

- **Launch, Explore, Summarize:**
Strategies to Implement a Problem-Based Lesson



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OREGON
REPORT CARD
2016-17

**ENROLLMENT AND
DEMOGRAPHICS**

	Grades K - 3	Grades 4 - 5	Grades 6 - 8	Grades 9 - 12
Total Enrollment	3,238	1,696	2,358	3,036
Regular Attenders	84.2%	86.2%	83.6%	71.3%
Economically Disadvantaged	77%	77%	75%	74%
Students with Disabilities	11%	11%	13%	11%
Ever English Learners	39%	43%	47%	48%
Different Languages Spoken	43	41	41	45
Mobile Students	16.3%	13.8%	15.3%	15.2%

Practices of Ambitious Teaching

1. Beginning and closing activity to facilitate entry and summary of work.
2. Working towards a mathematical goal.
3. Eliciting and responding to students' mathematical contributions.
4. Representing student thinking verbally and on the board.
5. Orienting students to one another's ideas and to the mathematics.
6. Positioning students as competent mathematical thinkers.
7. Assessing student understanding.
8. Managing time, space, voice, and manner.

Lampert, M., Franke, M., Kazemi, E., Ghouseini, H., Turrou, A.C., Beasley, H., Cunard, A., & Crowe, K. (2013). Keeping it complex: Using rehearsals to support novice teacher learning of ambitious teaching in elementary mathematics. *Journal of Teacher Education*, 64, 226-243.

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LAUNCH

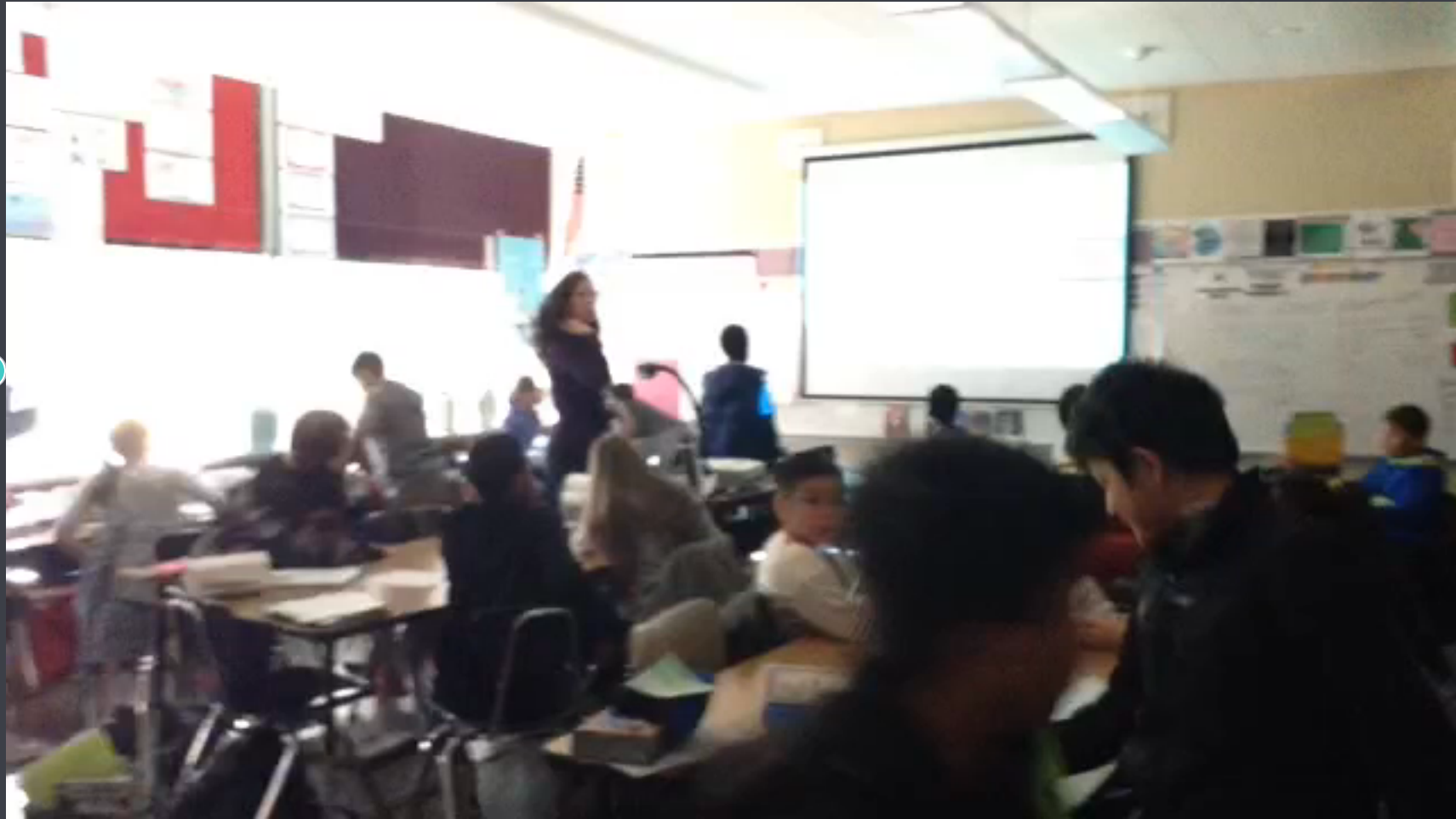
- Launching Complex Tasks
 - Read the article.
 - What is the purpose of an effective Launch?
 - What are the four crucial aspects of an effective Launch?

