

Tables from Myths on Mathematics - Windy Hottel

Task	Typical	Enriched
Opening	Students arrive in class, copy the problem from the board, complete the problem, and try to solve it. When time is up, teacher tells the right answer, and those who missed it change what they had written down.	Students work a problem. When time is up, teacher invites one student to share his work with all, then invites peers to ask questions, give feedback, and share alternate approaches.
Managing homework	Teacher projects correct answers on board, asks students to mark their own work, then turn in the corrected paper.	No answer key is provided. Students pair and share answers with one another. When they have different solutions, they compare their processes and discuss which solutions are correct and why.
Teacher presentation	Teacher introduces a new topic with a short lecture explaining the concept, gives definitions of necessary terms, demonstrates practice problems.	Minilesson: Teacher invites students to share and discuss what they already know about a topic, then links new information to their background knowledge by sharing new information; invites class to work demonstration problems collaboratively.
Work time	During work time, students complete tasks individually. Teacher answers students' questions and clarifies sources of confusion.	During work time, students may work alone or in small groups where all members contribute. Students needing help seek peers' assistance. Everyone is held accountable for thinking and learning.
End of class	Teacher tells class what they did and gives answers to any lingering questions.	Sharing and Reflection: Students talk about what they do and do not yet understand about the material. Learners respond to peers' questions. Teacher allows some questions to linger for further discussion.

Foster Interdependence
Building a Culture for Learning
High Expectations

Norm	Definition	Examples
You are responsible for your own learning.	You are in the driver's seat and need to show up every day ready to engage and make the most of your learning opportunities.	Come to class well fed, with materials, without distractions (toys, cell phones, nail polish, etc.) and use your time wisely throughout.
You are responsible for supporting the learning of others.	Interact with peers in a way that builds their confidence and helps them to understand the content we are studying.	Be kind. Be encouraging. Treat people the way you would like to be treated. Respond when peers talk with you. Ask coaching questions, rather than giving answers. Invite peers to explain thinking. Affirm insight.
Be where you are supposed to be.	Show respect for yourself and the learning community by being where the learning is.	Be here on time. Stay with your group. When fetching materials, do it quickly and safely.
Take care of our learning environment.	All physical property in the classroom needs to be treated gently and stored properly.	Write only on paper or boards. Use materials appropriately and store them where they belong.

Cognitive Demand

Level	Description	Sample instructions
1	Recall - of fact, definition, term - simple procedure, algorithm or formula - rote response	“identify” “use” “measure”
2	Skill / Concept - some decision making or mental processing required - interpreting information - displaying data in graphs, tables	“solve,” “organize,” “estimate,” “make observations,” “interpret data”
3	Strategic Thinking - requires reasoning, planning, citing evidence - make conjectures, justify responses - using concepts to solve problems and explain phenomena	“explain” “justify”
4	Extend Thinking - complex reasoning, planning, development - making connections between ideas within or across content areas	“design and conduct” “synthesize” “critique”

High Cognitive Demand: What to Look For

- **Multiple Entry Points:** Students with varying levels of prior knowledge could access the problem.
- **Various Possible Approaches:** While the problem may have only one correct answer, there are numerous possible ways to find that answer.
- **Higher Order Thinking Required:** Students need to think critically and understand the conceptual basis behind the problem, rather than simply insert numbers in a formula.
- **Opportunities to Synthesize:** Problem invites students to draw together background knowledge about various strands of mathematics, as well as relate mathematics to the real world.
- **Justification and Explanation:** Requires solution to be explained or applied in one or more ways.

Creating and Sustaining Effective Discourse

Let's listen in again to another excerpt from the classroom of Rachel Rosenberg, fourth-grade teacher at Denver's Harrington Elementary. As you read, you may begin to wonder, "How did she get those kids to talk like that?" which is exactly what we are going to discuss next.

Ms. Rosenberg: Let's just do a quick number of the day. Let's take a minute to activate prior knowledge. What properties of the number three are important? What's important about that number? Who would like to open up our conversation? Martin has something. . . . Anabelle, I'll be coming to you.

Edgar: It's an odd number.

Luisa: It has factors.

Ms. Rosenberg: We're connecting to Edgar. Do you agree, disagree?

Luisa: I agree that it's an odd number because it's one more than two.

Clarissa: It's an odd number because. . . .

Ms. Rosenberg: So you're agreeing with Luisa? Because she just said that. What do we know about all odd numbers?

Arturo: It's odd because two, four. . . .

Ms. Rosenberg: What's that called, when you're skip-counting by a number?

Salvador: Multiplication.

Ms. Rosenberg: It's like that, because that's how you multiply. It's a multiple. I love that way of explaining that it's odd, because when you skip-count by twos, you don't land on three.

Salvador: Prime number.

Ms. Rosenberg: Do you agree or disagree?

Maricela: I agree with Clarissa because it's like the odd number.

Ms. Rosenberg: So all odd numbers are prime?

Maricela: No . . . like nine.

Minds on Mathematics
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Ms. Rosenberg: So nine is a prime number? Do you guys agree? Anabelle, is nine a prime number?

Maricela: I disagree with myself because $3 \times 3 = 9$.

Ms. Rosenberg: So, is that a prime?

Salvador: It's a composite.

David: I have a wondering. What if it's not a prime or a composite?

Ms. Rosenberg: That's a great question. We'll have to look at the definitions to see if there are numbers that don't fit into either.

Martin: I have a question about skip-counting. Can you skip-count by every number, like zero, one, two?

Ms. Rosenberg: Let's try skip-counting by zero. Zero, zero. I love that question, so Martin, be sure to write that down.

This very brief excerpt illustrates many key features of classroom discourse: the shift in the role of the teacher from expert to facilitator, and the shift in the voices of the students, from answer providers ("Seven!" my classmates and I shouted out in my seventh-grade math class) to explainers of thinking. These are fourth graders, primarily English language learners, and every day Rachel gets them thinking and reasoning as mathematicians. She works hard to scaffold discourse in her classroom, knowing that the skills of communicating about ideas are critical to children's success and esteem. She is aware of how her tone and comments shape the classroom culture, and she explicitly teaches and regularly reinforces the conversational and thinking skills students need in academic conversations.

As the lead learners in our minds-on math workshops, our stance has significant power in influencing the attitudes of students toward their own thinking and that of their peers. Let us examine some critical teacher moves one at a time, as they may be employed in the context of any discourse structure, whether brief paired sharing, small-group work, or whole-class discussion. The constellation of questions that follows is by no means a daily prescription, but rather a menu of choices from which you might choose one or more on a regular basis as you cultivate discourse within your community of learners.

TYPICAL SHARING VS. MINDS-ON DISCOURSE

	Typical sharing	Minds-on discourse
Positions	Teacher remains at front of room. Student presenter may share from desk, give teacher her paper, or come to front.	Student presenter stands at front of group while teacher steps to the side.
Content	Student shows or shares an answer.	Student explains how he approached the problem and why he believes his solution is accurate.
Response	Teacher verifies accuracy of student's answer or corrects any errors.	Classmates respond with questions and feedback, compare their ideas to those of the presenter, share alternate approaches.

In responding to the ideas of others, students could start with:

- I agree with . . . because . . .
- I disagree with . . . because . . .
- I am wondering . . .
- How did you know to . . .
- Can you explain . . .