Welcome!

Highlighting Mathematical Practices in Everyday Tasks

California Mathematics Council 2013
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Our Work Together

- Brief overview of Common Core State Standards for Mathematical Practice (SMPs)
- Implementing the SMPs—what do they look like in the classroom
  - Square Pattern Vignette
  - Connecting mathematical tasks and the SMPs

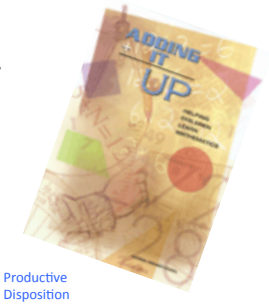
Standards for Mathematical Practice

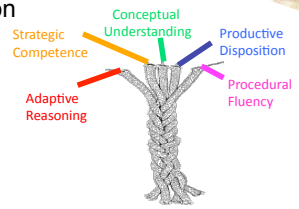
- "The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important 'processes and proficiencies' with longstanding importance in mathematics education."

National Governors Association Center for Best Practices *and* Council of Chief State School Officers (2010) Common Core State Standards for Mathematics

Underlying Frameworks:
National Research Council

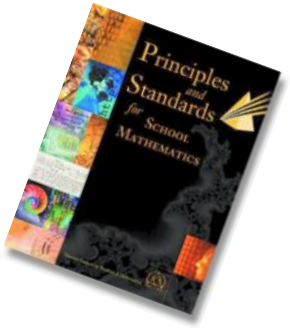
- *Adding It Up*
  - Strands of Mathematical Proficiency
    - Conceptual understanding
    - Procedural fluency
    - Strategic competence
    - Adaptive reasoning
    - Productive disposition





Underlying Frameworks
National Council of Teachers of Mathematics

- *Principles and Standards for School Mathematics*
  - Process Standards
    - Problem Solving
    - Reasoning and Proof
    - Communication
    - Connections
    - Representation



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Standards for Mathematical Practice

Overarching Habits of Mind
1. Make sense of problems and persevere in solving them
6. Attend to precision

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

Modeling and Using Tools
4. Model with mathematics
5. Use appropriate tools strategically

Seeing Structure and Generalizing
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

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Unpacking the Standards for Mathematical Practice

- Individually
  - Identify the verbs in each sentence by circling them
  - Underline the nouns (or phrases) that are the objects of those verbs
- As a group
  - Make a succinct list of verbs followed by nouns, for example:

Standard 1. Make sense of problems and persevere in solving them.
Explain…*meaning of problem*
Understand…*approaches*

- Group discussion
  - What do you notice about what students are expected to do in this practice standard?

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Standards for Mathematical Practice

- On one hand, the Standards for Mathematical Practice describe mathematical content students need to learn.
  - SP1. Make sense of problems
    - "… students can **explain correspondences** between equations, verbal descriptions, tables, and graphs or **draw diagrams** of important features and relationships, **graph data**, and **search for regularity or trends**."

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Standards for Mathematical Practice

- On the other hand, they describe the nature of the learning experiences, thinking processes, habits of mind, and dispositions that students need to develop a deep, flexible, and enduring understanding of mathematics.

- SP1. Make sense of problems
  - "….they [students] **analyze** givens, constraints, relationships and goals. ….they **monitor and evaluate** their progress and **change course** if necessary. …. and they continually **ask themselves** "Does this make sense?"

Standards for Mathematical Practice in the Classroom

The Square Pattern Task

A Vignette from Ms. Hutchins' Classroom

The Square Pattern Task

Figure 1 Figure 2 Figure 3

- Ms. Hutchins posed this situation to her students:
  - I've constructed a sequence of squares chained together [as above]. I'd like for you to think about how you would be able to find the perimeter of the chain, in units, if I were to chain 100 squares together.
- Working with a partner, come up with at least two different rules students might identify for finding the perimeter AND how the students might explain why their rule makes sense to them.

The Square Pattern Task

Figure 1 Figure 2 Figure 3

Reasoning and Explaining

2. Reason abstractly and quantitatively

3. Construct viable arguments and critique the reasoning of others

- As you were working on the task, how did you find yourself using either of these SMPs?

Classroom Vignette

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

- Read through the vignette and look back over the verbs that were identified for these two practices
  - What evidence do you see of either of these practices in the vignette?
    - How are students using them?
    - How is Ms. Hutchins encouraging/supporting them?

What Did You Notice?

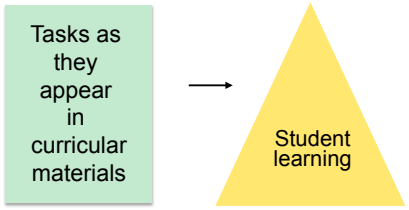
- What is Andrea's rule?
- What is Markus' rule?

- What evidence do you see of either of these practices in the vignette?
  - How are students using them?
  - How is Ms. Hutchins encouraging/supporting them?

Implementing the SMPs

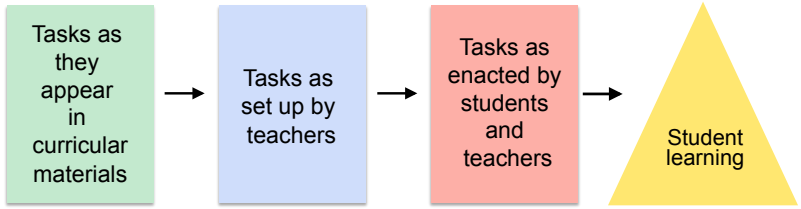
Considerations for Lesson Design

The nature of tasks used in the classroom will impact student learning!



But, what teachers do with the tasks matters, too!

The Mathematical Tasks Framework*



Smith & Stein (1998); Stein, Smith, Henningsen & Silver (2000)

Planning a Task

- Working with a partner, select one of the "**Reasoning and Explaining**" tasks.
  - Together, discuss and make notes on how you might implement the task, incorporating some of the suggestions from "Implementing SMPs" and paying careful to the content goal.
- Be ready to share your thinking with another group.

A Few Words from CCSSM Authors About the Importance of the SMPs

Importance of the SMPs

- Take a few minutes to discuss:
  - What do you think of Dr. McCallum and Dr. Zimba's comments?
  - How are you currently thinking about implementing the SMPs in your math class?

Wrapping Up

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