As you get settled please start work on the set of tasks available on the handout.

Ensuring the Tasks in Our Curriculum are Worthwhile

East Metro Mathematics Leadership (EaMML) MSP
National Council of Teachers of Mathematics
April 6, 2017

https://goo.gl/tEYjCA

Who is in the room?

Kirk, Crunch, Kangaroo

Classroom Teachers *(picnic, card, pool)*

Mathematics Coaches/Specialists *(car, tree, elephant)*

Principals/Building Administrators *(yard, pogo, chop)*

- **District Office Administrators** *(string, kidney, green)*
- **State or Regional Coordinators** *(storm, needle, potato)*

Teacher Educators *(map, wallet, laundry)*

- **Who did we miss?** *(gas, police, train)*

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Who We Are

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#EaMML
#NCTMannual

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Doing Math Is...

Analyzing, Building, Classifying,
Designing, Estimating, Formulating,
Generalizing, Hypothesizing, Investigating,
Justifying, Knowing, Listing, Modeling,
Numbering, Organizing, Proving,
Questioning, Representing, Substituting,
Testing, Uncovering, Visualizing,
Wondering, eXplaining, asking whY,
Zipping through mental calculations

Session Agenda

- Opening
- Criteria for Worthwhile Tasks
- Doing Math
  - Task Analysis Guide
  - Mathematical Task Framework
- Strategies for Enhancing Tasks
- Wrap up

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Learning Target

What: Develop criteria for worthwhile tasks and learn ways to open up tasks to create high-level learning experiences for your students.

How: Evaluate your own experiences and various frameworks as tools for task analysis and enhancement.

Why: Consider ways that worthwhile tasks influence both
what students learn, and
what they come to believe about mathematics.

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Worthwhile Tasks

https://goo.gl/ENEv0Q

Private Think Time

Using worthwhile tasks is a key element to effective mathematics learning and teaching. Based on your knowledge and experiences, what are your top criteria for "worthwhile" tasks? Record your thoughts and ideas.

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Worthwhile Tasks

https://goo.gl/ENEv0Q

Private Think Time

Using worthwhile tasks is a key element to effective mathematics learning and teaching. Based on your knowledge and experiences, what are your top criteria for "worthwhile" tasks? Record your thoughts and ideas.

For this purpose, let's agree to define a task as a segment of classroom activity that:

- focuses on the development of a particular math idea
- may involve several related problems or extended work on a single complex problem
- may last from twenty minutes to an entire class period

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Worthwhile Tasks

Task Continuum

Solve the rational number tasks. Feel free to talk to others as you see that they are ready for a conversation.

Pay particular attention to your thinking process as you solve each task.

- What type of thinking did you employ?
- How did it differ across the four tasks?

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1. What are the decimal and percent equivalents for the fractions ½ and ¼?

2. Convert the fraction 3/8 to a decimal and a percent.

3. Using a 10 x 10 grid, identify the decimal and percent equivalents of 3/5.

4. Shade 6 small squares in a 4 x 10 rectangle. Using the rectangle, explain how to determine each of the following:
   a. The percent of area that is shaded,
   b. The decimal part of area that is shaded, and
   c. The fractional part of area that is shaded

