



Math Solutions®  
FOUNDED BY MARILYN BURNS

*Classroom Discussions in Mathematics:  
A Key Strategy in Building a Culture for  
Developing Mathematical Habits of Mind  
Session 111*

Carolyn Felux

Model Schools Conference – Nashville, TN

June 26-29, 2011



# Two Aspects of Learning Mathematics

- **Making Sense**—Most of mathematics involves relationships, concepts, and skills rooted in logic. Students don't learn these ideas from being told; they learn them by making sense of the ideas in their minds.

This happens in the course of their interactions with others, their investigation of the ideas with materials and contexts, and thoughtful facilitation by their teacher.

- **Learning Social Conventions**—The terminology and symbolism that we use to represent ideas are social conventions. These ideas are not rooted in logic. The source of learning is external. The source could be another person, a book, or television, but there is no way for children to figure out or discover the information by themselves.

# Common Core State Standards for Mathematics

- Standards for Mathematical Practice
- Content Standards

# Common Core Standards for Mathematical Practice

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

For elaborations on the  
mathematical practices . . .

- [www.commoncore.org](http://www.commoncore.org)

# Focus Questions

- Why use talk to support math learning?
- What are barriers to discussions in math class?
- What are the steps for productive classroom discussions?
- What mathematics should we talk about?
- What does productive talk look and sound like?
- What contribution can classroom discussions make to the development of the Common Core Mathematical Practices?

## Positive Influences of Using Math Talk

- + Talk can reveal understanding and misunderstanding.
- + Talk supports robust learning by boosting memory.
- + Talk supports deeper reasoning.
- + Talk supports language development.
- + Talk supports the development of social skills.



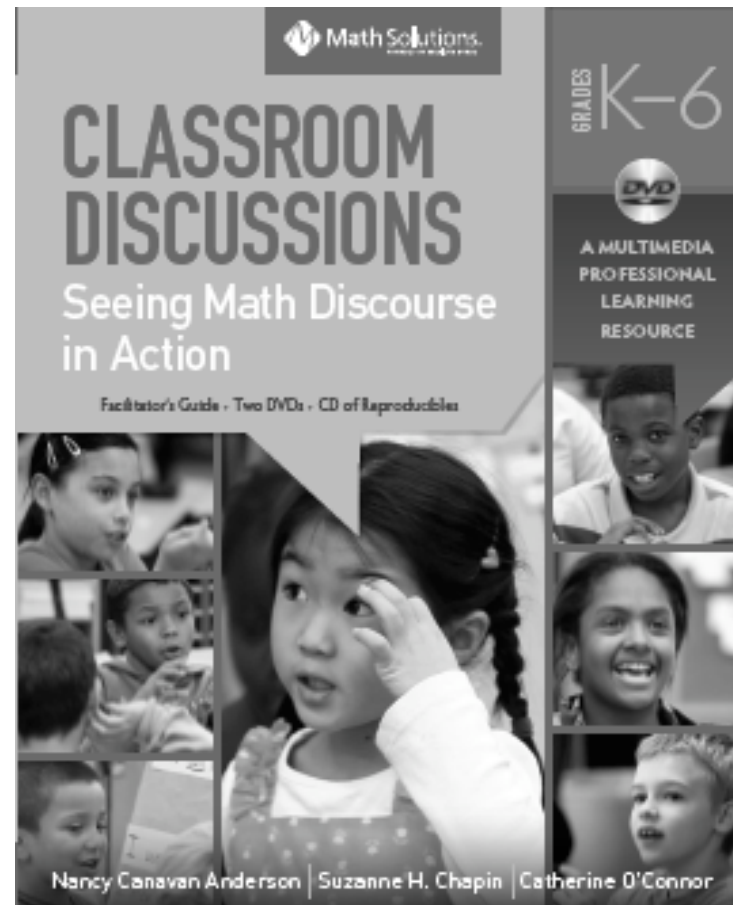
# Project Challenge

Scores on TOMA-2	Beginning	After 2 Years
Below Average	73%	0
Average		23%
Above Average	23%	36%
Superior/ Very Superior	4%	41%

# Why Isn't Talk Used in More Math Classes?

- Teachers may lack images of what sustained classroom discourse looks like.
- Teachers may be unsure of how to facilitate discussions.
- Teachers may be unsure of what math to discuss.
- Teachers may think they don't have time!
- Teachers may be concerned that no one will talk.
- Teachers may worry that their students can't do this.