THREE READS & PROBLEM STEM



WAYNE BUND, 1ST GRADE

THREE ACT TASK & I NOTICE, I WONDER



CARLA MONTOYA, 5TH GRADE

Structures for a Launch

- I notice, I wonder (Annie Fetter & Max Ray-Riek)
- Three Reads (Kelemanik & Lucenta)
- Problem Stem (Phil Daro or Tracy Zager)
- Three-Act Tasks – Act 1 (Dan Meyer or Graham Fletcher)
- Which One Doesn't Belong (Christopher Danielson)
- Math/Number/Pattern Talks or Number Strings (Cathy Fosnot or Sherry Parrish or Ruth Parker or Cathy Humphreys)
- Other?

<https://sites.google.com/pdx.edu/eamml>

Navigate to the Lesson Study Tab



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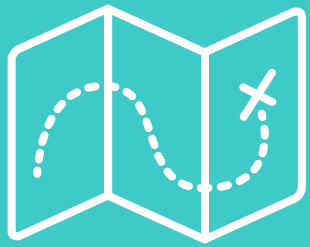
TURN AND TALK

How does the launch support equity and increase access to the mathematics task?

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EXPLORE

- 3 KEY FEATURES OF GROUPWORK

- 1. Worthwhile task
- 2. Authority delegated to students
- 3. Members need one another to complete the task

Cohen, E.G. & Lotan, R.A. (2014). Designing groupwork: Strategies for the heterogeneous classroom (3rd ed.). New York: Teachers College Press.

