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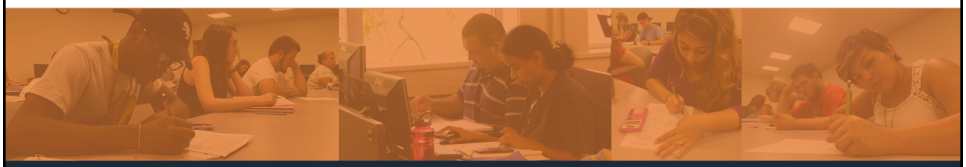
Teaching Elementary Students to Speak the Language of Mathematics Through Mathematical Discourse

Michael Greenlee, Professional Learning Facilitator, Elementary Math

April 3, 2019, NCSM Annual Conference



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Dana Center by the Numbers

We provided professional development for **Department of Defense Education Activity teachers**, benefiting 88,500 students in 14 countries.

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Dana Center by the Numbers

1,000
teacher-leaders

Nearly 1,000 Louisiana teacher-leaders and mentors received **capacity building support** from our professional learning facilitators.

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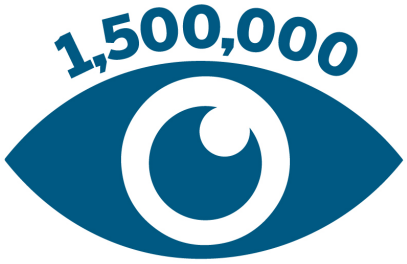
Dana Center by the Numbers



People who viewed MathCuts—**quick, engaging strategies** for K–6 classroom teachers—on Facebook.

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Visit the Dana Center website at utdanacenter.org.

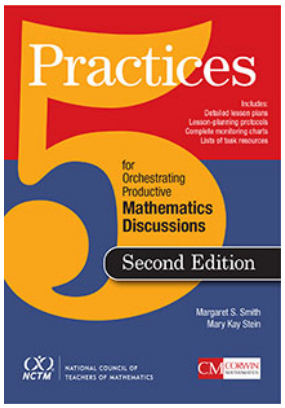
Find us on Facebook at facebook.com/utdanacenter or on Twitter at @UTDanaCenter.

Objective

Understand a process for orchestrating productive mathematical discourse and how it can deepen student understanding.

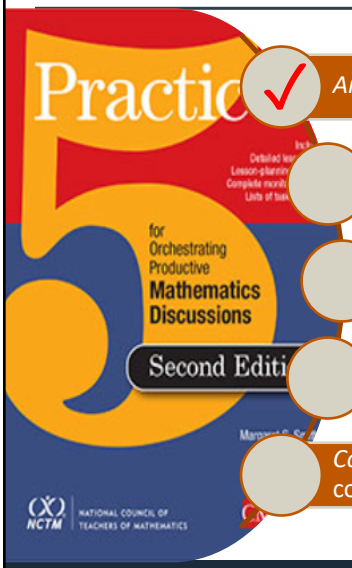
The National Council of Teachers of Mathematics book

5 Practices for Orchestrating Productive Mathematics Discussions



—Smith, M. S., & Stein, M. K. (2018, second edition.). *5 practices for orchestrating productive mathematics discussions.* Reston, VA: National Council of Teachers of Mathematics. Available at https://www.nctm.org/Store/Products/5-Practices-for-Orchestrating-Productive-Mathematics-Discussion,-2nd-Edition

5 Practices for Orchestrating Productive Mathematics Discussions



- *Anticipating* student responses prior to the lesson
- *Monitoring* students' work on—and engagement with—the tasks
- *Selecting* particular students, or groups of students, to present their mathematical work
- *Sequencing* students' responses in a specific order for discussion
- *Connecting* different students' responses, and connecting the responses to key mathematical ideas

Anticipating student responses

Mathematics

Consider which strategies are likely to be most useful in addressing the content.

Consider which strategies students are likely to use.

Consider how to respond to likely student work.

Orchestrating productive mathematics discussions

A third-grade class is setting up chairs for a school talent show. The class needs to set up 8 rows of chairs with 30 chairs in each row, leaving space in the middle for a center aisle. The class needs to know how many chairs they need to get out of storage to set up for the show.

Learning goal: How is the structure of multiplication evident in different representations?

Anticipating student responses

Mathematics

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- Consider which strategies students are likely to use.
- Consider how to respond to likely student work.

