DMT COMPANION

Insight 49 · 2026 · for teachers, coaches, principals, and families

Math Success by DMTI

WHY STUDENTS STRUGGLE WITH WORD PROBLEMS AND HOW BAR MODELS HELP

How to Use This

This Companion accompanies DMT Insight 49, for teachers, coaches, principals, and families. Work the three guiding questions before the Insight or the video, and again afterward. The move that makes it work is small: have students draw the bar before they choose an operation, then ask why one bar is longer than the other.

Three Guiding Questions

ANSWER THESE BEFORE THE INSIGHT, AND AGAIN AFTER

1. When your students draw a bar model, are they producing a diagram or reasoning about a relationship? What in the drawing indicates which?
2. What does one unit represent in the bar your students drew today, and can they say it out loud?
3. Where else will they meet this structure: part–whole, comparison, equal groups, an unknown?

Before and After: What the Proportions Carry

The proportions carry the relationship. When 24 and 14 are drawn as equal-length parts of the same total, the bar model hides the structure it exists to reveal. Parts drawn to scale make the difference visible before anyone computes.

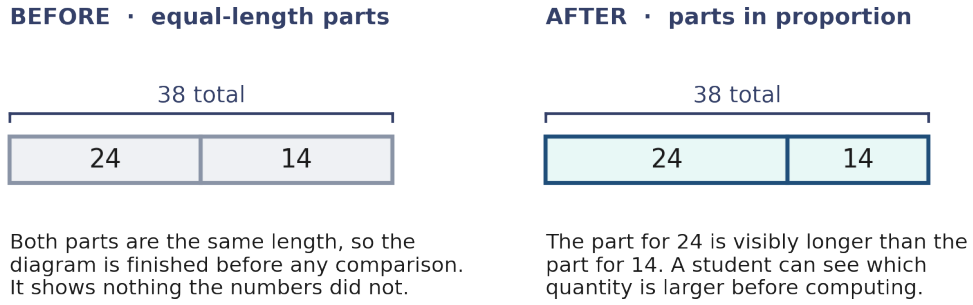

Figure 1. The same part–whole situation drawn twice: equal-length parts for unequal quantities, beside parts drawn in proportion.

The takeaway: equal-length parts for unequal quantities indicate only that a student completed the diagram. Parts in proportion show what the student understood about the quantities.

Worked Examples

Each example pairs the model students should reason with and the language that directs attention to the unit, the total, and the relationship.

Example 1 · Part–whole

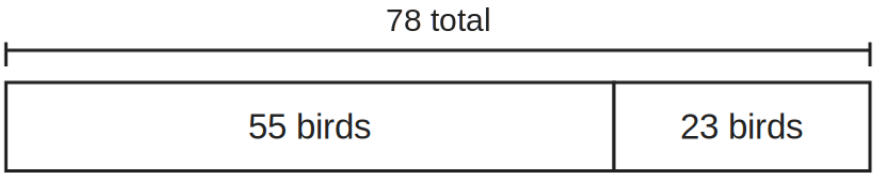

Figure 2. One bar model represents the total, and the parts (quantities) compose the whole (total). 55 birds and 23 birds compose 78 in total.

In a part–whole situation, one bar represents the total, and the parts compose it. The bracket names the total, and the parts are drawn in proportion, so a student can see that 55 covers more of the bar than 23 before adding anything.

- "Where is the total on your bar model, and where are the parts?"
- "Which quantity is larger, and how does your diagram show it?"
- "What would change if you knew the total and one quantity were missing?"

Example 2 · Comparison

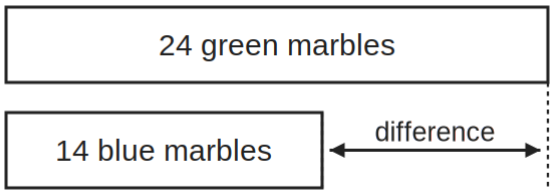

Figure 3. Two bars side by side, 24 green marbles and 14 blue. The difference is the extra length.

In a comparison situation, two bars represent two quantities, and the difference appears as extra length. Students see the relationship as a length before they subtract, which a keyword search never gives them.

- "Which bar model is longer, and how do you know before you subtract?"
- "What does the extra length represent?"
- "How many more, and how many fewer? Point to each on your diagram."

Example 3 · Equal units

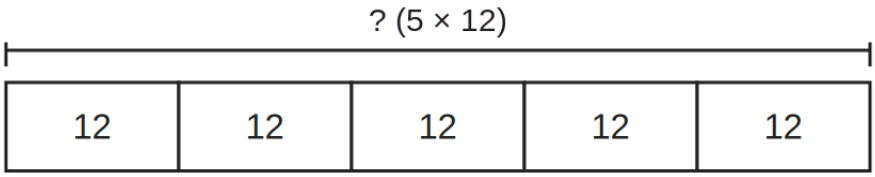

Figure 4. Five equal units of 12 compose 60, and 60 partitioned into five units gives 12.