THINK, WRITE, SHARE

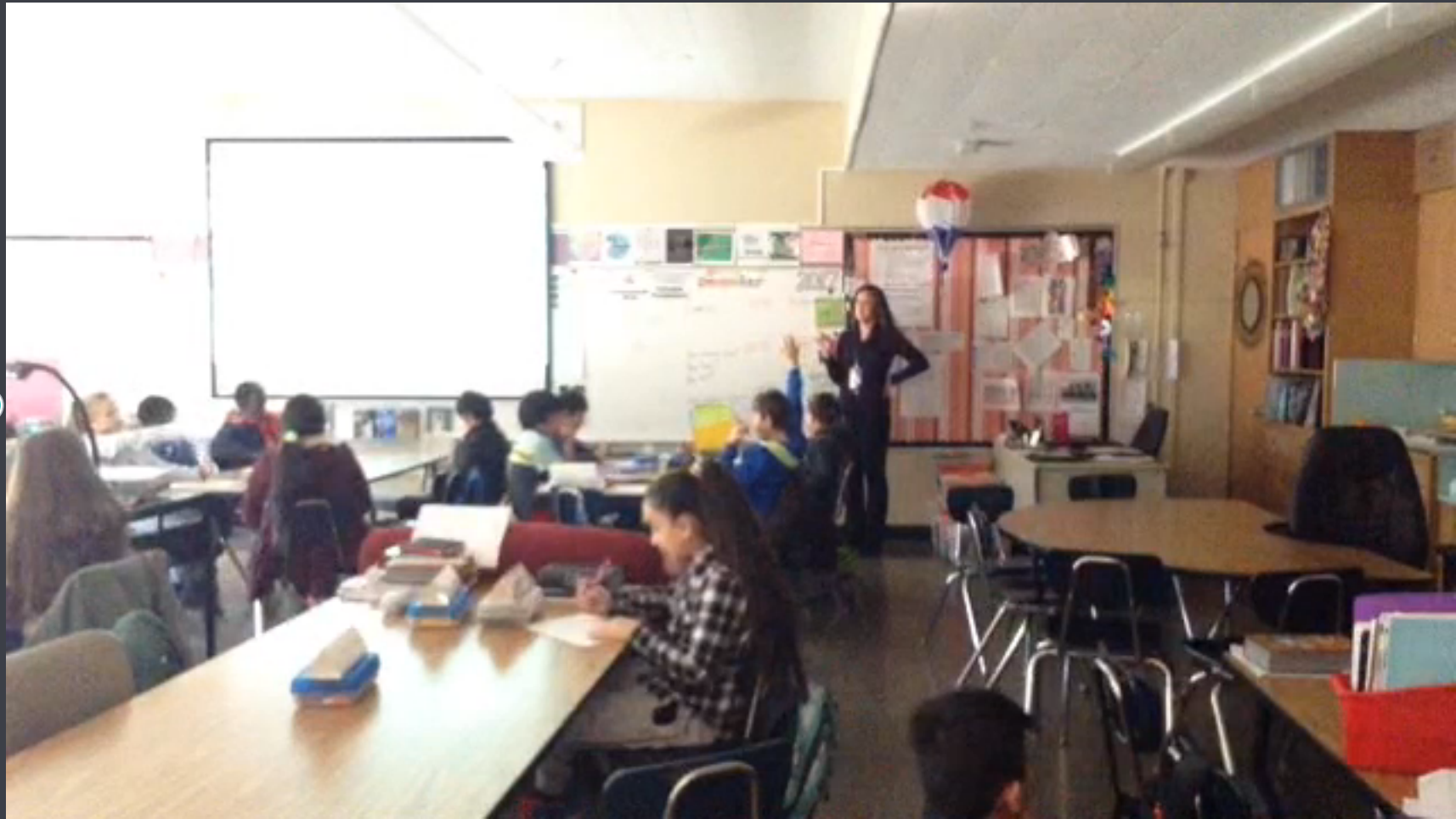
- What are traditional classroom norms?
- How would the norms for groupwork differ from traditional classroom norms?
- What behaviors would students need to learn to participate effectively in groupwork?



Norms for Groupwork	Behaviors	Skillbuilders
Responding to the needs of the group	• Pay attention to what other group members need. • No one is done until everyone is done.	Broken Circles Broken Squares
Learning to help, ask questions, and explain	• Discuss and decide. • Give reasons for your suggestions. • Explain by telling how. • Everyone helps. • Help others do things for themselves. • Find out what others think. • Tell why.	Rainbow Logic Master Designer Four-Stage Rocket Guess My Rule

Norms for Groupwork	Behaviors	Skillbuilders
Preventing dominance	• Everyone gives information. • Make a plan. • Agree on strategies. • Describe accurately and in detail. • Say your own ideas. • Listen to others; give everyone a chance to talk. • Ask others for their ideas. • Give reasons for your ideas.	Shipwreck Space Ship Alligator River

DETERMINING GROUPS



CARLA MONTOYA, 5TH GRADE

TURN AND TALK

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How does the Explore support equity and increase access to the mathematics task?