SO THE AUTHORS CREATED ....



## Four Steps for Productive Classroom Discussions

- + Step 1: Help Students Clarify and Share Their Own Thoughts

## Help Students Clarify and Share Their Own Thoughts

It is important to help students get better at saying what they are thinking in ways that can be understood. Very often, students say things that are hard to understand. So we need to provide supports for them to express their thoughts and to use mathematical vocabulary.

## Four Steps for Productive Classroom Discussions

- + Step 1: Help Students Clarify and Share Their Own Thoughts
- + Step 2: Help Students Orient to the Thinking of Other Students

## Help Students Orient to the Thinking of Other Students

When the goal is to hold a discussion in which students can productively share their thinking and work with the reasoning of their classmates, they must be willing and able to *listen to what their* classmates say, and they must *try to understand*. But this does not automatically occur. So we need to provide the structure that supports students hearing what was said and the expectation that *all* students will try to understand.

# Talk Moves to Clarify and Orient

## Clarify: What are you saying?

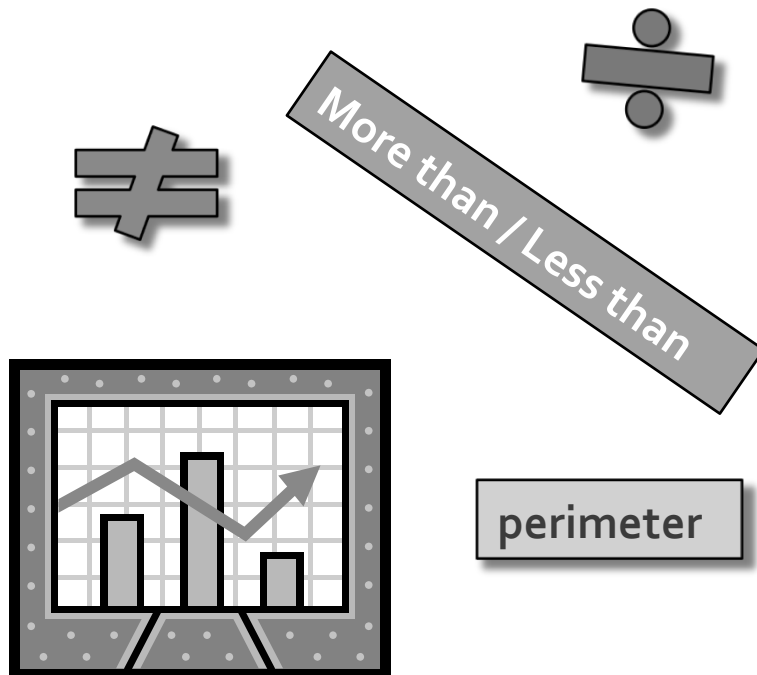
- + Turn-and-Talk (also called *partner talk or think-pair-share*)
- + Revoicing: "So are you saying . . . ?"; "Is that what you mean?" (also called *verify and clarify*)
- + Say More: "Who can say more?"; "Can you give us an example?"

## Orient: What are others saying?

- + Who Can Repeat?
- + Turn-and-Talk: "Tell your partner what you think David just said."

# What Mathematics Should We Talk About?

+ Mathematical symbols,  
vocabulary and terms



+ Mathematical Reasoning

- + Induction/deduction
- + Justification





## An Example: How many students are wearing shoelaces?

- + Kindergarten in urban district
  - + 19 children, ages 4 and 5
  - + 18% Caucasian, 46% Black, 11% Hispanic and 22% Asian
  - + 62% qualify for free or reduced lunch
- + Watching the video:
  - + What mathematics are they talking about?
  - + How does the teacher help her students clarify and share their thoughts?
  - + How does the teacher help her students orient to the thinking of others?

