Promoting Mathematical Discourse

**Introduction**
This guide explains the role that discourse plays in Connected Mathematics® Project 3 (CMP™ 3).

It explores best practices in promoting mathematical discourse, identifies teacher support for enhancing discourse that is embedded throughout the CMP™ 3 program, and examines the importance of planning to promote rich mathematical discourse.

**What is discourse?**
One of the fundamental features of CMP™ 3 is that students learn by exploring rich problems.

Ensure that your students’ exploration is productive by promoting effective mathematical discourse. Mathematical discourse includes ways of representing, thinking, talking, agreeing, and disagreeing.

It may take place between partners, small groups, or as a whole class. Encourage students to engage in productive mathematical discourse both with each other and with you.

Find references to discourse in the Standards for Mathematical Practice. Standards 1, 3, and 6 describe how mathematically proficient students explain and communicate their reasoning.

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**Common Core State Standards**

**Mathematical Practices and Habits of Mind**

In the Connected Mathematics curriculum you will develop an understanding of important mathematical ideas by solving problems and reflecting on the mathematics involved. Every day, you will use “habits of mind” to make sense of problems and apply relevant concepts to new situations. Some of these habits are described by the Common Core State Standards for Mathematical Practice (MP).

**MP1** Make sense of problems and persevere in solving them.
When using mathematics to solve a problem, it helps to think carefully about:
- data and other facts you are given and what additional information you need to solve the problem;
- strategies you have used to solve similar problems and whether you could apply a related simpler problem first;
- how you could express the problem with equations, diagrams, or graphs;
- whether your answer makes sense.

**MP2** Reason abstractly and quantitatively.
When you are asked to solve a problem, it often helps to:
- focus first on the key mathematical ideas;
- check that your answer makes sense in the problem setting;
- use what you know about the problem setting to guide your mathematical reasoning.

**MP3** Construct viable arguments and critique the reasoning of others.
When you are asked to explain why a conjecture is correct, you can:
- show some examples that fit the claim and explain why they fit;
- show how a new result follows logically from known facts and principles.

When you believe a mathematical claim is incorrect, you can:
- show one or more counterexamples—cases that don’t fit the claim;
- list steps in the argument that do not follow logically from prior claims.
Classroom Environment

Create a classroom environment that fosters rich mathematical discourse.

Consider how the physical arrangement of your classroom either encourages or discourages students’ collaboration.

Use a flexible seating arrangement that allows students to work individually, in pairs, or in small groups.

Make it easy for students to move around. That way, they can easily access tools or resources that they need, compare strategies with other groups, and present their solutions to the whole class.

Take advantage of the seating chart in the Students section of Dash. Use it to design a flexible seating arrangement that meets the needs of you and your students.

For example, the Stadium seating arrangement begins during the Launch phase with students in long rows that face the center of the classroom. They can arrange their desks into pairs or small groups to work during the Explore phase. They may remain in small groups or return to rows for the Summarize phase.
**Class Norms**

Establish class norms that value productive mathematical discourse. Communicate to your students the importance of creating a mathematical community. Enlist their help to determine the concrete steps that the class can take to create a supportive environment.

At the beginning of the year, ask students to share ideas about their ideal math class. Have them generate guidelines for behaviors and attitudes that will make that ideal a reality. Phrase guidelines positively. Include ideas such as participating in discussions or being open to new methods. Allow the guidelines to emerge from discussion with your students, so that they feel ownership of their community. Post the guidelines in a prominent place in the classroom.

Find more suggestions for choosing and establishing classroom norms in your copy of *A Guide to Connected Mathematics 3: Understanding, Implementing, and Teaching*.

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**Strategies**

Utilize familiar instructional strategies to promote discourse in your classroom.

Support rich discussion between your students by using talk moves.

- Prompt them to explain a strategy to a classmate.
- Ask them to restate another’s explanation in their own words.
- Encourage them to ask each other questions when anything is unclear.