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“Groupwork is...a superior technique for conceptual learning, for creative problem solving, and for developing academic language proficiency. Socially, it will improve intergroup relations by increasing trust and friendliness... Most important, groupwork provides greater access to the learning tasks to more students in the classroom with a wide range of academic skills and linguistic proficiency. Productive groupwork increases and deepens opportunities to learn content and develop language and thus has the potential to build equitable classrooms.”

Cohen, E.G. & Lotan, R.A. (2014). *Designing groupwork: Strategies for the heterogeneous classroom* (3rd ed.). New York: Teachers College Press.



SUMMARIZE

How Expert Discussion Facilitation is Characterized

- **Skillful improvisation...**
 - Diagnose students' thinking on the fly
 - Fashion responses that guide students to evaluate each others' thinking, and promote building of mathematical content over time.

Stein, M.K., Engle R.A., Smith, M.S., & Hughes, E.K. (2008) Orchestrating Productive Mathematical Discussions: Five Practices for Helping Teachers Move Beyond Show and Tell, *Mathematical Thinking and Learning*, 10:4, 313-340, DOI: 10.1080/10986060802229675

How Expert Discussion Facilitation is Characterized

- ...requires deep knowledge of:
 - Relevant mathematical content
 - Student thinking about it and how to diagnose it.
 - Subtle pedagogical moves
 - How to rapidly apply all of this in specific circumstances

Stein, M.K., Engle R.A., Smith, M.S., & Hughes, E.K. (2008) Orchestrating Productive Mathematical Discussions: Five Practices for Helping Teachers Move Beyond Show and Tell, *Mathematical Thinking and Learning*, 10:4, 313-340, DOI: 10.1080/10986060802229675

Some Sources of Challenge in Facilitating Discussions

- Lack of familiarity
- Reduces teachers' perceived level of control
- Requires complex, split-second decisions
- Requires flexible, deep, and interconnected knowledge of content, pedagogy and students.

Five⁺ Practices for Orchestrating Productive Mathematics Discussions

O₁ Identifying learning goal

O₂ Selecting a mathematical task

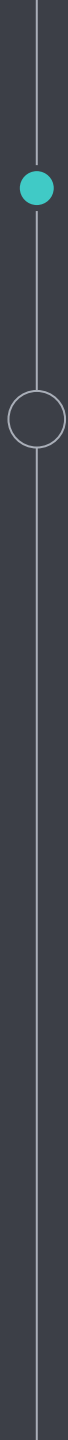
1. Anticipating (e.g., Fernandez & Yoshida, 2004; Schoenfeld, 1998)
2. Monitoring (e.g., Hodge & Cobb, 2003; Nelson, 2001; Shifter, 2001)
3. Selecting (Lampert, 2001; Stigler & Hiebert, 1999)
4. Sequencing (Schoenfeld, 1998)
5. Connecting (e.g., Ball, 2001; Brendehur & Frykholm, 2000)

Smith, M.S., & Stein, M.K. (2015). 5 practices for orchestrating productive mathematics discussions. Reston, VA: National Council of Teachers of Mathematics.

Purpose of the Five⁺ Practices

To make student-centered instruction more manageable by moderating the degree of improvisation required by the teachers and during a discussion.

Smith, M.S., & Stein, M.K. (2015). 5 practices for orchestrating productive mathematics discussions. Reston, VA: National Council of Teachers of Mathematics.



You fill 8 drinking glasses $\frac{3}{4}$ of the way full. How many of those glasses could you have filled to the top instead?

