Facilitating Mathematical Discourse

Math Department

Agenda

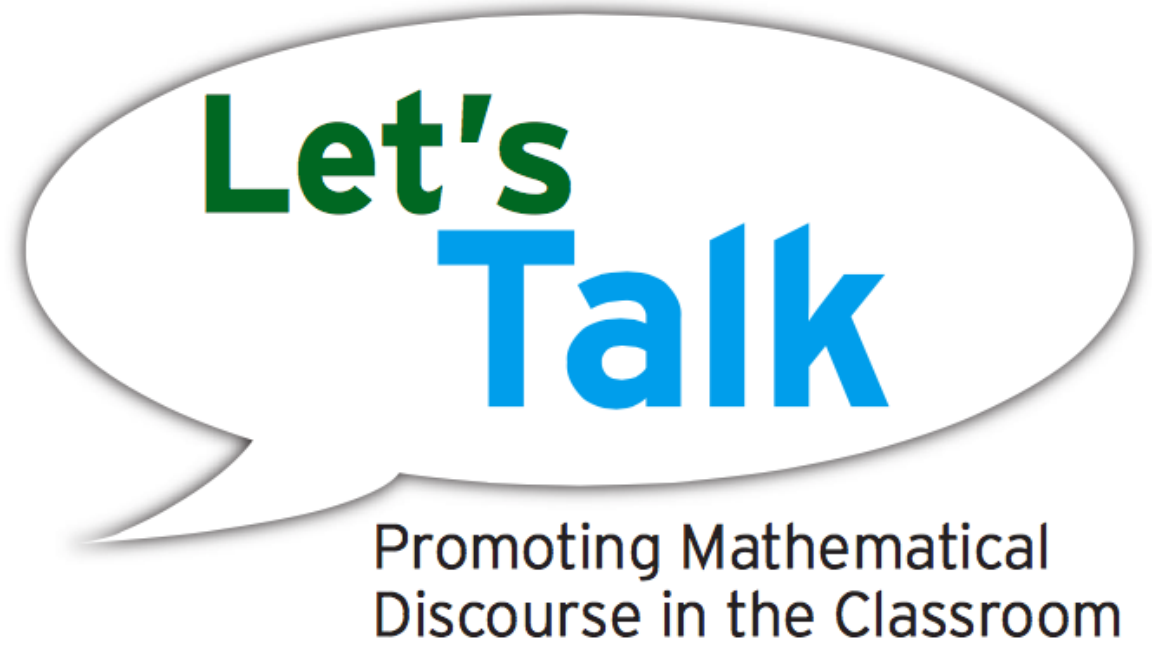
- Define Discourse
- Recognize the benefits of discourse for learning
- Recognize that discourse is developed with effort over time
- Learn how to create student and teacher behavior norms during discourse
- Learn to facilitate discourse, encourage students to extend thinking and connections to others' ideas and mathematical concepts.

Answer the Question

There are several books on a bookshelf. If one book is the 4th from the left and 6th from the right, how many books are on the shelf?

Turn and talk. Do you agree on your answers?

Activity :


Let's
Talk
Promoting Mathematical
Discourse in the Classroom

What is Discourse in the Mathematics Classroom?

Representing, thinking, talking, agreeing, and disagreeing; the way ideas are exchanged and what the ideas entail; and as being shaped by the tasks in which students engage as well as by the nature of the learning environment.

-The National Council of Teachers' of Mathematics

Five Reasons Talk is Critical to Teaching & Learning

1. Talk can reveal understanding & misunderstanding.
2. Talk supports robust learning by boosting memory.
3. Talk supports deeper reasoning.
4. Talk supports language development.
5. Talk supports development of social skills.

From *Classroom Discussions: Seeing Math Discourse in Action, Grades 6-12*. Nancy C. Anderson, Suzanne H. Chapin & Catherine O'Connor, 2011.

