

Math Success with DMTI

THE POWER OF VARIED PRACTICE

In today's edition, we explore:

- **The Cognitive Science Behind Learning:** Why connecting context, iconic models, and symbols builds stronger neural pathways.
- **From Rigid to Flexible:** Simple strategies to shift students from rote routine to authentic reasoning.
- **The 3-Column Tool:** How to use this research-backed worksheet structure to support every learner.
- **Classroom Transformation:** Tips to turn routine practice into a cognitive workout for the brain.

Educators!

Are we teaching math for the worksheet—or for life? Too often, students complete pages of repetitive problems: facts and procedural drills that build short-term fluency but not flexible reasoning. Research shows that true mathematical thinkers move fluidly between story problems, visual models, and symbolic notation. To build these thinkers, we must link understanding across representations—through varied practice.

Why Repetition Alone Is Not Enough

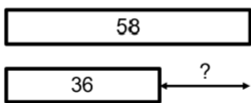
Routine worksheet tasks often separate context (story), iconic model (visual), and symbol, causing brittle understanding and limiting transfer. When students solve only for answers, they miss the deeper logic that connects math to meaning.

- **Cognitive research reveals** that when students learn to construct and translate among story, model, and symbol, they:
- Forge stronger neural connections by using both **verbal and visual brain pathways** (Dual Coding Theory).
- Improve conceptual understanding and build **representational fluency** (Bruner, 1966).
- **Develop metacognition**, noticing and correcting errors as they align different representations.
- **Transfer knowledge to new problems**, building true mathematical flexibility and confidence.

Varied Practice: Training the Brain to Think Flexibly

Varied practice tasks are designed as a cognitive workout, presenting problems in a three-column format: **context/story**, **visual model**, and **equation/symbol**. In each row, only one form is provided—students must

construct the other two.

Contextual (Story)	Iconic (Visual Model)	Symbolic / Mathematical Language
There are 58 green apples in one basket. And there are 36 red apples in another basket. How many more green apples are there than red apples?		$58 - 36 = 22$ "I compared 58 and 36 and found the difference to be 22."

This intentional translation is cognitively demanding but deeply generative. It forces students to reorganize knowledge, building interconnected mental schemas rather than isolated facts. This design develops powerful reasoning and supports diverse learners, including English language learners and students with disabilities.

Try This Tomorrow: Classroom Strategies for Varied Practice

Anchor with Visual Models (The Iconic Mode)

Don't start with symbols—use bar models, number lines or area models to make abstract relationships visible. This engages the non-verbal channel of the brain, creating a mental image of the math structure.

Use Precise Language

Emphasize vocabulary that highlights benchmarks, comparisons, and structure. Ask, "What is the story behind this model?" to bridge the verbal and non-verbal systems.

Connect to Real-World Contexts (The Enactive Connection)

Ask when and why a certain math idea is useful outside of school. This connects abstract symbols to lived experience, making practice authentic and memorable.

The Research Behind Varied Practice

The latest research in cognitive science provides a clear rationale for varied practice. Central to this is **Dual Coding Theory**, which explains that when students simultaneously pair a visual model (iconic) with a story (verbal) and an equation (symbolic), they encode the knowledge through two distinct brain pathways. This dual-channel processing dramatically strengthens recall and deepens conceptual understanding (Paivio, 1971).

This approach shifts the primary goal of practice from procedural mimicry to achieving **representational fluency**—the ability to move flexibly and accurately between different forms of a mathematical idea (Ainsworth, 2006). Ultimately, this research confirms that mathematical meaning is not static; it is solidified in the active coordination and translation between story, image, and symbol. It is this very movement that builds knowledge which is transferable to new problems, durable in long-term memory, and richly interconnected.

Get Inspired—Share Your Story!

Varied practice doesn't replace fluency—it deepens it. It turns worksheets into thinking spaces and builds students who can see structure, not just steps. Let's teach math for life, not just for the worksheet.

What's your favorite three-column task, or your biggest challenge fostering representational flexibility? Share your tip or classroom moment—your story could be in our next newsletter!

For the full research overview, classroom videos, downloadable resources, and professional learning modules, visit mathsuccess.dmtinstitute.com.

Keep inspiring mathematical minds!

MORE INFORMATION

This newsletter is just a preview—there is more to explore! For the full research overview and additional videos, visit the “Research Overviews” page at dmtinstitute.com/research. You'll find deeper insights, classroom strategies, downloadable resources, and more ways to expand your math teaching.

Have a classroom story, tip, or question to share? We love featuring educator voices and ideas. Email us at mathsuccess@dmtnstitute.com to contribute a teaching tip or share your experience—your story could be in our next newsletter!

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