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Teaching High School Students to Speak the Language of Math

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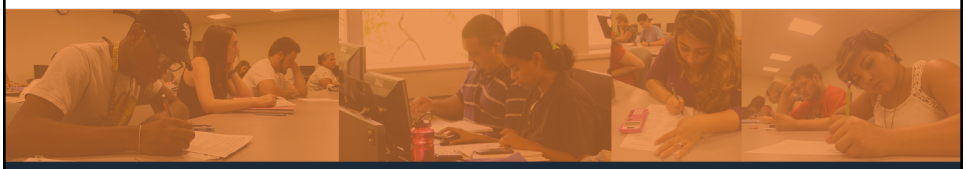
Professional Learning Facilitators, K-12 Education Strategy, Policy, and Services

April 23, 2018, NCSM Annual Conference



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About the Dana Center

Equity — Access — Excellence

2018

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Dana Center by the Numbers

We supported 60,500 K–12 students attending school on U.S. military bases through our work with the **Department of Defense Education Activity**.

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Dana Center by the Numbers

We engaged with 118 districts in 23 states to provide middle and high school math courses of the **highest quality** as recognized by rigorous state and national reviews, including EdReports.org.

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Dana Center by the Numbers

At the close of 2017, the Dana Center has contributed to the **implementation of math pathways** in higher ed systems, institutions, and campuses in 29 states.

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Agile Mind: Ultimate Invaders Task

Used with permission of Agile Mind, Inc., the animation "The Ultimate Invaders Alien Family," which appears in *Mathematics 7*, part of the family of programs in middle school mathematics by the Charles A. Dana Center and Agile Mind, Inc.. Available to users of Dana Center/Agile Mind programs in mathematics and science.

To learn more about the middle school family of programs, see http://www.agilemind.com/programs/mathematics/middle-school-math.

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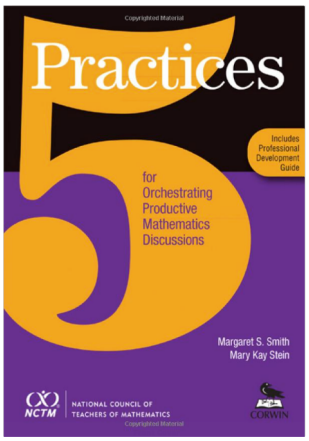
5 Practices for Orchestrating Productive Mathematics Discussions



— Smith, M. S., & Stein, M. K. (2011). *5 practices for orchestrating productive mathematics discussions.* Reston, VA: National Council of Teachers of Mathematics. Available at http://www.nctm.org/Store/Products/5--Practices-for-Orchestrating-Productive-Mathematics-Discussions

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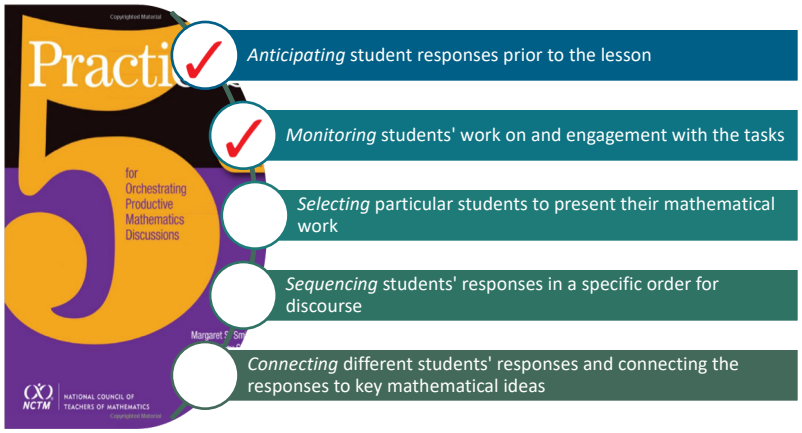

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Orchestrating productive mathematics discussions

Anticipating student responses prior to the lesson

What should you consider?	How is this supported?
• The strategies that students must use to approach or solve a challenging mathematical task • How to respond to what students produce • Which strategies are most useful in addressing the mathematics to be learned	• Solving the problem in as many ways as possible • Solving the problem with other teachers • Drawing on relevant research when possible • Documenting student responses year to year

— Adapted from Smith, M. S., & Stein, M. K. (2011). *5 practices for orchestrating productive mathematics discussions.* Reston, VA: National Council of Teachers of Mathematics.

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Orchestrating productive mathematics discussions

Monitoring students' work on, and engagement with, the task

What does this involve?	How is this supported?
• Circulating while students work, watching and listening • Recording interpretations, strategies, and points of confusion • Asking probing questions to get students back "on track" or to advance their understanding	• *Anticipating* student responses beforehand • Using a recording tool • Observing students' actual responses during independent work

— Adapted from Smith, M. S., & Stein, M. K. (2011). *5 practices for orchestrating productive mathematics discussions.* Reston, VA: National Council of Teachers of Mathematics.

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Orchestrating productive mathematics discussions

Working with participants at your table:

- Sort your questions into different groups.
- Use a sticky note to label each group of questions and define how you sorted the questions into each group.
- Make note of distinctions between the categories you created.

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Question types

Question Type	Description
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, including making an argument for the validity of their work.

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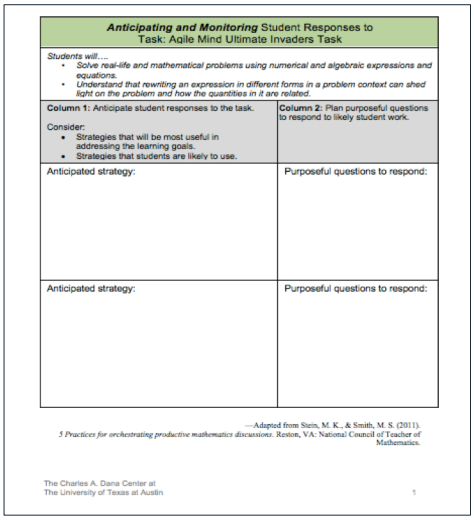
Anticipating and monitoring discourse

With a partner, use the Agile Mind Ultimate Invaders task to:

1) Discuss how you anticipate students will respond.

2) Plan possible probing questions to help students through the problem.



Anticipating and Monitoring Student Responses to Task: Agile Mind Ultimate Invaders Task

Students will….
- *Solve real-life and mathematical problems using numerical and algebraic expressions and equations.*
- *Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.*

Column 1: Anticipate student responses to the task. Consider: • Strategies that will be most useful in addressing the learning goals. • Strategies that students are likely to use.	**Column 2:** Plan purposeful questions to respond to likely student work.
Anticipated strategy:	Purposeful questions to respond:
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—Adapted from Stein, M. K., & Smith, M. S. (2011). *5 Practices for orchestrating productive mathematics discussions*. Reston, VA: National Council of Teacher of Mathematics.

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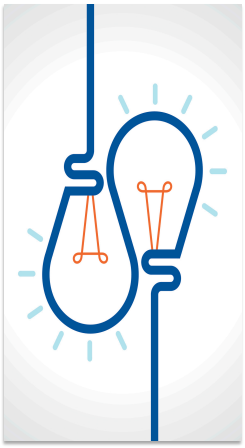
Reflection



Credit: ARTOLI/iStock/Thinkstock

How can you apply this new learning to support teachers in orchestrating productive mathematical discourse in the classroom?

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