Teaching High School Students to Speak the Language of Math

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About the Dana Center

Equity — Access — Excellence
Dana Center by the Numbers

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

Dana Center by the Numbers

118
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.
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.

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.
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 to present their mathematical work

Sequencing students’ responses in a specific order for discourse

Connecting different students’ responses and connecting the responses to key mathematical ideas
## Orchestrating productive mathematics discussions

### Anticipating student responses prior to the lesson

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


### Monitoring students’ work on, and engagement with, the task

<table>
<thead>
<tr>
<th>What does this involve?</th>
<th>How is this supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Circulating while students work, watching and listening</td>
<td>• <em>Anticipating</em> student responses beforehand</td>
</tr>
<tr>
<td>• Recording interpretations, strategies, and points of confusion</td>
<td>• Using a recording tool</td>
</tr>
<tr>
<td>• Asking probing questions to get students back “on track” or to advance their understanding</td>
<td>• Observing students’ actual responses during independent work</td>
</tr>
</tbody>
</table>

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.

### Question types

<table>
<thead>
<tr>
<th>Question Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering information</td>
<td>Students recall facts, definitions, or procedures.</td>
</tr>
<tr>
<td>Probing thinking</td>
<td>Students explain, elaborate, or clarify their thinking, including articulating the steps in solution methods or the completion of a task.</td>
</tr>
<tr>
<td>Making the mathematics visible</td>
<td>Students discuss mathematical structures and make connections among mathematical ideas and relationships.</td>
</tr>
<tr>
<td>Encouraging reflection and justification</td>
<td>Students reveal deeper understanding of their reasoning and actions, including making an argument for the validity of their work.</td>
</tr>
</tbody>
</table>
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.

Reflection

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