Anticipating student responses

Planning for Mathematical Discourse

Math Task: **Content Standard(s):**

Strategy	Student or Small Group	Work To Be Shared	Order
Anticipating student responses prior to the lesson	*Selecting* particular students, or groups of students, to present their mathematical work	*Selecting* students to present their work; *Connecting* different students' responses, and connecting the responses to key mathematical ideas	*Sequencing* students' responses in a specific order for discussion

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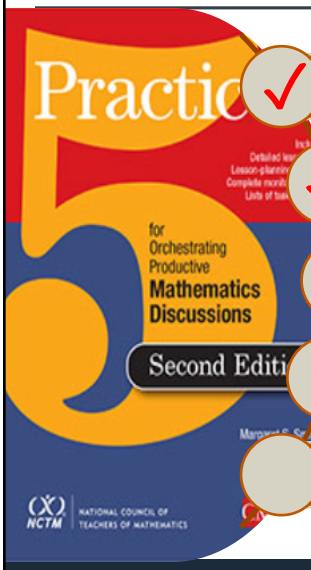
5 Practices for Orchestrating Productive Mathematics Discussions



- ✓ *Anticipating* student responses prior to the lesson
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- *Sequencing* students' responses in a specific order for discussion
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Orchestrating productive mathematics discussions

Monitoring **students' work on—and engagement with—the tasks**

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

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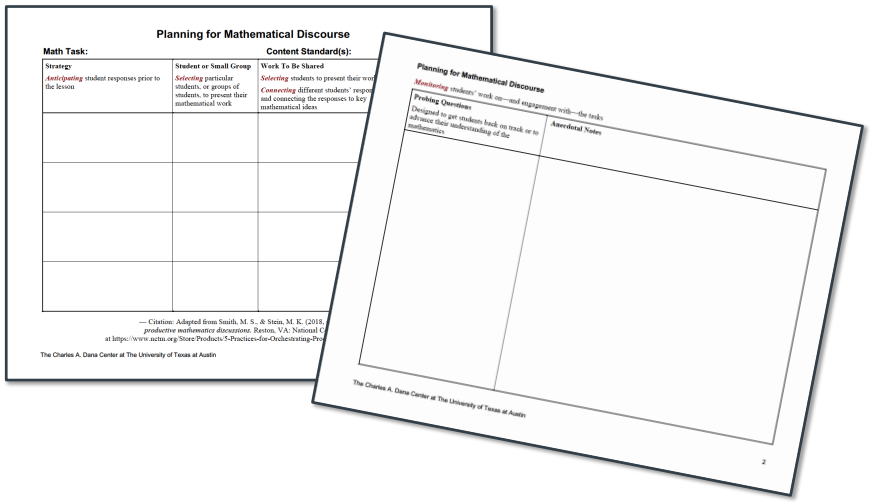

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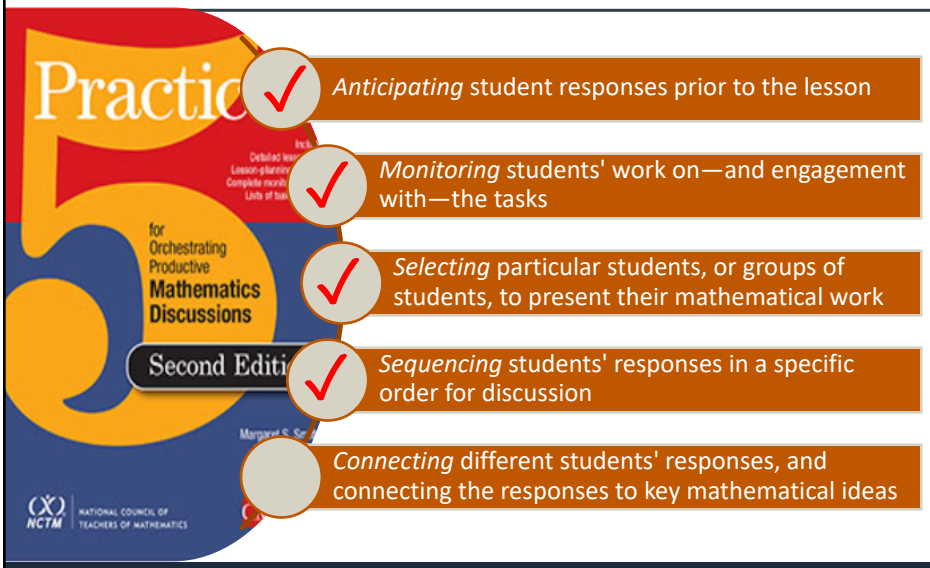

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Orchestrating productive mathematics discussions

Selecting **particular students, or groups of students, to present their mathematical work**

What does this involve?	How is this supported?
• Choosing students to present because of the mathematics in their responses • Making sure that over time, all students are seen as authors of mathematical ideas and have the opportunity to demonstrate competence • Gaining some control over the content of the discussion	• Anticipating and monitoring • Planning in advance which types of responses to select, perhaps considering an incorrect solution to illustrate a typical misconception • Being ready to consider unanticipated solutions