Hufford-Ackles Rubric

	Teacher role	Questioning	Explaining mathematical thinking	Mathematical representations	Building student responsibility within the community
Level 0	Teacher is at the front of the room and dominates conversation.	Teacher is only questioner. Questions serve to keep students listening to teacher. Students give short answers and respond to teacher only.	Teacher questions focus on correctness. Students provide short answer-focused responses. Teacher may give answers.	Representations are missing, or teacher shows them to students.	Culture supports students keeping ideas to themselves or just providing answers when asked.
Level 1	Teacher encourages the sharing of math ideas and directs speaker to talk to the class, not to the teacher only.	Teacher questions begin to focus on student thinking and less on answers. Only teacher asks questions.	Teacher probes student thinking somewhat. One or two strategies may be elicited. Teacher may fill in an explanation. Students provide brief descriptions of their thinking in response to teacher probing.	Students learn to create math drawings to depict their mathematical thinking.	Students believe that their ideas are accepted by the classroom community. They begin to listen to one another supportively and to restate in their own words what another student has said.
Level 2	Teacher facilitates conversation between students, and encourages students to ask questions of one another.	Teacher asks probing questions and facilitates some student-to-student talk. Students ask questions of one another with prompting from teacher.	Teacher probes more deeply to learn about student thinking. Teacher elicits multiple strategies. Students respond to teacher probing and volunteer their thinking. Students begin to defend their answers.	Students label their math drawings so that others are able to follow their mathematical thinking.	Students believe that they are math learners and that their ideas and the ideas of their classmates are important. They listen actively so that they can contribute significantly.
Level 3	Students carry the conversation themselves. Teacher only guides from the periphery of the conversation. Teacher waits for students to clarify thinking of others.	Student-to-student talk is student initiated. Students ask questions and listen to responses. Many questions ask "why" and call for justification. Teacher questions may still guide discourse.	Teacher follows student explanations closely. Teacher asks students to contrast strategies. Students defend and justify their answers with little prompting from the teacher.	Students follow and help shape the descriptions of others' math thinking through math drawings and may suggest edits in others' math drawings.	Students believe that they are math leaders and can help shape the thinking of others. They help shape others' math thinking in supportive, collegial ways and accept the same support from others.

Fig. 11. Levels of classroom discourse. From Hufford-Ackles, Fuson, and Sherin (2014), table 1.

Activity : Establishing Norms

- What are characteristics of a classroom environment that encourages productive discourse?

Discourse Video

- https://www.teachingchannel.org/videos/student-participation-strategy

Activity:
Accountable Talk Moves

- Building on Prior Knowledge
- Challenging
- Expanding Reasoning
- Keeping Everyone Together
- Keeping the Channels Open
- Linking Contributions
- Marking
- Modeling
- Pressing for Accuracy
- Pressing for Reasoning
- Recapping
- Verifying and Clarifying

Accountable Talk Matching

Accountable Talk Moves

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Talk Move	Function	Example
To Ensure Purposeful, Coherent, and Productive Group Discussion		
Marking	Direct **attention** to the value and importance of a student's contribution.	That's an important point.
Challenging	Redirect a question back to the students, or use students' contributions as a source for further challenge or query.	Let me challenge you: Is that always true?
Modeling	Make one's thinking public and demonstrate expert forms of reasoning through talk.	Show us your thinking. Here's how a mathematician works.
Recapping	Make public in a concise, coherent form, the group's achievement at creating a shared understanding of the phenomenon under discussion.	Let me put these ideas all together. What have we discovered?
To Support Accountability to Community		
Keeping the Channels Open	Ensure that students can hear each other, and remind them that they must hear what others have said.	Say that again and louder. Can someone repeat what was just said?
Keeping Everyone Together	Ensure that everyone not only heard, but also understood, what a speaker said.	Can someone add on to what was said? Did everyone hear that?
Linking Contributions	Make explicit the relationship between a new contribution and what has gone before.	Does anyone have a similar idea? Do you agree or disagree with what was said? Your idea sounds similar to his idea.
Verifying and Clarifying	Revoice a student's contribution, thereby helping both speakers and listeners to engage more profitably in the conversation.	So are you saying..? Can you say more? Who understood what was said?

