

## Teaching Mathematics through Problem Solving in the Common Core State Standards Classroom

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## *A Pathway for Mathematical Practices*

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### Standards for Mathematical Practice

- varieties of expertise that mathematics educators at all levels should seek to develop in their students
- practices rest on important “processes and proficiencies” with longstanding importance in mathematics education

CCSSI (2010, p. 6)

### Standards for Mathematical Practice

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.

CCSSI (2010, p. 6)

### Standards for Mathematical Practice

- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

CCSSI (2010, p. 6-7)

How can we address all of the  
Standards for Mathematical  
Practice?

## 1. Problem Solving

Make sense of problems and persevere in solving them.

- Reason abstractly and quantitatively.
- Model with mathematics.
- Use appropriate tools strategically.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

How can we address all of the Standards for Mathematical Practice?

1. Problem solving
2. Discussions about solving problems

Discussions about solving problems

- Construct viable arguments and critique the reasoning of others.
- Attend to precision.

What should the Standards for Mathematical Practice look like in the elementary class?

Principles and Standards for School Mathematics (NCTM, 2000)

NCTM Process Standards

- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representation

CCSS Standards for Mathematical Practice

Make sense of problems and persevere in solving them.

Reason abstractly and quantitatively.

Model with mathematics.

Use appropriate tools strategically.

NCTM Process Standards

Problem Solving

Representation & Connections

Problem Solving & Connections

Representation

<p>CCSS Standards for Mathematical Practice</p> <hr/> <p>Construct viable arguments and critique the reasoning of others.</p> <p>Attend to precision.</p>	<p>NCTM Process Standards</p> <hr/> <p>Reasoning and Proof &amp; Communication</p> <p>Communication &amp; Reasoning and Proof</p>
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## Let's visit some elementary mathematics classes...

### Jamie Rust's 1<sup>st</sup> Grade Class

- Valeria has 6 red balls. Andrew has 7 green balls. Hailey has 4 blue balls and Kevin has 3 orange balls. How many balls do Valeria, Kevin and Andrew have altogether?
- How many more balls does Andrew have than Kevin?

### Jamie Rust's 1<sup>st</sup> Grade Class

- How are the Standards for Mathematic Practice exemplified in this class?
- How is problem solving an integral part of her mathematics lesson?
- What is the role of communication in her lesson?
- How does Jamie involve her students in the discussion?

### Julie Shafer's 1<sup>st</sup> Grade Class

- There are 6 bird nests. In each nest there are 10 eggs. There is one more nest with only 5 eggs. How many eggs are there together?

### Professional Development Embedded Day

- Problem written by kindergarten, first grade and second grade teachers.
- Problem posed before lunch. Teachers observed students working and collected student work.
- Teachers planned the sharing session.
- The class discussion took place after lunch.
- Additional adults in video: Jeanie Behrend, Melanie Wenrick

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