

NEWSLETTER

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HOW MATHEMATICAL UNDERSTANDING DEVELOPS AND LASTS

What research tells us about memory, mathematical relationships, and practice.

In today's edition, we explore:

- **Prior knowledge:** how it influences mathematical learning
- **Working memory:** what cognitive load means for instruction
- **Practice:** why retrieval, spacing, and interleaving matter
- **An example:** how representations, explanation, and practice support understanding of 24×3

Educators!

Why do students remember some mathematical ideas but struggle to apply others a few weeks later? Cognitive psychology research helps explain how prior knowledge, working memory, and practice shape mathematical learning.

Students interpret new mathematics through what they already understand. Instruction helps them examine mathematical relationships and connect new ideas to familiar ones. Clear explanations, appropriate representations, feedback, and opportunities to retrieve and practice previously learned mathematics can support retention and application.

Classroom Tips

1. **Connect to prior knowledge.** Begin by identifying what students already understand about the mathematical relationships involved. Use their responses to determine what needs further development.
2. **Select appropriate representations.** Use physical models, diagrams, language, and symbols to make quantities and relationships visible. Students do not need to follow a fixed sequence.
3. **Provide retrieval and spaced practice.** Revisit important facts, procedures, and relationships over time. Ask students to explain how they know and why a strategy works.
4. **Use interleaved practice when appropriate.** After initial instruction and practice, mix related problem types. Ask students which relationship or procedure applies and why.

A Mathematical Example: Connecting Prior Knowledge

A student writes $24 \times 3 = 612$. The student may know the multiplication facts but may not be accounting for the value of each digit. Ask the student to explain the calculation. Decomposing 24 into 20 and 4 shows how

multiplication facts, place value, and the distributive property are connected: $24 \times 3 = (20 \times 3) + (4 \times 3) = 60 + 12 = 72$.

Revisit this relationship with different numbers and ask students to explain how their strategies work.

What Does the Research Say?

Research on retrieval practice shows that recalling previously learned information can improve later retention (Roediger & Karpicke, 2006). Spacing practice over time also supports retention (Cepeda et al., 2006). In mathematics, Rohrer et al. (2015) found that seventh-grade students who practiced mixed problem types performed better on a delayed assessment than students who practiced problems grouped by type.

Keep developing mathematical thinkers.

More Information

Read DMT Insight 31 for the research behind these instructional recommendations at mathsuccess.io/dmtinsights.

How do you help students retain what they learn? Share it with us at contact@dmtinstitute.com.

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

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