Model these behaviors yourself, and encourage your students to use them in their own groups. Consider posting a list of question stems on the wall, like the following:

- Why did you think that or draw that?
- What does that (diagram, number, or symbol) represent?
- What makes you say that?
Refer your students to this list for ideas about how to use their classmates as resources to learn. Refer to it yourself as you monitor students’ discussions.

**Orchestrating Discourse**

Consider the process proposed by Margaret S. Smith and Mary Kay Stein in their book *5 Practices for Orchestrating Productive Mathematics Discourse* (2011, 8). The process consists of the following five practices:

- Anticipating
- Monitoring
- Selecting
- Sequencing
- Connecting

Anticipate how students will respond to a math task as you plan.

During the Explore phase, monitor students’ work. Select strategies that you would like students to share with the whole class. Prepare for the Summarize phase by sequencing those presentations in an order that will help students understand the Problem’s Big Idea.

**Planning**

Use your planning process to anticipate how your students will approach and think about a Problem. First, solve the Problem. Generate different strategies that your students might use. Also, list any misconceptions that they may have. As you complete the Problem, keep in mind how you will use the different solution strategies to help students make sense of the Focus Question.

Consider some best practices as you plan:

- Anticipate multiple strategies and representations. Reference the Five-Representation Star as you generate solutions.
- Anticipate correct and incorrect solutions.
- Create assessing and advancing questions for each solution strategy.

Ask assessing questions to determine what students know about the Problem as they work. Use advancing questions to extend students’ thinking and understanding of the Problem.
Resources

As you plan, look to CMP™ 3’s teacher support for ways to promote discourse.

Use your printed Teacher’s Guide or go online to Teacher Place to access your materials.

Find suggested questions that you can use directly or as inspiration for your own.

Notice that the questions tie directly in to the lesson’s concepts and push students to engage more deeply with their thinking.

Be aware that the questions will serve many purposes. They help you assess your students’ understanding. They also encourage your students to communicate that understanding to both you and their peers.

Launch

Encourage discourse from the very beginning of every lesson in the Launch.

Find prepared questions that help you engage in dialogue with your students about their prior knowledge.

Encourage this discourse as you introduce the new challenge and set the stage for the rest of the lesson.
**Explore**

During the Explore phase, monitor your students as they work. Watch for accuracy in their solutions as well as how their diverse approaches relate to the mathematical goals of the Unit.

Interact with your students, and question them to gain better insight into their reasoning.

Supplement the questions from CMP™ 3’s teacher support with the talk moves that you explored earlier in this guide. When you pose a question, have students restate or respond to another’s thinking.

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**Planning for the Summary**

Remember that during the Explore phase, you must also select and sequence the solutions that you want students to present to the whole class.

When selecting solutions, ask yourself this question: What conjectures, processes, and conclusions should students share with the whole class? The solutions you choose will directly impact the level of discourse in the discussion.

Refer to the Focus Question to make sure that the strategies that you select will further the goals of the Problem.

Sequence students’ presentations so that each new representation or approach adds depth to the discussion. Choose an order that will move the whole class to a deeper understanding of the mathematical concepts in the lesson.

Consider these methods to select and sequence during the Summarize phase:

- Move from concrete to abstract (models to symbols).
- Start with commonly used solutions to allow a majority of students to enter into the discussion. Then, move to less-used strategies and representations.
| **Summarize** | Facilitate more formal discourse during the Summarize phase.  
Focus on connecting multiple students’ approaches, representations, and misconceptions. Relate each new idea back to the lesson’s Focus Question. As much as possible, prompt students to describe these connections rather than stating them yourself.  
When you select and sequence students’ conjectures and conclusions in a way that moves the whole group toward proficiency, you allow student discourse to take center stage. |
| **Review** | This guide explained the role that discourse plays in CMP™ 3.  
It explored best practices in promoting mathematical discourse, identified teacher support for enhancing discourse that is embedded throughout the CMP™ 3 program, and examined the importance of planning to promote rich mathematical discourse. |