

DMT COMPANION

Insight 36 · 2026 · for teachers, coaches, and school leaders



FROM SCREENS TO SENSEMAKING: WHAT ARE WE MISSING?

Choosing digital and hands-on representations for a mathematical purpose

How to Use This

This Companion is for teachers, coaches, and school leaders working with DMT Insight 36. It summarizes the research, provides worked examples comparing digital and hands-on tasks, and suggests questions to help students explain the units, quantities, and relationships behind their work.

Key Idea • What students learn from a digital tool depends on what the tool asks them to do. Choose each representation, physical or digital, for the relationship students need to examine.

Three Guiding Questions

Consider these questions as you plan a lesson that uses digital tools.

1. What mathematical relationship should students examine in this lesson?
2. Which representation, physical or digital, will help students examine the units and quantities involved?
3. How will students explain their reasoning, and what will their responses tell you?

What the Research Shows

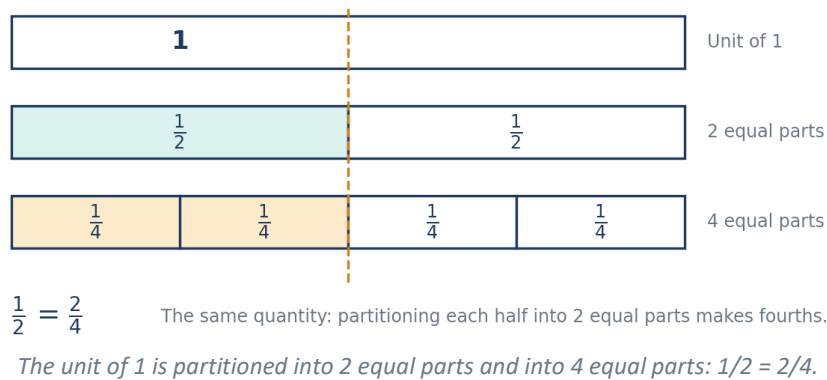
These studies examine different instructional approaches and outcomes. Their findings inform decisions about representations and technology, but they are not evaluations of DMTI programs.

Study	Scope	Finding	What it suggests
Moyer-Packenham & Westenskow (2013)	32 studies of virtual manipulatives	Average effect size of 0.35 compared with other instructional treatments	Digital models can support learning
Carbonneau, Marley, & Selig (2013)	Meta-analysis of concrete manipulatives	Positive average effect that varied with instructional factors	How materials are used matters
Cheung & Slavin (2013)	74 studies, K–12 mathematics	Small positive effect of educational technology (+0.16)	Educational technology interventions showed a small positive average effect on mathematics achievement
Goldin-Meadow, Cook, & Mitchell (2009)	Children learning equivalence problems.	Children taught to gesture learned more	Gesture can support reasoning

Worked Examples

Example 1 • equivalent fractions: $\frac{1}{2}$ and $\frac{2}{4}$

Students partition a paper strip representing the unit of 1 into two equal parts. They then partition each half into two equal parts, creating four equal parts. Two fourths represent the same quantity as one-half. A digital fraction strip can show the same relationship. In both cases, ask students to name the unit and explain why the lengths are equal.



Questions to ask:

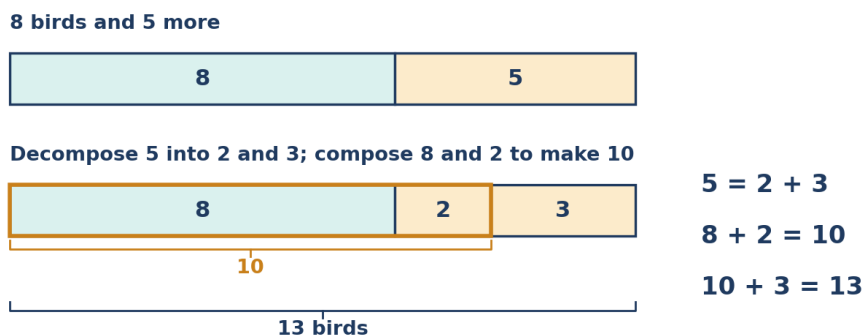
“What is the unit of 1, and how was it partitioned?”

“How did partitioning each half change the size of each part?”

“Why do 2 of the fourths cover the same length as 1 half?”

