Developing Student Strategies Through Student Discourse

Presented by: Melissa Canham

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Today’s Objectives

• Teachers will use their knowledge of the CCSS-M and Cognitively Guided Instruction to discuss orchestrating classroom discourse.

• Through analyzing the 6 Steps of Orchestrating Classroom Discourse, teachers will discuss the selection of number choices and the development of student strategies.
Problem solving is the focus of instruction; teachers pose a variety of problems.

Many problem-solving strategies are used to solve problems. Children decide how they should solve each problem.

Children communicate to their teachers and peers how they solved the problems.

Teachers understand children’s problem-solving strategies and use that knowledge to plan instruction.
## Levels of Classroom Discourse

<table>
<thead>
<tr>
<th>Level</th>
<th>Teacher Role</th>
<th>Questioning</th>
<th>Explaining Mathematical Thinking</th>
<th>Mathematical Representations</th>
<th>Building Student Responsibility within the Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Teacher is at the front of the room and dominates conversation.</td>
<td>Teacher only questions. Questions serve to keep students listening to teacher. Students give short answers to teacher, and may not respond to teacher.</td>
<td>Teacher questions focus on correctness. Students provide short answer-focused responses. Teacher may ask questions of one another.</td>
<td>Representations are not teacher-centered. Students ask contrast statements about their own ideas and the ideas of the class.</td>
<td>Culture supports students keeping ideas to themselves or just providing answers when asked.</td>
</tr>
<tr>
<td>Level 2</td>
<td>Teacher enables sharing of mathematical ideas and directs students.</td>
<td>Teacher encourages students to ask questions of one another.</td>
<td>Teacher follows student explanations closely. Teacher asks students to contrast strategies. Students defend and justify their answers with little prompting from the teacher.</td>
<td>Students follow and help shape the descriptions of others' math thinking through math drawings and may suggest edits in others' math drawings.</td>
<td>Students believe that they are math learners and can help shape the thinking of others. They help shape others' math thinking in supportive, collegial ways and accept the same support from others.</td>
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<tr>
<td>Level 3</td>
<td>Students carry the conversation themselves. Teacher only guides from the periphery of the conversation. Teacher waits for students to clarify thinking of others.</td>
<td>Student-to-student talk is student initiated. Students ask questions and listen to responses. Many questions ask &quot;why&quot; and call for justification. Teacher questions may still guide discourse.</td>
<td>Teacher follows student explanations closely. Teacher asks students to contrast strategies. Students defend and justify their answers with little prompting from the teacher.</td>
<td>Students follow and help shape the descriptions of others' math thinking through math drawings and may suggest edits in others' math drawings.</td>
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**Fig. 11.** Levels of classroom discourse. From Hufford-Ackles, Fuson, and Sherin (2014), table 1.
Orchestrating Classroom Discourse

- **Design of Instruction**: writing or selecting a problem or task
- **Anticipating** likely student responses to cognitively demanding mathematical tasks
- **Monitoring** students’ responses to the tasks during the explore phase
- **Selecting** particular students to present their mathematical responses during the discuss-and-summarize phase
Orchestrating Classroom Discourse

• Purposefully *sequencing* the student responses that will be displayed

• Helping the class *make mathematical connections* between different students’ responses and between students’ responses and key ideas
A paleontologist wants to build a display for her t-rex fossil. She measured the space and needs ____ ft. of wood. She already has ____ ft. of wood from another project. How much more wood does she need?

Considering your class, what number choices might you consider for this problem? Why might have these number choices been selected?
“to select productive number choices that move individual children’s thinking forward, we first need to attend to the details in their strategies and the understandings reflected in those details”

- Vicki Jacobs
Don’t Forget Your Problem Types!

**Table 1. Common addition and subtraction situations.**

<table>
<thead>
<tr>
<th>Result Unknown</th>
<th>Change Unknown</th>
<th>Start Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add to</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Join</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now?</td>
<td>Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two?</td>
<td>Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before?</td>
</tr>
<tr>
<td>$2 + 3 = ?$</td>
<td>$2 + ? = 5$</td>
<td>$? + 3 = 5$</td>
</tr>
<tr>
<td>Take from</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Separate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five apples were on the table. I ate two apples. How many apples are on the table now?</td>
<td>Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat?</td>
<td>Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before?</td>
</tr>
<tr>
<td>$5 - 2 = ?$</td>
<td>$5 - ? = 3$</td>
<td>$? - 2 = 3$</td>
</tr>
<tr>
<td>Put Together/Take Apart</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Part-Part-Whole</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three red apples and two green apples are on the table. How many apples are on the table?</td>
<td>Five apples are on the table. Three are red and the rest are green. How many apples are green?</td>
<td>Grandma has five flowers. How many can she put in her red vase and how many in her blue vase?</td>
</tr>
<tr>
<td>$3 + 2 = ?$</td>
<td>$3 + ? = 5, 5 - 3 = ?$</td>
<td>$5 = 0 + 5, 5 = 5 + 0$</td>
</tr>
<tr>
<td><strong>Compare</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(“How many more? Version”): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy?</td>
<td>(“Version with ‘more’”): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have?</td>
<td>(“Version with ‘more’”): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have?</td>
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<tr>
<td>(“How many fewer?” Version”): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie?</td>
<td>(“Version with ‘fewer’”): Lucy has three fewer apples than Julie. Lucy has two apples. How many apples does Julie have?</td>
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<th>Difference Unknown</th>
<th>Bigger Unknown</th>
<th>Smaller Unknown</th>
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**Equal Groups**

- There are 3 bags with 6 plums in each bag. How many plums are there in all? Measurement example. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?

- If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? Measurement example. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?

- If 18 plums are to be packed 6 to a bag, then how many bags are needed? Measurement example. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?

- **Multiplication**
  - $3 \times 6 = ?$

- **Partitive Division**
  - $3 \div 18$ and $19 + 3 = ?$

- **Measurement Division**
  - $? \div 18$ and $19 + 6 = ?$
**Anticipating Likely Student Responses**

- Considering a 2\textsuperscript{nd} grade class, how do you think students might approach this task?
  - How might students interpret the problem?
  - What strategies, both correct and incorrect, might students use?
  - As a teacher, what strategies would you like your students to learn for this problem?
Monitoring Students’ Responses
## Selecting, Sequencing, and Making Mathematical Connections

With your table, pick two or three students that you would have share during the debrief.

- Why did you choose them?
- What order would you have them present? Why?
- What ideas would you try to bring out with the class?
- What questions would you ask?
Student Share Out
What Do You Do Next?

• What does the next day’s lesson look like?
  • Open strategy sharing vs. Targeted Discussions

• Where would we want to go next with Cheyenne’s class?

• How do we push students along the problem solving trajectory?
Compare and Connect

**Goal:** To compare and similarities and differences among strategies

**Important things to consider:**
- What is the instructional goal?
- What mathematical connections do you want your students to make between strategies?
Follow Up Lesson

same
use friendly 10
answer
fact family
different
number bond/PPW
Subtraction/addition
Strategies
C Started with 40
A Started with 17
Let’s Discuss!

- How did Cheyenne highlight the strategy that she wanted to focus on?

- What questions did Cheyenne ask to help her students Compare and Connect?
  - How did her students respond?

- What would be Cheyenne’s next step?
What Standards Were Addressed?
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Thank You!!!

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