THE OHIO STATE UNIVERSITY

Making the Most of Student Collaboration in Mathematics, Grade 6-12

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Last Person Standing

- The class stands in a circle. Counting around the circle, every other person must sit down. Where do you want to stand to be the last person standing?

  - From CPM CC Course 1, Puzzle Investigator Problem PI-2

Explaining Exponents

- Explain the meanings of zero exponents in three different ways.
- Explain the meanings of negative exponents in three different ways.

Why Collaboration?

- So students engage in “rich mathematical tasks”

- “Group tasks provide a perfect environment for students to implement the Mathematical Practices outlined in the CCSS-M. Group work and collaborative learning are effective in academically and linguistically heterogeneous classrooms, and the evidence for the academic and social benefits of these instructional strategies is substantial.”

  - Quote and following pages from http://www.sfusdmath.org/rich-math-tasks.html

Group-Worthy Tasks

- Group-worthy tasks require students to share their experiences and justify their beliefs and opinions. In such activities, students analyze, synthesize, and evaluate; they discuss cause and effect, explore controversial issues, build consensus, and draw conclusions.
- Group-worthy learning assignments rely on using materials that incorporate multiple representations of the academic content, thereby supporting various ways of learning, the development of multiple literacies, and deeper and more sophisticated understandings. They create and support interdependence among members of a group, which is the essence of collaboration.
- Group-worthy tasks have academic and social benefits; they foster students' critical thinking skills and contribute to friendlier classrooms.

Features of Rich Tasks

- **Tasks support productive struggle. Tasks …**
  - are relevant and engaging
  - have multiple entry points that allow for initial success
  - have high cognitive demand
  - allow for divergent ways of thinking
  - are not scaffolded in ways that reduce cognitive demand
  - are not timed; students should not be rushed
- **Tasks build conceptual understanding. Tasks …**
  - allow students to make connections to prior learning
  - allow students to answer with multiple representations
  - embed multiple Standards for Mathematical Practice
  - can provide a preview into the next level of learning
- **Tasks allow students to show what they know and are able to do. Tasks …**
  - cover multiple standards that are central to the unit
  - contain a balance of skills, concepts, and problem solving
  - generate student work that a teacher can analyze to measure understanding and to inform instruction in the next lesson series

Team Roles (from CPM)

- **Resource Manager:** If your name comes first alphabetically:
  - Make sure that that the team has at least one sticky dot for each team member.
  - Ask the teacher when the *entire* team has a question. *"No one has an idea? Should I ask the teacher?"*
  - Make sure that your team cleans up by delegating tasks. You could say, *"I will put away the _____ while you _____ ."*
- **Facilitator:** If your name comes second alphabetically:
  - Start the team's work by choosing a volunteer to read the problem aloud.
  - Keep everyone discussing each part together by asking questions such as,
    "Are we all ready to move on?"
    "Does anyone have an idea about how we can tell who gets the most sleep?"
- **Recorder/Reporter:** If your name comes third alphabetically:
  - When your team is called on, share your team's ideas and reasons with the class.
  - Help the team agree on an idea for part (d) of problem 1-2 (Sleepy Time): *"Do we agree on how much sleep students in our class get in general?"*
- **Task Manager:** If your name comes fourth alphabetically:
  - Remind the team to stay on task and not to talk to students in other teams. You can suggest,
    "Let's move on to the next part of the problem."
    "Let's get back to work."
  - Listen for reasons and ask your teammates to justify their thinking.
    "*Why do you think that?"*

Collaborative Learning Expectations (CPM)

- Working with other students allow you to:
  - Develop new ways of thinking about mathematics,
  - Learn to communicate about math, and
  - Understand ideas better by having to explain your thinking to others.
- The following expectations will help you get the most out of working together.

T	Together, work to answer questions.
E	Explain and give reasons.
A	Ask questions and share ideas.
M	Members of your team are your first resource.
S	Smarter together than apart.