NEWSLETTER

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From Recognizing Answers to Rebuilding Them

DMT Insight 50 · Mathematical Thinking in the Age of Digital Dependence

In today's edition, we explore:

- **The Classroom Reality:** Why students who look successful on a screen stall when the supports come off
- **The Structure:** What a student decides when drawing a model that a finished model decides for them
- **Classroom Tips:** Three moves that keep the cognitive work with the student

Educators!

A student completes a digital lesson with a perfect score. A day later, given the same problem on paper, she says she does not remember how to start. She knows she did it yesterday. She does not know how. Another student, asked to draw a bar model for $\frac{3}{4}x + 5 = 17$, pauses. He has watched bar models on a screen but has never drawn one, and he is not sure how large to make the bar or where the 5 goes.

Each of those students appears successful in a digital environment, and neither has built the understanding the screen seemed to demonstrate. The tool performed the cognitive work, and that work was the work the student still needed to do. A bar model a student draws by hand requires decisions about scale, partitioning, and labeling that a model arriving finished on a screen does not.

Classroom Tips

1. **Draw before clicking.** Every problem begins with the question, what does the model look like? Students draw the bar model, number line, or diagram by hand before opening any digital tool.

2. **Choose tools that ask, not tools that answer.** Adaptive practice that requires active recall differs from step-by-step scaffolding that bypasses the need for effort. The question is whether the tool asks the student to do the work.

3. **Ask for the drawing, not only the box.** A page that asks students to construct a model, compare strategies, and write reasoning asks for the mathematics. A page of blank answer boxes asks for the answer.

A Teacher's Perspective

My students could all finish the app. Then I asked them to draw the model on paper, and half of them did not know where to start.

What Does the Research Say?

Testing after study yields better long-term retention than restudying, and learners misjudge which of the two is more effective (Roediger & Karpicke, 2006). In mathematics specifically, the evidence is thinner. A meta-analysis of spacing and retrieval practice for mathematics found a small retrieval effect whose confidence interval crosses zero, alongside a more robust effect for spacing (Murray et al., 2025). Better established is that forming letters and shapes by hand recruits motor, parietal, and language regions that typing does not (James & Engelhardt, 2012). However, those studies used letters rather than mathematical models.

Keep developing mathematical thinkers!

More Information

For the full research overview and the accompanying video, visit the DMT Insights page at mathsuccess.io/dmtinsights. You will find the Insight, the Companion, classroom resources, and related materials there.

Have a classroom story, tip, or question to share? We feature educator voices and ideas. Email us at contact@dmtinstitute.com to contribute a teaching tip or share your experience.

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