DMT INSTITUTE NEWSLETTER

Math Success with DMTI

HOW DEPTH OF KNOWLEDGE (DOK) CAN SHAPE THE WAY WE TEACH MATH

In today's edition, we explore:

- **The Classroom Reality:** Why "harder" tasks are often not deeper tasks
- **The Cognitive Why:** How repetition and pacing can unintentionally flatten thinking
- **The Instructional Shift:** Designing lessons around mental actions, not worksheet length
- **The Question Audit:** How small changes in questioning dramatically raise cognitive demand

Educators

A student completes 25 multiplication problems correctly in under five minutes.

Another solves a word problem but cannot explain why multiplication was used.

A third draws an array and hesitates when asked, "Why does switching the factors not change the product?"

These are not random differences in ability. They reflect the kinds of thinking we routinely ask students to do.

When Depth of Knowledge (DOK) is misunderstood as a measure of difficulty rather than a classification of mental actions, instruction quietly shifts toward procedural intensity rather than conceptual depth.

Our latest **DMT Insight—What Depth of Knowledge Means in Math**—explains why this misunderstanding persists and how a small instructional shift can change both lesson design and student thinking.

The Classroom Reality: Where the Confusion Begins

In many classrooms, rigor is equated with:

- Larger numbers
- More complex-looking worksheets
- Faster completion times
- Multi-step procedures

From a student's perspective, the message becomes clear: mathematics is about doing more work more quickly.

So students adapt logically:

- "If it's harder, it must be deeper."

- "If I can do it fast, I must understand it."
- "Multiplying bigger numbers means I'm thinking harder."

But a page of 4-digit multiplication problems remains DOK 1 if students are simply executing a rehearsed procedure. The size of the numbers may increase effort, but not necessarily reasoning.

The materials are consistent—even when the mathematics is not.

The Cognitive Why: Mental Actions Drive Depth

Depth of Knowledge was never meant to measure difficulty. It classifies the type of thinking a task requires (Webb, 2002).

In multiplication, consider the difference:

- Compute 7 × 8. (Retrieval)
- Solve a word problem about rows of chairs. (Interpretation)
- Draw an array and explain what each dimension represents. (Modeling)
- Justify why 7 × 8 equals 8 × 7. (Reasoning about structure)

Each task feels different because each activates different cognitive systems.

Retrieval strengthens long-term memory. Modeling requires integrating visual and symbolic representations (Paivio, 1990). Justification engages self-explanation and executive reasoning (Chi et al., 1989).

When instruction emphasizes only reproduction, students develop speed. **When instruction includes representation and justification, students develop structure. Depth lives in the mental action, not in the number of problems.**

The Instructional Shift: Design Lessons Around Thinking

Instead of asking, "Is this hard enough?" **We might ask, "What kind of thinking does this require?"**

A multiplication lesson might intentionally include:

- **Retrieval**: Compute 7 × 8.
- **Context**: There are 7 rows of 8 chairs. How many chairs?
- **Modeling**: Draw an array or area model.
- **Justification**: Why does reversing the factors not change the product?

This sequencing builds understanding rather than assuming it.

During instruction, small questions create large shifts:

- "How do you know?"
- "What does your model show?"
- "If you forgot that fact, how could you figure it out?"

These prompts move students from doing mathematics to reasoning about mathematics.

When explanation is absent, DOK 3 rarely occurs, no matter how large the numbers appear.

A Question Worth Asking

If students learned multiplication only from your lessons and questioning patterns:

- Would they believe math is about speed or structure?
- Would they see arrays as tools or decorations?
- Would they know why multiplication works—or just how to perform it?

The answers are being shaped daily.

Your Turn to Share

We would love to hear from you.

What is one shift in lesson design or questioning that has changed the quality of thinking in your classroom?

Share your thoughts at **contact@dmtinstitute.com**. We will compile and elevate your insights to help advocate for stronger teacher support across districts.

Keep inspiring mathematical minds!

MORE INFORMATION

This newsletter is just a preview—there is much more to explore. For the complete **research overview**, **teacher companion guide**, and **classroom examples**, visit the **DMT Insights** page at **dmtinstitute.com/research**.

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