Low Cognitive Demand ⟷ High Cognitive Demand

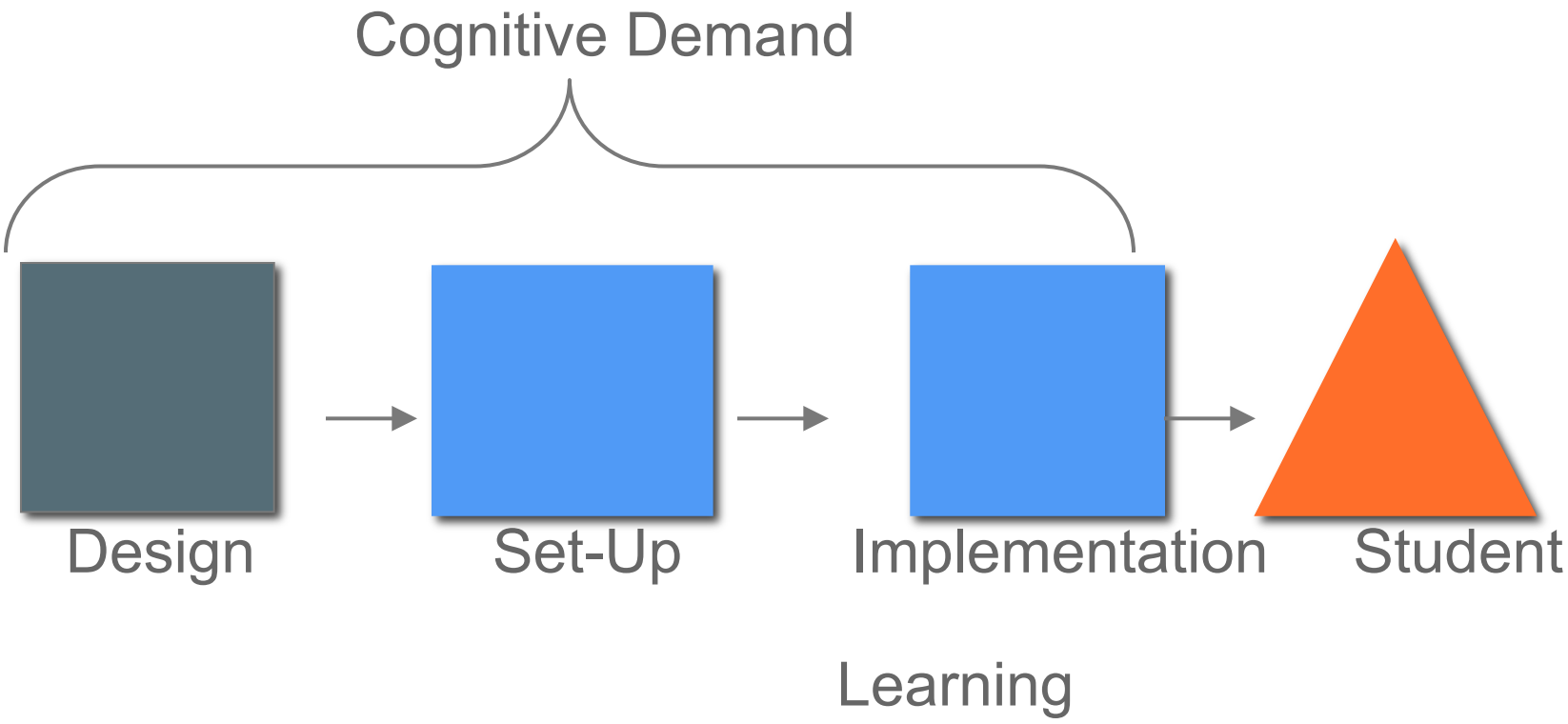
Memorization	Procedures with Connections
Procedures Without Connections	Doing Mathematics

Shade some small squares in a 4 x 10 rectangle. Using the rectangle, explain how to determine each of the following:

a. The percent of area that is shaded,
b. The decimal part of area that is shaded, and
c. The fractional part of area that is shaded

What might be useful and dangerous about posing this task?

Mathematics Tasks Framework



- Stein et al, 1998

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Shade [6, 8, 21, 30] small squares in a 4 x 10 rectangle. Using the rectangle, explain how to determine each of the following:

a. The percent of area that is shaded,
b. The decimal part of area that is shaded, and
c. The fractional part of area that is shaded

How might this version of the task influence relationships students notice?

Enhancing Tasks at the Task Level

Problem Stems

Remove the Question… Focus on the Situation

For each of the following situations:

- build or sketch a model for each situation
- record observations about the mathematical relationships
- write equations to describe the relationships
- ask and answer some questions about the situation

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Task as represented in the Curricular Materials

There are 9 red birds and 6 blue birds in a tree. How many birds are in the tree?

Use a ten-frame drawing and a number sentence.

Write a number sentence.

Write a number bond to match the story and a number bond to show the matching 10+ fact. Write a statement.

From Eureka Math: Grade 1, Module 2, Lesson 5

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Task as Adapted by the Teacher

Mrs. Zielinski went bird watching with her daughters. They saw a tree with lots of birds. Izzy counted 9 red birds, and Maggie counted 6 blue birds.

How many birds are in the tree?

Show how you got your answer.

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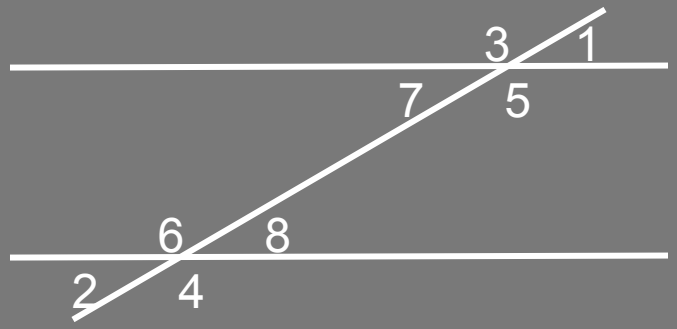
Goal Specific versus Non-Goal Specific

Two parallel lines are cut by a transversal, as shown in the figure below. If angle 2 is 30°, find the measure of angle 1.

