DMT INSTITUTE NEWSLETTER

Math Success with DMTI

WHY AREA AND PERIMETER ERRORS PERSIST: AND WHAT TO DO INSTEAD

In today's edition, we explore:

- **The Classroom Reality:** Why students keep swapping formulas and confusing area with perimeter
- **The Cognitive Why:** How common tools and sequencing quietly train the wrong mental models
- **The Instructional Shift:** How teaching dimensions first build durable understanding
- **The Materials Question:** What to audit, adjust, and redesign in K–5 measurement instruction

Educators

A student finds the area of a rectangle by adding all four sides. Another confidently multiplies length × width to find the perimeter. A third insists, "If the perimeter is bigger, the area has to be bigger too."

These are not careless mistakes. They are **logical conclusions drawn from the way area and perimeter are typically taught**.

When instruction presents area and perimeter as two formulas attached to the same figure—often in the same lesson—students build a fragile understanding that works on familiar worksheets but collapses when the shape changes or the problem looks different.

Our latest **DMT Insight—Rethinking the Teaching of Area and Perimeter** — explains why these misconceptions persist and how a small but powerful instructional shift can prevent them.

The Classroom Reality: Where the Confusion Comes From

In many classrooms, students encounter area and perimeter like this:

- Same rectangle
- Same diagram
- Same tool
- Two formulas written side by side

From a student's perspective, the message is subtle but powerful: *Area and perimeter are basically the same thing—just different calculations.*

So students invent rules that make sense given the materials they see:

- "Multiplication is for rectangles."
- "Adding sides is just another way to find how big it is."
- "Bigger around means bigger inside."

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

The Cognitive Why: Units and Dimensions Get Blurred

Research in mathematics education and cognitive psychology shows that students organize measurement ideas around **units and dimensions**, not symbols alone.

But many common instructional choices quietly blur those distinctions:

- Using square tiles or grids to "find" both area *and* perimeter
- Introducing formulas before students ever tile or trace
- Teaching area and perimeter together before either concept is stable

Without clear experiences that distinguish one-dimensional thinking (length around; linear units) from two-dimensional thinking (surface coverage; square units), students build mental shortcuts that feel efficient but are mathematically incorrect.

This is not a lack of effort or attention. It is a predictable outcome of instruction that overloads working memory and underemphasizes structure.

The Instructional Shift: Teach Dimensions First

Our research overview proposes a simple but powerful reframe: **before formulas, students must know what kind of measurement they are doing.**

From this perspective:

- **Perimeter** measures a **1-dimensional boundary**
    - How many *linear units* go all the way around?
- **Area** measures a **2-dimensional surface**
    - How many *square units* cover the inside?

When instruction consistently asks:

- *"Are we measuring the boundary or the surface?"*
- *"What kind of unit makes sense here?"*

students stop guessing and start reasoning.

This shift:

- Reduces formula swapping
- Clarifies why equal areas can have different perimeters

- Supports transfer to irregular and composite shapes
- Lays groundwork for volume, proportional reasoning, and algebra

The Materials Question: What to Audit, Remove, and Redesign

If students are consistently confused, the issue may not be effort—it may be the training set.

High-impact moves include:

- Auditing lessons that teach area and perimeter on the same day or week
- Removing tasks that rely on formula recognition before unit reasoning
- Ensuring tools match the dimension:
    - String, stir sticks, tracing → **perimeter**
    - Square tiles, grids, overlays → **area**
- Including contrast tasks where:
    - Area stays the same, but perimeter changes
    - Perimeter stays the same, but area changes

Small changes in sequencing and materials can produce large changes in student understanding.

A Question Worth Asking

If students learned area and perimeter **only** from your lessons, worksheets, and tools:

- What would they believe area *is*?
- What would they believe the perimeter *is*?
- Would they know which one they are measuring—before calculating?

That understanding is being built every day—whether intentionally or not.

Your Turn to Share

We would love to hear from you.

What is one form of support that would genuinely help you teach measurement more effectively? More planning time? Better models? Deeper content learning? Classroom examples?

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**.

facebook.com/dmtinstitute

instagram.com/dmtinstitute/

@DMTInstitute.bsky.social

mathsuccess.dmtinstitute.com

x.com/dmtinstitute

linkedin.com/company/dmt-institute

Tiktok.com/@math.success

youtube.com/@dmtinstitute