# Guidelines for Viewing Videos

- + Assume there are many things you don't know about the students, the classroom, and the shared history of the teacher and students on the video.
- + Assume good intent and expertise on the part of the teacher. If you do not understand his or her actions, try to hypothesize what might have motivated him or her.
- + Keep focused on your observations about what students are getting out of the talk and interaction.
- + Keep focused on how the classroom discourse serves the mathematical goals of the lesson.



## How many students are wearing shoelaces? Kindergarten

- + What mathematics were the kindergarteners talking about?
- + How did the teacher help Maimouna clarify and share her thoughts?
- + How did the teacher help the class orient to the thinking of Maimouna?

## Four Steps for Productive Classroom Discussions

- + Step 1: Help Students Clarify and Share Their Own Thoughts
- + Step 2: Help Students Orient to the Thinking of Other Students
- + Step 3: Help Students Deepen Their Reasoning

## Help Students Deepen Their Reasoning

Our goal as teachers is to hold a classroom discussion in which students can reason together about important mathematical issues. If students are clarifying and sharing their reasoning, and listening to one another, but their talk is superficial and their reasoning is shallow, we will not achieve the student learning gains we are aiming for. Therefore, the next step is to focus on deepening each student's reasoning during the classroom talk.

## Four Steps for Productive Classroom Discussions

- + Step 1: Help Students Clarify and Share Their Own Thoughts
- + Step 2: Help Students Orient to the Thinking of Other Students
- + Step 3: Help Students Deepen Their Reasoning
- + Step 4: Help Students to Engage with the Reasoning of Others

## Help Students to Engage with the Reasoning of Others

The final step toward engaging in academically productive discussion involves students actually working with the thinking and reasoning of others. If a classroom is to function as a community of learners who can learn from one another, they must be able to engage with one another's ideas beyond simply listening and repeating. This is the core of real discussion and is highly mathematical.



# Talk Moves That Support Reasoning

## Students Deepen Their Reasoning

- + Press for Reasoning: "Why do you think that?"
- + Who Can Repeat?: "That was important, but sort of complex. Who can put that into their own words?"
- + Turn-and-Talk: "Does everyone follow that? Let's do a quick turn-and-talk about her reasoning."

## Students Focus on the Reasoning of Others

- + "What do you think about that? Who can add on?"
- + "Do You Agree or Disagree . . . and Why?"
- + Who Can Repeat?: "That was a key point. Who can explain what was just said?"

# A Reasoning Game: Four Strikes and You're Out!

$$\_ \_ + \_ \_ = \_ \_$$

$$\_ \underline{5} + \_ \underline{5} = \underline{5} \underline{0} \quad \text{STRIKES}$$

X

~~0~~ 1 ~~2~~ 3 4 ~~5~~ 6 7 8 9

# An Example: Four Strikes and You're Out!

## Viewing the Video

- + Third grade in urban district
  - + 18 children
  - + 33% Caucasian, 36% Black, 20% Hispanic and 11% Asian
  - + 58% qualify for free or reduced lunch, 26% are ELL students
- + Watching the video:
  - + What mathematics are they talking about?
  - + How does the teacher help his students deepen their reasoning?
  - + How does the teacher help his students to engage with the reasoning of others?



# Four Strikes and You're Out!

## Third Grade

- + What mathematics were they talking about?
- + How does the teacher help students deepen their reasoning?
- + How does the teacher help students to engage with the reasoning of others?

# Mathematical Vocabulary and Terms

- + What do we need to talk about?
  - + Phrases that represent mathematical relationships (less than, times as many as, no more than, ...)
  - + Words where meaning is related to the context (6-pack of juice, 2 groups of 5 hearts )
  - + Words with multiple meanings—mathematical and non-mathematical (similar, radical)
  - + Mathematical vocabulary (circumference, ratio)
  - + Meaning of symbols and when they can appropriately be applied

## An Example: The Birthday Party

Mrs. Foley needs to buy drinks for her daughter's birthday party. She wants to buy both apple juice and grape juice. Cans of apple juice are sold in 6-packs. Cans of grape juice are sold in 4-packs. Mrs. Foley needs to buy at least 26 but no more than 30 cans of juice.