Two parallel lines are cut by a transversal, as shown in the figure below. If angle 2 is 30°, find the measure of as many of the other angles as you can.



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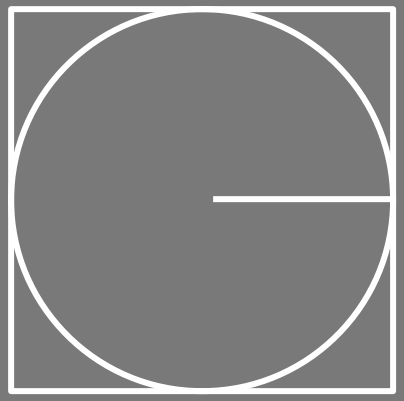
Goal Specific versus Non-Goal Specific

The radius of a circle inscribed in a square is 6 cm, as shown in the figure below. Find the area of the square.

The radius of a circle inscribed in a square is 6 cm, as shown in the figure below. Find out all you can about the circle and the square.



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Goal Specific versus Non-Goal Specific

Thu and Marina each ride their bikes to school. Thu lives 8 blocks from school. Marina lives 12 blocks from school. It takes Thu 16 minutes to ride his bike to school each morning. How long does it take Marina to ride her bike if she rides at the same rate as Thu?

Thu and Marina each ride their bikes to school. Thu lives 8 blocks from school. Marina lives 12 blocks from school. It takes Thu 16 minutes to ride his bike to school each morning. Write and solve as many different problems as you can.

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Try On a Strategy

Goal Specific versus Non-Goal Specific, Problem Stems

1. As a dyad or triad, examine the tasks on the handout of your choice.
2. Determine the big idea or intentions of the prompts.
3. Use one or more of the non-goal specific “approaches” to enhance the task.
4. Consider the potential student responses and other possible enhancements to the prompt(s).
5. Select your favorite to share with another group.

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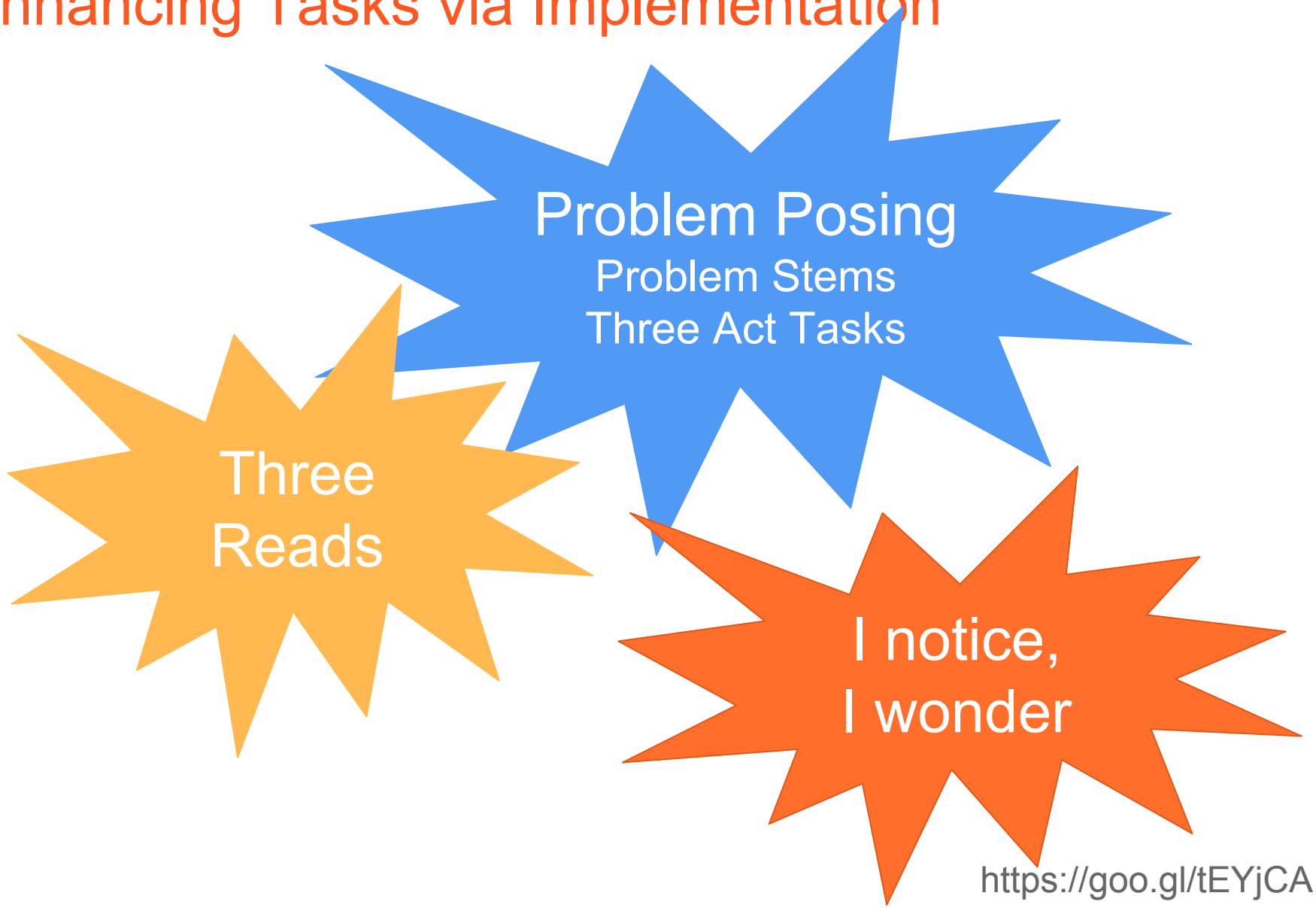
Enhancing Tasks via Implementation



