

NEWSLETTER

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Division: One Equation, Two Questions

DMT Insight 10 · The Power of Division: Understanding What the Quotient Counts

In today's edition, we explore:

- **The Classroom Reality:** Why a correct quotient can hide a missing sense of what the answer counts
- **The Language:** How total, unit, and iterator name what each number in a division equation does
- **Classroom Tips:** Three Instructional Moves: Ways to build division reasoning rather than division rules

Educators!

A student writes $18 \div 3 = 6$ and is correct. Ask what the 6 counts, and you learn whether the student read the situation or only the symbols. If the coops hold 3 chickens each, the 6 counts coops. If the farmer has 3 coops and shares 18 chickens evenly among them, the 6 counts chickens. Same equation, same answer, two different questions.

In a longitudinal study, elementary students' knowledge of division was strongly associated with later mathematics achievement, even after accounting for several student and family characteristics (Siegler et al., 2012). Division is hard not because of the computation. Students often develop an implicit model of division as sharing. That model works in many early problems but becomes limiting as numbers and situations change, as they do when the divisor is a fraction.

Classroom Tips

1. **Ask what the answer counts.** Every time a student finishes a division, ask what the quotient counts in the situation: coops or chickens, friends or stickers. If a student cannot say what the quotient counts, the correct answer tells us less about what the student understands.
2. **Give both situations from the start.** Pair a sharing problem with a measuring problem on the same numbers. Partition a bar model into 3 equal units for sharing, and iterate the unit of 3 along a number line for measuring.

3. **Let students chunk before they meet the algorithm.** To divide 144 by 8, let students record that 10 units of 8 compose 80 and 8 more compose 64. The standard algorithm then reads as a compact record of that work rather than a new rule.

Try This Tomorrow

Give students $18 \div 3 = 6$ and ask them to write two different situations for the equation. In one, 3 should represent the unit size. In the other, 3 should represent the number of units. Then ask: What does the 6 count in each?

What Does the Research Say?

Students hold an implicit model of division as sharing, and it limits what they accept as a division problem: they reject a divisor larger than the dividend, and they expect the quotient to be smaller than the total (Fischbein et al., 1985). Children grasp the relationship among the total, the divisor, and the quotient before they can compute it, showing that important structural understandings can develop before students can carry out the computation (Correa et al., 1998). Dutch students who learned long division through chunking moved from diverse strategies toward chunking by place value over five months (van Putten et al., 2005).

Keep developing mathematical thinkers!

More Information

For the full research overview and the accompanying video, visit the DMT Insights page at mathsuccess.io/dmtinsights, where the Insight, the Companion for teachers and coaches, and this Newsletter are together in one place.

Have a classroom story, tip, or question to share? Email us at contact@dmtinstitute.com to contribute a teaching tip or a story for a future issue.

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