

NEWSLETTER

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Seeing a Fraction as One Number, Not Two

DMT Insight 58 · Fractions: The Developmental Understandings Beneath Concepts and Operations

In today's edition, we explore:

- Why students often read a fraction as two separate whole numbers
- How the number line shows a fraction as one quantity with a size
- Three classroom moves that build fractions from a unit
- Where fractions lead, from equivalence to algebra

Educators!

Fractions are one of the most important ideas in elementary and middle school mathematics, and one of the hardest. A student's understanding of fractions predicts how well they will do in later mathematics, including algebra. When fractions do not make sense, the trouble tends to follow students for years.

The shift this Insight is about is simple to say and hard to build. Students move from reading a fraction as two separate whole numbers, a top and a bottom, to seeing it as one quantity with a size. The obstacle it replaces is the habit of judging fractions by their digits, which is why a student may say one-eighth is larger than one-third because eight is larger than three.

The Fraction Math Learning Profile is built on five connected understandings that build on one another: the unit of one, partitioning, iterating, magnitude, and equivalence. Each one prepares the next, and a student's answers show which understanding to build.

Classroom Tips

1. **Start with the unit.** Ask what counts as one, then partition it into equal units. Name the unit fraction and iterate it: one-fourth, two-fourths, three-fourths. Fold a paper strip or a bar model before writing any symbols.
2. **Put fractions on a number line.** Have students place one-third and one-fourth on a number line from 0 to 1

and explain which is farther from zero. The number line shows a fraction as one point with a size, which a shaded shape hides.

3. **Rebuild the unit.** Show three-fourths and ask, “If this is three-fourths, where is 1?” A student who can rebuild the unit of one from a fractional part is coordinating the count with the size, not reading two separate numbers.

A Teacher’s Perspective

“Once my students started putting fractions on a number line, the arguments about which is larger stopped. They could see it.” — Grade 4 Teacher

What Does the Research Say?

Researchers have found that fraction knowledge matters more than we once thought. Siegler and colleagues (2012) found that fifth-grade knowledge of fractions predicted students’ achievement in high school mathematics, even after accounting for whole-number skill, working memory, and family background. Jordan and colleagues (2013) found that how accurately students place fractions on a number line strongly predicts later fraction learning. Ni and Zhou (2005) describe the whole number bias, the habit of treating fractions by their digits, that much of this work is about.

The point of a Math Learning Profile is not simply to identify a wrong answer. It is to identify the understanding a student needs to build next.

Keep developing mathematical thinkers!

More Information

For the full research overview and the accompanying video, visit the DMTI Insights page at mathsuccess.io/dmtinsights. You will find the Insight, the Companion, classroom resources, and related materials there.

Have a classroom story, tip, or question to share? We feature educator voices and ideas. Email us at contact@dmtinstitute.com to contribute a teaching tip or share your experience.

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