# Learning Path Teaching-Learning: Differentiating within Whole-Class Instruction by Using the Math Talk Community

Bridging for teachers and students by coherent learning supports Learning Path

Phase 3: Compact methods for <b>fluency</b>	$\uparrow$
Math Sense-Making Math Structure Math Explaining	
Phase 2: Research-based mathematically-desirable and accessible methods in the middle for understanding and growing fluency	
Math Sense-Making Math Structure Math Explaining	
Phase 1: Students' methods elicited for <b>understanding</b> but move rapidly to Phase 2	

# **Common Core Mathematical Practices**

#### Math Sense-Making about Math Structure using Math Drawings to support Math Explaining

### Math Sense-Making: Making sense and using appropriate precision

- 1 Make sense of problems and persevere in solving them.
- 6 Attend to precision.

### Math Structure: Seeing structure and generalizing

- 7 Look for and make use of structure.
- 8 Look for and express regularity in repeated reasoning.

#### Math Drawings: Modeling and using tools

- 4 Model with mathematics.
- 5 Use appropriate tools strategically.

### Math Explaining: Reasoning and explaining

- 2 Reason abstractly and quantitatively.
- 3 Construct viable arguments and critique the reasoning of others.

The top is an extension of Fuson, K. C. & Murata, A. (2007). Integrating NRC principles and the NCTM Process Standards to form a Class Learning Path Model that individualizes within whole-class activities. National Council of Supervisors of Mathematics Journal of Mathematics Education Leadership, 10 (1), 72-91. This is a summary of several National Research Council Reports.

# Learning Path for Multidigit Computation in CCSS

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Learning Path



Note. Students may consider problems with special structure (e.g., 98 + 76) and devise quick methods for solving such problems. But the major focus must be on general problems and on generalizable methods that focus on single-digit computations (i.e., that are or will generalize to become a variation of writing the standard algorithm).

#### The learning path

- Any method that is taught or used must have a learning path resting on visual models and on explaining the reasoning used. It is not acceptable to teach methods by rote without understanding how place values are used in the methods.
- Methods are elicited from students and discussed, but good variations of writing the standard algorithm are introduced early on so that all students can experience them.

Steps in written methods are initially related to steps in visual models.

Experiencing and discussing variations in writing a method is important mathematically.

Students stop making drawings when they are not needed. Fluency is solving without a drawing. Students drop steps of Helping Step methods when they can move to a short written variation of the standard algorithm for fluency.