Accountable Talk Matching

Accountable Talk Moves *(continued)*

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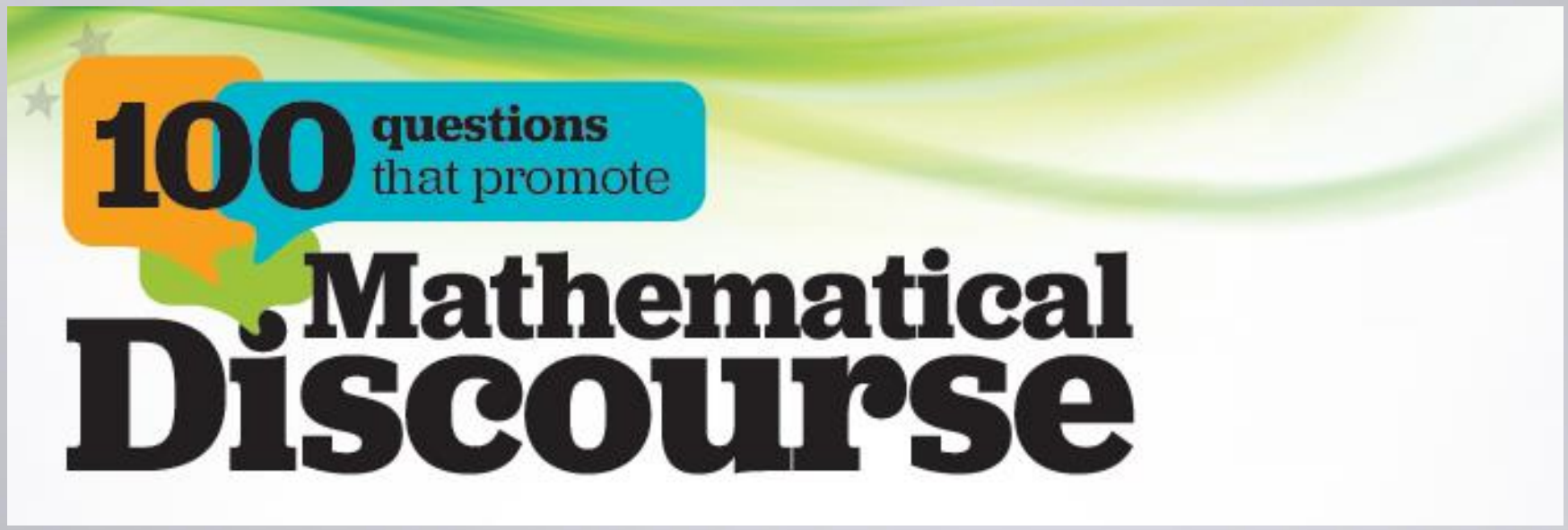
To Support Accountability to Knowledge		
Pressing for Accuracy	Hold students accountable for the accuracy, credibility, and clarity of their contributions.	Why does that happen? Someone give me the term for that.
Building on Prior Knowledge	Tie a current contribution back to knowledge accumulated by the class at a previous time.	What have we learned in the past that links with this?
To Support Accountability to Rigorous Thinking		
Pressing for Reasoning	Elicit evidence to establish what contribution a student's utterance is intended to make within the group's larger enterprise.	Say why this works. What does this mean? Who can make a claim and then tell us what their claim means?
Expanding Reasoning	Open up extra time and space in the conversation for student reasoning.	Does the idea work if I change the context? Use bigger numbers?

Levels of Mathematical Thinking

LEVELS OF THINKING	GUIDE QUESTIONS
Memory: recalls or memorizes information	What have we been working on that might help with this problem?
Translation: changes information into another form	How could you write/draw what you are doing? Is there a way to record what you've found that might help us see more patterns?
Interpretation: discovers relationships	What's the same? What's different? Can you group these in some way? Can you see a pattern?
Application: solves a problem - use of appropriate generalizations and skills	How can this pattern help you find an answer? What do think comes next? Why?
Analysis: solves a problem - conscious knowledge of the thinking	What have you discovered? How did you find that out? Why do you think that? What made you decide to do it that way?
Synthesis: solves a problem that requires original, creative thinking	Who has a different solution? Are everybody's results the same? Why/why not? What would happen if....?
Evaluation: makes a value judgement	Have we found all the possibilities? How do we know? Have you thought of another way this could be done? Do you think we have found the best solution?


100 questions that promote
Mathematical Discourse

How can you use Accountable Talk and questions that promote discourse to increase mathematical thinking when planning your lessons?

3-2-1 Implementation Outline

Think about implementing discourse in your own classroom. Sketch out the following:

3 norms/expectations you believe will promote discourse in your classroom;

2 discourse moves to add to your current repertoire;

1 date on which you will pull out the Hufford-Ackles rubric and assess your progress.

References

- Math discourse power point .“How to Facilitate Discourse in the Mathematics classroom”.

https://www.nd.gov/dpi/uploads/1379/MathDiscoursePowerpoint.pptx

- Institute for Learning. “Accountable Talk® Discussions in Mathematics: A Means of Making Sense of Mathematical Ideas” Paterson Public Schools Middle School Mathematics Grades 6 & 7. January 31, 2013


Thank You!