When the units are equal, the same bar model applies to both multiplication and division. Multiplication iterates a unit to make a total, and division either finds the unit or counts how many units fit. Students identify the value of one unit first.

- "What does one unit represent here? Show me one unit."
- "How many units compose the total, and how do you know that they are equal?"
- "If one unit changed, what would happen to the total?"

Example 4 · Ratio

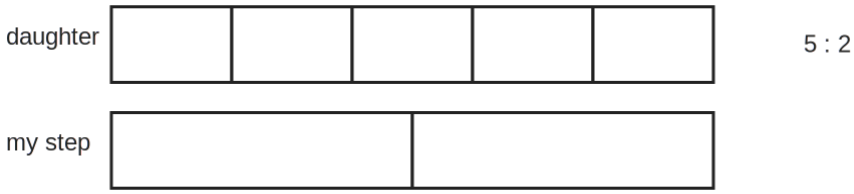

Figure 5. The daughter's step to the adult's step, 5 to 2, drawn as equal units.

A ratio is an equal-unit structure comparing two quantities measured in a shared unit. Five of the daughter's steps cover the distance that two of the adult's cover, and the two bars are built from that one shared unit.

- "What is the one unit that both bar models are built from?"
- "How many units in each bar model, and what does that indicate?"
- "If the daughter took ten steps, how long would the adult's bar model be?"

Example 5 · Percent

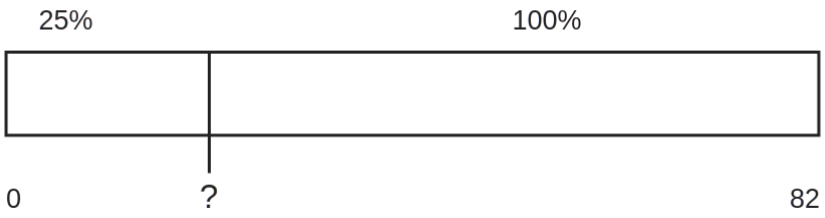

Figure 6. The total of 82 is one bar model. The mark shows where 25 percent lands, and the unknown is the length from 0 to that mark.

A percent names a part of the total, and the bar model keeps the total in view while students find that part. Marking 25 percent on a bar model that runs from 0 to 82 makes the relationship visible, which a rule about moving a decimal point does not.

- “What is the total, and where does 25 percent land on it?”
- “How many parts that size would fill the whole bar?”
- “What would 75 percent look like on the same bar?”

Example 6 · The unknown

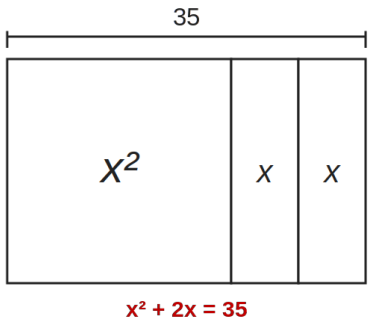

Figure 7. The same rectangle now holds an unknown, and the structure the student draws is $x^2 + 2x = 35$.

The same rectangle contains an unknown quantity. Students reason about the structure first, and the equation follows from the structure rather than replacing it.

- “Which part do you know, and which part are you finding?”
- “How many times does the unknown appear in your bar model?”
- “Write the equation your bar model already shows.”

The Language Shift

Wording can either hide the structure or point at it. Keep this by the board.

Instead of	Say
Draw a bar model.	What does the bar model look like? Where is the total, and where are the quantities (parts)?
Look for the keyword.	What are the quantities, and how are they related?
Make the parts equal.	Are these quantities equal? Draw each bar model the size the quantity deserves.
That is the answer.	Point to the answer on your bar model. What does that length represent?
Bar models are for the younger grades.	What did this bar model show last year, and what does it hold now?
Now write the equation.	Read your bar model out loud. The equation is already there.

What to look for in a classroom

- Students drawing before they choose an operation.
- Bar models sized to the quantities, without a ruler.
- Students naming what one unit represents.
- The same rectangle appearing in fractions, ratio, and algebra, not only in word problems.
- Student drawings kept as evidence, because the proportions indicate the thinking.

Across the Grades

Band	What students build	Model	What changes in their thinking
K–2	One bar model decomposed into parts, and two bars compared side by side.	Part–whole and comparison bars.	A quantity becomes a length, so a total and its parts can be seen at once.
3–5	A bar model partitioned into equal units, then used for multiplication, ratio, and percent.	Equal-unit and partitioned bars.	The unit becomes something to identify, iterate, and partition.
6–8	A bar model holding a quantity that is not yet known.	Bars with an unknown.	Structure comes before symbols, and the equation is read off the model.

Where to Go Next

Read the full research overview and watch the accompanying video on the DMT Insights page at mathsuccess.io/dmtinsights. The Newsletter for this issue gives a one-page version for families and for staff meetings. For more classroom materials, visit mathsuccess.io.