DMT COMPANION

Insight 38 · 2026 · for teachers, coaches, principals, and families

Math Success by DMTI

DRAWING UNDERSTANDING: WHY STUDENTS SHOULD BUILD THE NUMBER LINE

How to Use This

This Companion accompanies DMT Insight 38, 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: hand out a blank segment instead of a printed number line, and ask what one unit represents.

Three Guiding Questions

ANSWER THESE BEFORE THE INSIGHT, AND AGAIN AFTER

1. When your students place a number on a number line, what tells you whether they have established the unit, or only found a location?
2. What does one unit represent on the number lines your students used this week, and who decided that?
3. Where else will your students meet a number line this year: a ruler, a fraction strip, an axis?

Before and After: The Shift This Insight Is About

The same student places 47 in the same place on both number lines. Only one of the two placements required the student to establish what one unit represents.

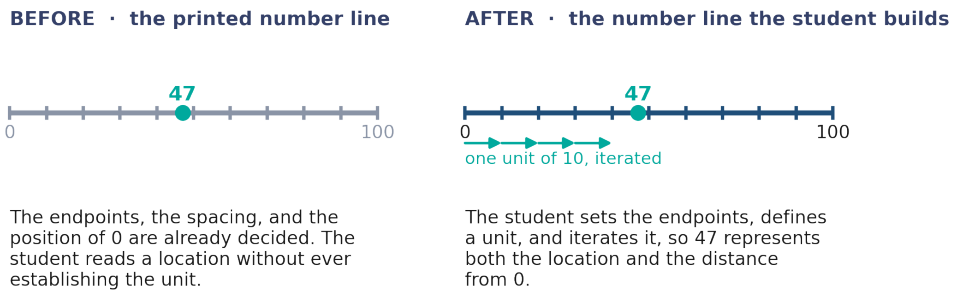

Figure 1. A printed number line sets the endpoints, the spacing, and the position of 0. A built one does not.

The takeaway: the correct placement on a printed number line indicates where a student pointed. A number line the student built tells you what the student did to get there.

Worked Examples

Each example pairs the model students should reason with and the language that directs attention to the unit, the partition, or the scale.

Example 1 · Partitioning the unit of 1

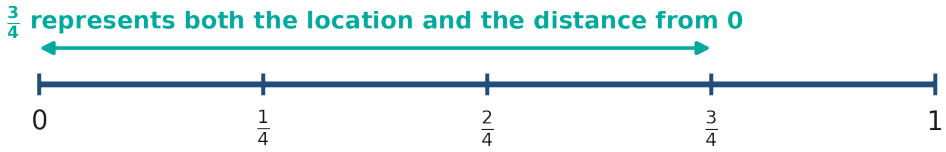

Figure 2. Students partition a number line from 0 to 1 into fourths, then locate $\frac{3}{4}$ as both a location and a distance from 0.

The number line from 0 to 1 is the unit that students partition. Four equal units make each unit one fourth, and $\frac{3}{4}$ represents both the location of that point and the distance covered by three of those units. Partitioning the same number line into tenths lets students compare $\frac{3}{4}$ and $\frac{7}{10}$ as lengths rather than as remembered facts.

- "Show me one fourth. How do you know that the four units are equal?"
- "Where is $\frac{3}{4}$ located, and how far is it from 0?"
- "Partition the same number line into tenths. Which is longer, $\frac{3}{4}$ or $\frac{7}{10}$, and how do you know?"

Example 2 · Changing the endpoints

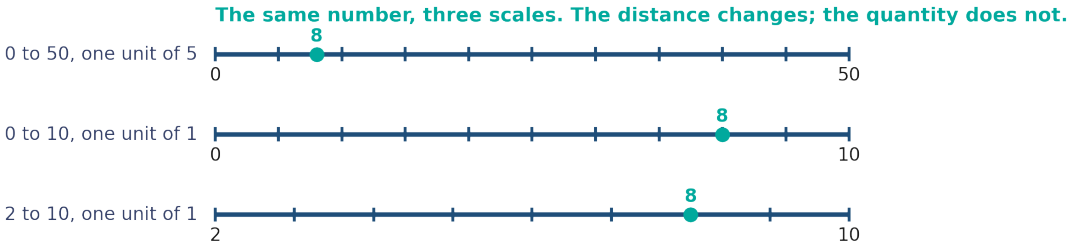

Figure 3. The same quantity, 8, located on three number lines with different endpoints and units.

A student who has built only one kind of number line often expects 0 at the left, a unit of 1, and a number line that ends where the paper ends. Varying the endpoints across the week removes that expectation. The quantity 8 does not change. The distance that represents it does, because the unit changed.

- "What does one unit represent on this number line? Show me one unit before you place anything."

- “The endpoints changed. What has to change about your spacing?”
- “On which of these number lines is 8 farthest from the left end, and why is it not the largest number?”

Example 3 · Building the axis before plotting

A line plot is a number line with data placed on it.
Equal spacing on the axis represents equal units, for the same reason it does on a ruler.

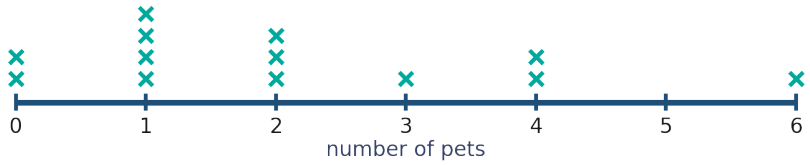

Figure 4. A line plot, with the axis drawn by students before any data are placed.

Students draw the axis first: they choose the range, decide what one interval represents, and place 0. Only then do they place the data. The same reasoning carries to a bar graph, where equal spacing represents equal units, and to the coordinate plane, where the x-axis is a scaled number line.

- “Before you plot anything, what will one interval on your axis represent?”
- “Where does 0 go, and how do you know?”
- “Someone else chose a different interval. Whose graph is easier to read, and why?”

The Language Shift

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

Instead of	Say
Put 47 on the number line.	Where does 47 land, and how far is it from 0?
Count the tick marks.	What does one unit represent here? Show me one unit.
Make sure it looks even.	How do you know that your spacing is equal?
Three-fourths is right here.	Three-fourths represents the location and distance from 0. Show me the four equal units.
Use the grid.	What will one interval on your axis represent, and where will 0 go?
That is the wrong spot.	Measure from 0 with your unit, and tell me where that lands.

What to look for in a classroom

- Students working on blank or open number lines, not only on printed ones.
- Endpoints and units that change from task to task across the week.
- Students explaining how they know that their spacing is equal.

- Axes drawn by students before any point is plotted.
- Student work kept as evidence, because the spacing and the labels show the thinking.

Across the Grades

Band	What students build	Model	What changes in their thinking
K–2	A number line from 0 to 10, with units of 1 stepped off, to locate 7.	A blank segment with student-made ticks.	A number represents both a location and a distance stepped off from 0, rather than a word in a count sequence.
3–5	A number line from 0 to 1, partitioned into fourths and then into tenths, to place $\frac{3}{4}$ and 0.7.	The partitioned unit of 1.	The unit of 1 becomes something to partition, so a fraction represents both a location and a measured distance.
6–8	The axis for a data display or a coordinate grid, choosing the interval and the origin.	A student-drawn axis.	Scale becomes a decision with consequences, which supports ratio reasoning and graphing.

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.