How many packs of apple juice might she buy?

How many packs of grape juice might she buy?

Show or explain how you got your answer.

# Class Discussion Expectations

- + Treat each other civilly at all times.
- + Participate in the class discussion.
- + Speak loudly enough for others to hear.
- + Listen to a speaker's idea.
- + Respect a speaker's idea.
- + Explain why you agree or disagree with a speaker's idea.



## An Example: The Birthday Party Problem

- + Third grade in urban district
  - + 19 children, 12 boys and 7 girls
  - + 29% Caucasian, 18% Black, 34% Hispanic and 19% Asian
  - + 43% qualify for free or reduced lunch, 25% are ELL students
- + Watching the video:
  - + How is talk used to make sense of mathematical vocabulary?
  - + How does the teacher help her students share their thoughts?
  - + What are the benefits of understanding the givens in a problem?



## The Birthday Party Problem

- + What terms, phrases and ideas were students talking about?
- + What were some of the “talk” challenges?
- + What are the benefits of taking 20 minutes to discuss the problem?

# Reflection

✚ What contribution can classroom discussions make to the development of the Common Core Mathematical Practices?

# 8 Standards for Mathematical Practice

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

# A Resource to support Math Discussions

Authors:

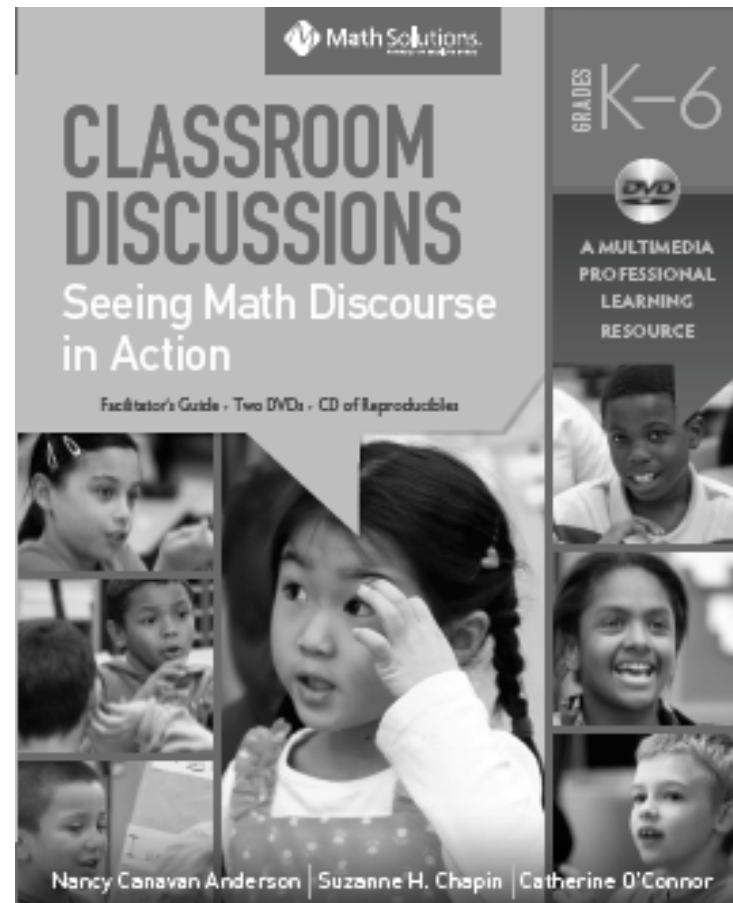
Chapin, O'Connor, Anderson

Order by phone:

877.664.2230 or online:

[Mathsolutions.com/books](http://Mathsolutions.com/books)

Promotion code: 9GNH5





Math Solutions®  
FOUNDED BY MARILYN BURNS

[mathsolutions.com](http://mathsolutions.com)

800.868.9092

[info@mathsolutions.com](mailto:info@mathsolutions.com)

[mathsolutions.com/presentations](http://mathsolutions.com/presentations)