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Planning for Mathematical Discourse

Math Task: **Content Standard(s):**

Strategy	Student or Small Group	Work To Be Shared	Order
Anticipating student responses prior to the lesson	***Selecting*** particular students, or groups of students, to present their mathematical work	***Selecting*** students to present their work; ***Connecting*** different students' responses, and connecting the responses to key mathematical ideas	***Sequencing*** students' responses in a specific order for discussion

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Sequencing **students' responses in a specific order for discussion**

What does this involve?	How is this supported?
• Purposefully ordering presentations so that the mathematics is accessible to all students • Building a mathematically coherent story line from prior knowledge to current grade-level standards	• Anticipating, monitoring, and selecting • During *anticipation* work, considering how possible student responses are mathematically related

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Planning for Mathematical Discourse

Math Task: **Content Standard(s):**

Strategy *Anticipating* student responses **before** the lesson	Student or Small Group *Selecting* students to present their work	Work To Be Shared *Selecting* students to present their work; *Connecting* responses to one another and to key mathematical ideas	Order *Sequencing* responses in a specific order for discussion

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Orchestrating productive mathematics discussions

Ways to *Sequence*

- Begin with the strategy used by most of your students before moving to those strategies used by only a few students.
- Begin with a strategy that is more concrete, then move to strategies that are more abstract.
- Present strategies that address common misconceptions.
- Present related or contrasting strategies one right after another.

Orchestrating productive mathematics discussions

A third-grade class is setting up chairs for a school talent show. The class needs to set up 8 rows of chairs with 30 chairs in each row, leaving space in the middle for a center aisle. The class needs to know how many chairs they need to get out of storage to set up for the show.

Learning goal: How is the structure of multiplication evident in different representations?

Orchestrating productive mathematics discussions

With your group, analyze the student work samples for strategies and misconceptions, then...

- *Select* student work that would best represent the strategies that would help build understanding of the math.
- *Sequence* the selected student work in the order that your group determines would best help the students make sense of the math.
- Fill in the tool to illustrate your selected strategies and the sequence you would have them presented in during your class to help students make sense of the math.

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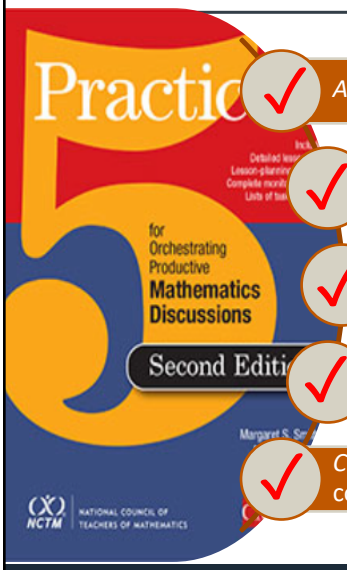
5 Practices for Orchestrating Productive Mathematics Discussions



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Orchestrating productive mathematics discussions

Connecting **different students' responses, and**
connecting **the responses to key mathematical ideas**

What does this involve?	How is this supported?
• Encouraging students to use questioning to make mathematical connections between different student responses • Making salient the key mathematical ideas that are the focus of the lesson • Considering extensions as they come from the students or the teacher	• Anticipating, monitoring, selecting, and sequencing • Considering how students might be prompted to recognize mathematical relationships between responses • Cultivating a classroom culture with explicit supports for student discourse

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Orchestrating productive mathematics discussions

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Orchestrating productive mathematics discussions

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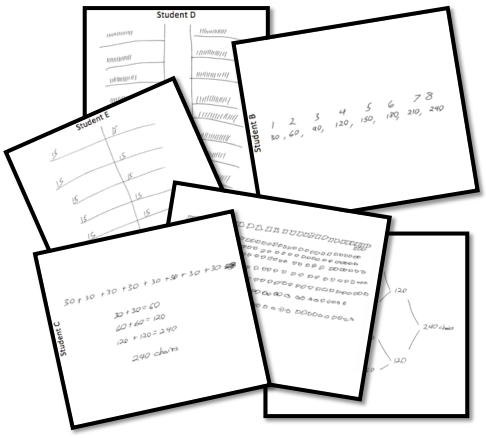
Learning goal: How is the structure of multiplication evident in different representations?

Orchestrating productive mathematics discussions

Write notes to describe how you would make connections between the students' strategies—and how you would connect these strategies to the learning goal.



Orchestrating productive mathematics discussions

Take a few minutes to think about and answer the following questions:

- What strategies can you use to ensure that ALL students engage in mathematical discourse in your classroom?
- What can you do to leverage incorrect or incomplete reasoning or solutions to strengthen the learning of all students?
- Based on your learning for this section, what action step(s) might you take in order to foster student mathematical discourse in your classroom?

Contact information

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