

Is Fifth Grade a Key Developmental Transition Period for Mature Number Sense?



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#2400686: Assessing the malleability and impact of third through eighth grade students' mature number sense

Sample Questions

Understanding Mathematical Equivalence

$$34 + 19 = \underline{\quad} + 18$$

- ☐ 33 ☐ 53
☐ 35 ☐ 71

3rd - 5th Grade

Number Concepts and Magnitude

Which fraction represents the largest amount?

- ☐ $\frac{5}{6}$ ☐ $\frac{5}{8}$
☐ $\frac{5}{7}$ ☐ $\frac{5}{9}$

3rd - 8th Grade

Understanding the Effect of Operations on Numbers

What is the best estimate for 87×0.09 ?

- ☐ A lot less than 87
☐ A little less than 87
☐ A little more than 87
☐ A lot more than 87

6th - 8th Grade

Multiple Representations of a Number

What is true about the number $\frac{2}{5}$ (two-fifths)?

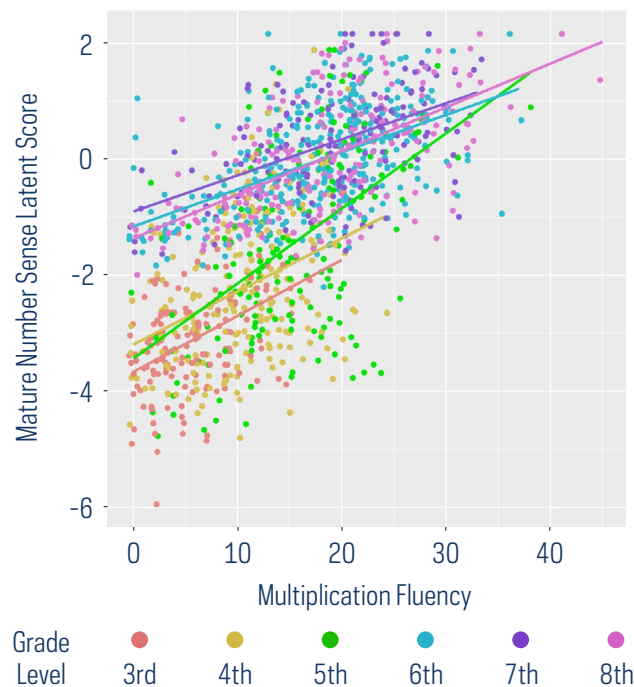
- ☐ It is greater than $\frac{1}{2}$ (one half)
☐ It is the same as 2.5
☐ It is equivalent to 0.4
☐ It is less than $\frac{1}{6}$ (one sixth)

3rd - 8th Grade

Mature Number Sense Matters

Strong, unique predictor of end-of-year mathematics achievement beyond demographic, cognitive, and mathematics-specific factors, including arithmetic fluency.

Mature Number Sense By Multiplication Fluency



Possible Developmental Transition

Mature number sense and multiplication fluency are strongly related, but not identical. Fifth grade students show particularly high variability.

METHODS

- Collected mature number sense and multiplication fluency in fall (N = 1305), winter (N = 1218), and spring (N = 1265) from students in Grades 3-8.
- Interviews with a subset of 125 students in fall and spring.
- Linking changes in students' mathematical thinking to changes in assessment scores.

CHALLENGES TO OVERCOME

- Building a common framework for mature number sense across cognitive science, mathematics education, special education, and classroom practice.
- Current static forms need greater precision at developmental transition points (Grade 3 floor; Grade 5-6 transition), motivating the need for an adaptive assessment across grades.



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