Example 2 • composing ten: 8 birds and 5 more

Eight birds sit on a fence, and 5 more join them. Students can represent the eight birds and five additional birds with a bar model, drawn on paper or on a screen. The teacher asks the student to decompose 5 into 2 and 3, compose 8 and 2 to make 10, and explain why the total is 13.



Eight birds and two of the five additional birds compose ten. Three birds remain, giving a total of thirteen: $8 + 5 = 8 + 2 + 3 = 10 + 3 = 13$.

Questions to ask:

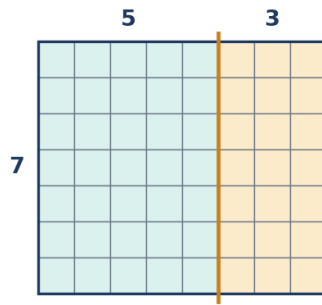
“Why did you decompose 5 into 2 and 3?”

“Where is the 10 in the bar model?”

“How could you use 10 to find $8 + 6$?”

Example 3 • digital fact practice: 7×8

Digital practice can build accuracy and efficiency with multiplication facts. Connect that practice to relationships students can explain. A student who knows $7 \times 5 = 35$ can decompose 8 into 5 and 3 and find $7 \times 8 = (7 \times 5) + (7 \times 3) = 35 + 21 = 56$. The distributive property explains why the two partial products compose the total product.



$$\begin{aligned}
 7 \times 8 &= (7 \times 5) + (7 \times 3) \\
 &= 35 + 21 \\
 &= 56
 \end{aligned}$$

7 rows of 8 square units, partitioned into two arrays: 7 rows of 5 (35 square units) and 7 rows of 3 (21 square units)

$$7 \times 8 = (7 \times 5) + (7 \times 3) = 35 + 21 = 56$$

Questions to ask:

“Which fact did you use to find 7×8 ?”

“Where are 7×5 and 7×3 in the area model?”

Key Idea • Digital practice can help students develop accuracy and efficiency. Teachers can also connect that practice to the mathematical relationships students are learning.

What Student Responses Can Show

A response is evidence to examine. Ask the student to explain before deciding what instruction should follow.

Student response	What to investigate	Possible teacher response
Matches $2/4$ to $1/2$ on screen but cannot explain why	Whether the student attends to the size of the parts	Ask the student to partition a strip and compare the lengths
Says $2/4$ is greater because 4 is greater than 2	How the student interprets the numerator and denominator	Ask what the 4 represents; compare the strips
Types 13 for $8 + 5$ after counting every counter	Whether the student composes 10 or counts by ones	Ask how the bar model shows 8 and 2 making 10
Answers facts quickly but cannot use a known fact	Whether the student can use a known fact to derive another fact	Ask how 7×5 helps find 7×8

Questions That Extend Mathematical Reasoning

Questions about answers are important. Also ask students to explain the units, quantities, and relationships behind their work.

Instead of only	Also ask
"Did the program mark it correct?"	"What does each number represent?"
"Drag 13 counters."	"How did you make ten?"
"Finish 20 fact items."	"How does one fact help you find another?"
"Watch the video."	"Explain to a partner the relationship the video showed."

Across the Grades

Across grade levels, teachers can select representations that help students examine the mathematical relationships being taught.

Grade band	Relationship	Physical or digital representation	Ask students to explain
Grades K–2	$8 + 5$ composed through 10	Bar model	How they made ten
Grades 3–5	$1/2 = 2/4$	Fraction strips	Why the lengths are equal
Grades 6–8	Equivalent ratios such as 2:3 and 4:6	Ratio table or graph	What stays the same as the quantities change

For Coaches

Coaches can work with teachers to identify the relationship a lesson targets, choose representations that make it visible, and examine student responses from digital work to plan what should follow.

Questions for a coaching conversation:

- What relationship did the digital tool help students examine?
- Where did students explain their reasoning during or after digital work?
- What did the program's data show, and what did students' explanations add?
- What will the next lesson do with what students said?

For School Leaders

School leaders can evaluate digital tools for their mathematical purpose and provide teachers with time to plan how representations, instruction, and practice connect. Assessments should examine students' explanations, accuracy, and procedural fluency.

Read DMT Insight 36 at mathsuccess.io/dmtinsights.