The day-in and day-out cumulative effect of classroom-based tasks leads to the development of students' implicit ideas about the nature of mathematics – about whether mathematics is something about which they can personally make sense and about how long and how hard they should have to work to do so.

- Stein and Smith, 1998, p. 269

On views of math and math learning

Impact of Mathematics Tasks

- The narrowness by which success in mathematics class is often judged means that some students will rise to the top, gaining good grades and teacher praise, whilst others sink to the bottom.
- When there are many ways to be successful, many more students are successful.
- Tasks that are multidimensional provide all students with the opportunity to engage in mathematical work.

- Boaler & Staples, 2008

On access and equity

Impact of Mathe

An open-ended task offers many more opportunities for success for all students than traditional tasks that recognize only one correct solution and one way to achieve it.

- Borasi & Fonzi, 2010

Different resources and hands-on materials attract more students and entice them to participate, thus opening additional avenues for students to understand the learning task.

- Lotan, 2003

Impact of Mathematic

On engagement and motivation

Reflecting on our Mathematics Tasks

Consider the characteristics of tasks that are “typical” to your curriculum materials and implementation:

- What implicit ideas are your students developing about what mathematics “is” and what it means to “do” math?
- What are you feeling the greatest need to reform/refine as a consequence?
- What are ways you could begin this reform/refinement process?

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Resources

https://goo.gl/opMZjA

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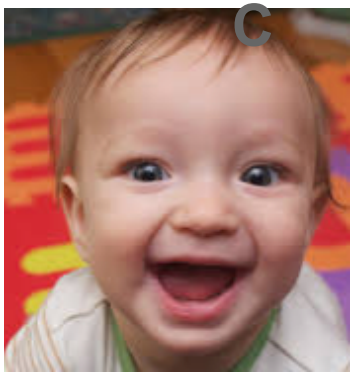
Sweller, J., Mawcr, R.F., & Ward, M.R. (1983). Development of expertise in mathematical problem solving. *Journal of Experimental Psychology,* 112: 639-661.

Meet Your Elbow Partner

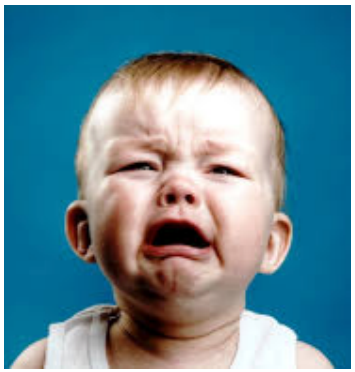
A



C

B

D



Find someone nearby to be your elbow partner. Introduce yourself and use a simile sentence frame...

The tasks in my curriculum are like _____ because _____.

OR

The tasks in my curriculum are not like _____ because