoning behind their responses, teachers may repeat the original explanation or assign additional practice. Goertz et al. (2009) examined how teachers used interim assessment results in a cycle of gathering evidence, analyzing it, and adjusting instruction. They concluded that interim assessments designed for instructional purposes were helpful but not sufficient to inform instructional change.

Effective reteaching requires teachers to identify the mathematical ideas students understand, examine the relationships they use incorrectly, and determine the best instructional response. Student explanations, representations, and work samples provide more direct evidence than a score.

What the Research Supports

Research from several areas helps explain why reteaching should respond to students' mathematical thinking. In a literature review, Bellert (2015) found that re-teaching is widely assumed to be central to effective instruction but is described in little detail and has received little empirical study, particularly for students with learning difficulties. Rosenshine (2012) describes instructional principles, including explanation, guided practice, checking for understanding, and review. Kirschner et al. (2006) argue that students benefit from strong instructional guidance when learning new material. Hattie and Timperley (2007) describe feedback as most useful when it helps students understand where they are in relation to a goal and what to do next.

Together, these sources provide a basis for examining the role of prior knowledge, instructional guidance, feedback, and practice. They do not establish that one reteaching method is effective for every student or mathematical topic. Teachers must use evidence of student understanding to determine what instruction is needed.

Implications for Reteaching

When reteaching, teachers should identify the mathematical relationship students struggle to understand. Models, diagrams, equations, and mathematical language can help make that relationship visible. Select representations because they clarify the mathematics, not simply because they provide a different activity. Students may use several representations together. The representation should be selected according to the mathematical relationship being developed.

Explicit instruction, guided practice, discussion, and feedback all have a place in reteaching. Their use depends on the mathematics, students' prior knowledge, and what student work reveals. Asking students to explain their reasoning gives the teacher evidence and helps students monitor their own understanding (Rosenhine, 2012).

Practice remains important for developing accuracy, efficiency, and fluency. Conceptual and procedural knowledge develop together, each supporting the other (Rittle-Johnson et al., 2015). How practice is organized also matters: in a randomized study with seventh-grade classes, practice that mixed different types of problems led to higher scores on a later test than practice that grouped problems of one type (Rohrer et al., 2020).

Key Idea • Choose the representation for the relationship it makes visible. Practice supports accuracy, efficiency, and fluency. Conceptual understanding and procedural fluency develop together.

Conclusion

Reteaching works best when teachers identify why students struggle and adjust instruction accordingly. Repeating a lesson or assigning additional practice may help some students, but it may not address misunderstandings about quantities, units, operations, or mathematical relationships.

Research on learning, instructional guidance, feedback, and practice suggests that teachers need to examine student thinking and select instruction that responds to the mathematics involved. Students benefit from opportunities to represent ideas, explain their reasoning, connect relationships, and practice procedures.

Effective reteaching depends on teachers' mathematical knowledge and their ability to use student responses to make instructional decisions. The goal is to help students develop a more connected mathematical understanding and increasingly accurate, efficient strategies.

References

- Bellert, A. (2015). Effective re-teaching. *Australian Journal of Learning Difficulties*, 20(2), 163–183. <https://doi.org/10.1080/19404158.2015.1089917>
- Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House.
- Goertz, M. E., Oláh, L. N., & Riggan, M. (2009). *Can interim assessments be used for instructional change?* (CPRE Policy Brief RB-51). Consortium for Policy Research in Education. <https://doi.org/10.12698/cpre.2009.rb51>
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81–112. <https://doi.org/10.3102/003465430298487>
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, 41(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1
- Ni, Y., & Zhou, Y.-D. (2005). Teaching and learning fraction and rational numbers: The origins and implications of whole number bias. *Educational Psychologist*, 40(1), 27–52. https://doi.org/10.1207/s15326985ep4001_3
- Rittle-Johnson, B., Schneider, M., & Star, J. R. (2015). Not a one-way street: Bidirectional relations between procedural and conceptual knowledge of mathematics. *Educational Psychology Review*, 27(4), 587–597. <https://doi.org/10.1007/s10648-015-9302-x>
- Rohrer, D., Dedrick, R. F., Hartwig, M. K., & Cheung, C.-N. (2020). A randomized controlled trial of interleaved mathematics practice. *Journal of Educational Psychology*, 112(1), 40–52. <https://doi.org/10.1037/edu0000367>
- Rosenshine, B. (2012). Principles of instruction: Research-based strategies that all teachers should know. *American Educator*, 36(1), 12–19, 39.
- Smith, J. P., III, diSessa, A. A., & Roschelle, J. (1993). Misconceptions reconceived: A constructivist analysis of knowledge in transition. *The Journal of the Learning Sciences*, 3(2), 115–163. https://doi.org/10.1207/s15327809jls0302_1
- Willingham, D. T. (2009). *Why don't students like school? A cognitive scientist answers questions about how the mind works and what it means for the classroom*. Jossey-Bass.

Social Media

When students do not understand a mathematical idea, what should reteaching look like?

Repeating the same explanation or assigning more problems can help when students need more practice. If a student is using an incorrect relationship, that approach may not address the difficulty.

A student who writes $\frac{1}{3} + \frac{1}{4} = \frac{2}{7}$ may be adding numerators and denominators as if they were whole numbers. Reteaching begins with the fractional unit and equivalence.

In DMT Insight 28, we review research on prior knowledge, misconceptions, motivation, assessment, feedback, and practice.

Read the full Insight at mathsuccess.io/dmtinsights.