5 Practices Organizer

Strategy	Work of Specific Students	Sequence	Compare	Questions to Assess	Questions to Advance

Questioning – 4 Question Types

Gathering Information	Students recall facts, definitions, or procedures
Probing Thinking	Students explain, elaborate, or clarify their thinking, including articulating the steps in solution methods or the completion of a task.
Making the mathematics visible	Students discuss mathematical structures and make connections among mathematical ideas and relationships.
Encouraging reflection and justification	Students reveal deeper understanding of their reasoning and actions making an argument for the validity of their work.

Principles to actions: Ensuring mathematical success for all. (2014) Reston, VA: NCTM, National Council of Teachers of Mathematics.

Having a hard time determining what questions to ask?

Developing Mathematical Thinking with Effective Questions

To help students build confidence and rely on their own understanding, ask...

- Why is that true?
- How did you reach that conclusion?
- Does that make sense?
- Can you make a model to show that?

To help students learn to reason mathematically, ask...

- Is that true for all cases? Explain.
- Can you think of a counterexample?
- How would you prove that?
- What assumptions are you making?

To check student progress, ask...

- Can you explain what you have done so far? What else is there to do?
- Why did you decide to use this method?
- Can you think of another method that might have worked?
- Is there a more efficient strategy?
- What do you notice when...?
- Why did you decide to organize your results like that?
- Do you think this would work with other numbers?
- Have you thought of all the possibilities? How can you be sure?

To help students collectively make sense of mathematics, ask...

- What do you think about what ____ said?
- Do you agree? Why or why not?
- Does anyone have the same answer but a different way to explain it?
- Do you understand what ____ is saying?
- Can you convince the rest of us that your answer makes sense?

To encourage conjecturing, ask...

- What would happen if...? What if not?
- Do you see a pattern? Can you explain the pattern?
- What are some possibilities here?
- Can you predict the next one? What about the last one?
- What decision do you think he/she should make?

What other questions would you add to this list?

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Developing Mathematical Thinking with Effective Questions

To promote problem solving, ask...

- What do you need to find out?
- What information do you have?
- What strategies are you going to use?
- Will you do it mentally? With pencil and paper? Using a number line?
- Will a calculator help?
- What tools will you need?
- What do you think the answer or result will be?

To help when students get stuck, ask...

- How would you describe the problem in your own words?
- What do you know that is not stated in the problem?
- What facts do you have?
- How did you tackle similar problems?
- Could you try it with simpler numbers? Fewer numbers? Using a number line?
- What about putting things in order?
- Would it help to create a diagram? Make a table? Draw a picture?
- Can you guess and check?
- Have you compared your work with anyone else? What did other members of your group try?

To make connections among ideas and applications, ask...

- How does this relate to...?
- What ideas that we have learned before were useful in solving this problem?
- What uses of mathematics did you find in the newspaper last night?
- Can you give me an example of...?

To encourage reflection, ask...

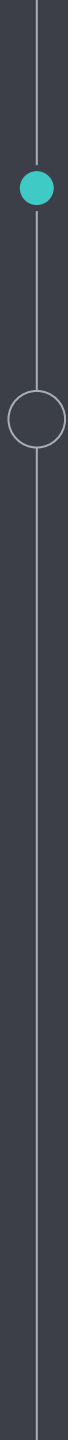
- How did you get your answer?
- Does your answer seem reasonable? Why or why not?
- Can you describe your method to us all? Can you explain why it works?
- What if you had started with... rather than...?
- What if you could only use...?
- What have you learned or found out today?
- Did you use or learn any new words today? What do they mean? How do you spell them?
- What are the key points or big ideas in this lesson?

What other questions would you add to this list?

