**Goals**: Notice differences between tasks based on their potential to elicit discourse from and between students, to discuss ways to set up and maintain meaningful discourse about the mathematical ideas. This is just an introduction to these ideas.

**Mathematical goal**: Exponential models

**SMP goal**: SMP 1-6, but mostly SMP 2, 3, and 4.

**Pedagogical goals**: choosing/adapting tasks to improve discourse; discussing nature of good discourse, how to set up and maintain good discourse, continued discussion of higher-level questioning.

**Time**: 1 hour

**Materials**:

Facilitators need poster paper and markers.

If used in a large group of teachers, they should work in groups of about 2-3. They should have calculators, their notebooks with the SMP available.

Extra copies of the SMP

Half-sheets for reflection.

Task sheet with Tasks A and Task B

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| On Ppt:  Goals:   1. Describe worthwhile mathematical discourse. 2. Discuss ways to set up and maintain worthwhile discourse in a classroom. 3. Describe characteristics of tasks that have the potential to support worthwhile discourse. |  |
| On Pp:  What is the nature of conversations we want students to have in our math classrooms? Why? | Launch (5 minutes):  What is the nature of the conversations we want students to have in our math classrooms? (Look over the SMP for ideas and think quietly to yourself for a couple of minutes, then discuss with group. Split up the SMP so that each person in the group looks at 2-3 SMP for ideas.)  **Write their suggestions on poster paper**.  Some possible answers:  Students explaining the meanings of mathematical ideas. (SMP 1)  Students describing what a problem is asking. (SMP 1)  Students describing their reasoning. (SMP 2)  Students critiquing the reasoning of others. (SMP 3)  Students using tools and representations to support their arguments. (SMP 5)  Students explain their ideas precisely and clearly. (SMP 6)  Students describing what they notice and use repeated reasoning. (SMP 7 and 8).  (Note that the goal of meaningful discourse is to improve learning; discourse itself is not the goal.) |
| On Pp:  What issues can arise in a classroom where the teacher expects students to engage in meaningful mathematical discourse? | What issues can arise when you try to get students to learn through discussion? (10 minutes)  **Write their suggestions on poster paper and put next to the first poster paper.**  (Here are some possible answers)   1. One student in each group assumes the role of authority while others trust him or her to be correct. 2. The teacher spends the class time moving from group to group to answer questions and help students through the difficult parts. 3. Students are off-task. 4. Conversations are unproductive. 5. It takes too much time. 6. Students with status are listened to, but students with little status are ignored. 7. Students come up with the wrong ideas or answers. |
| On Pp:  How do you set up and maintain an environment that supports good discourse? Brainstorm as many ideas as you can. | **What are some strategies to support good discourse? (10 minutes) Write their suggestions on the board**, then have them categorize these by the issues they target. What categories make sense? (accountability, teacher role, student role, Other?) Do new ideas come up from this categorizing?  Some ideas that could come up:  Discuss norms with students and reinforce them  Set accountability expectations from the beginning and think of ways to support them (e.g. Each member of the group needs to be able to provide a mathematical justification for the decision of the group.) |
| On Pp:  Imagine using Task A and Task B in two different Algebra 1 classes. Which task do you think will elicit richer mathematical discourse from and between students? Why: what characteristics of the tasks support this? | **Handout: Two tasks for discourse (10 minutes)**  Compare the two tasks on their potential to elicit good discourse:  **Write their suggestions on poster paper.**  Ideas:  Task A is more prescriptive while Task B requires students to critically look at the information and decide what information they have and what information they need.  Students need to make decisions, conjectures, and provide reasoning on Task B (more use of SMP).  The group must commit to a decision that affects all of them, so are more likely to argue their points with each other.  The first task asks how many fish were introduced into the lake. The students don’t really have to know anything to answer this question since the number 5 is the only number they can see – it is an easy guess. (There is no reason to discuss it with anyone else.)  How are these characteristics related to the SMP? |
| On Pp:  Take a few minutes to solve the tasks and reflect on the mathematical ideas.  What mathematical ideas could be highlighted in each task? What questions would you ask to get students to think about the ideas? | Compare the two tasks on the mathematics: (10 minutes)  What mathematical ideas arise in each task? In each case, how does the task prompt students to think about the mathematical ideas?  Other possible questions:  What is the level of cognitive complexity of each task?  How does the thinking required of students differ between the tasks?  What opportunities does each task offer for students to engage in SMP? |
| On Pp:  Suppose you choose to give Task B.   1. How would you set up this task to maximize students’ opportunities to engage in discourse that helps them make sense of the mathematical ideas? 2. What would you be ready to answer? 3. What types of difficulties would you expect from student and how could you respond? | (10 minutes) Give teachers a few minutes to discuss these ideas in their groups.  Other questions:  How are students asked to struggle with important mathematical ideas? What ideas can you share with other teachers to support this struggle?  What questions could the teacher ask to encourage students to think about the mathematical ideas?  What characteristics of mathematical discourse would you expect from each task? (think about the SMP) |
| Reflection (anonymous):  What reasons do you have for incorporating more discussion between students in your classes? | (5 minutes)  Have teachers write on half-sheets to turn in.  The purpose of asking this question is to see if teachers have made connections between having students engage in meaningful discourse and the SMP, mathematical goals of a lesson, or student motivation to learn. |

A good follow-up activity would be to create a Task Dialogue using Task B.

Note that there are two Research Briefs available to everyone on NCTM’s website:

Research Brief 19: What does research say the benefits of discussion in mathematics class are?

* Discussion can increase student learning.
* Discussion can motivate students.
* Discussion can support teachers in assessing and understanding student thinking.
* Discussion can shift mathematical authority to the community.

Research Brief 20: What are some strategies for facilitating productive classroom discussions?

* Attend to the classroom culture
* Choose high-level mathematics tasks
* Anticipate strategies that students might use to solve the tasks and monitor their work
* Allow student thinking to shape discussions
* Examine and plan questions
* Be strategic about “telling” new information
* Explore incorrect solutions
* Select and sequence the ideas to be shared in the discussion
* Use Teacher Discourse Moves to move the mathematics forward
* Draw connections and summarize the discussion

These can be found at <http://www.nctm.org/news/content.aspx?id=8468>

(You do not need to be a member to download)