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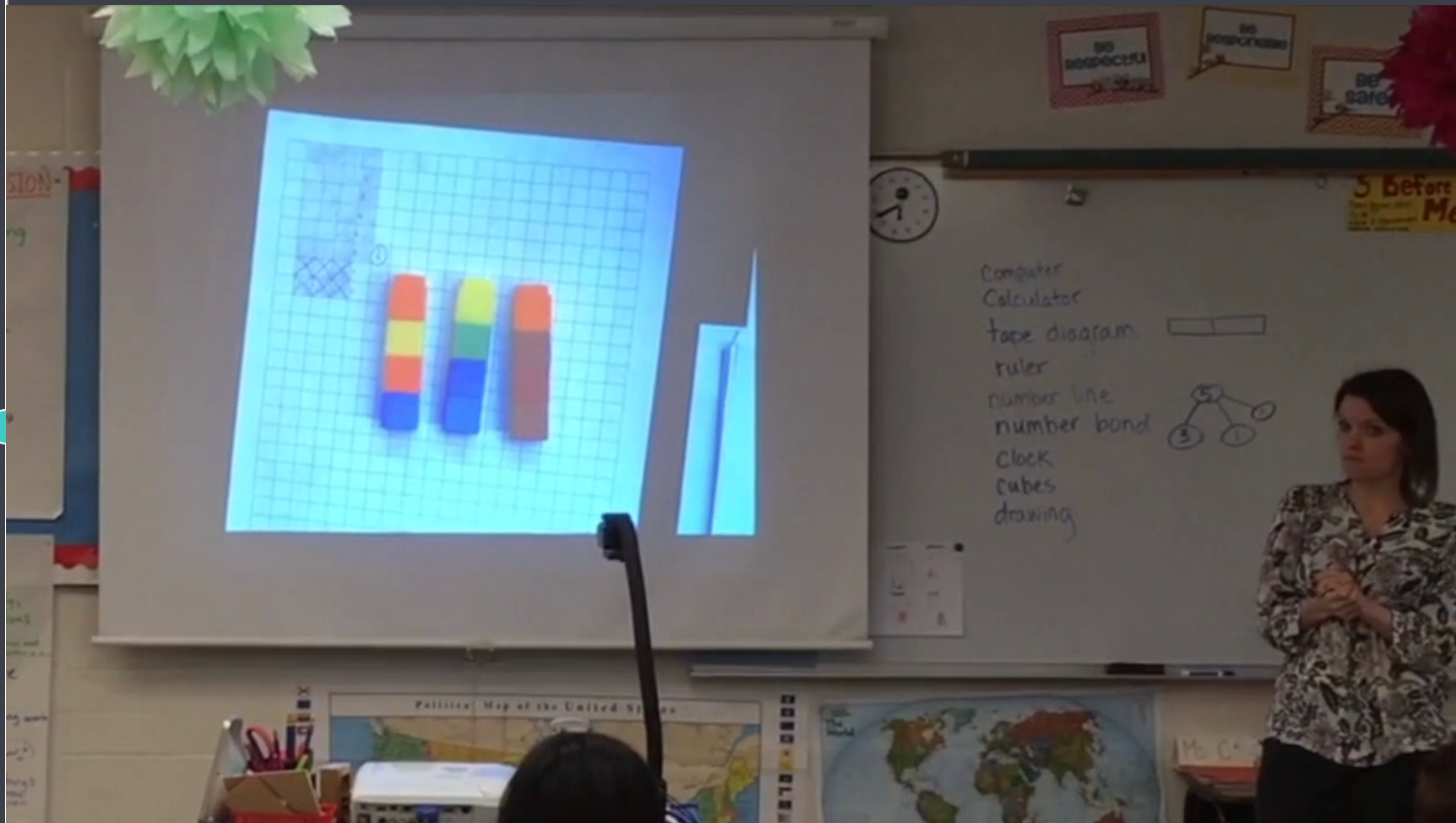
PBS TeacherLine is funded by a grant from the U.S. Department of Education.

<https://sites.google.com/pdx.edu/eamm1>
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SUMMARIZE



SARAH WOLFGANG, 4TH GRADE



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Thanks!

ANY QUESTIONS?

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