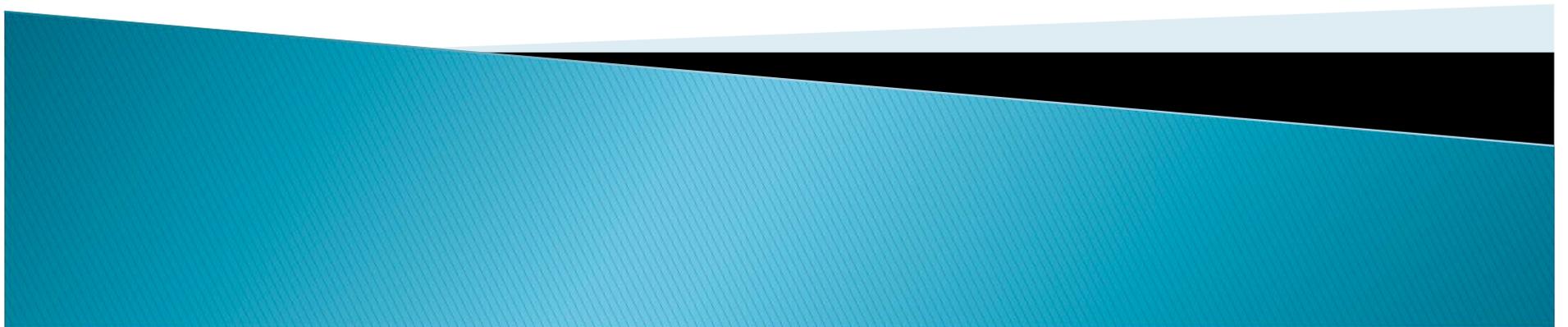


*What do you think about that?*  
Using discourse in math class

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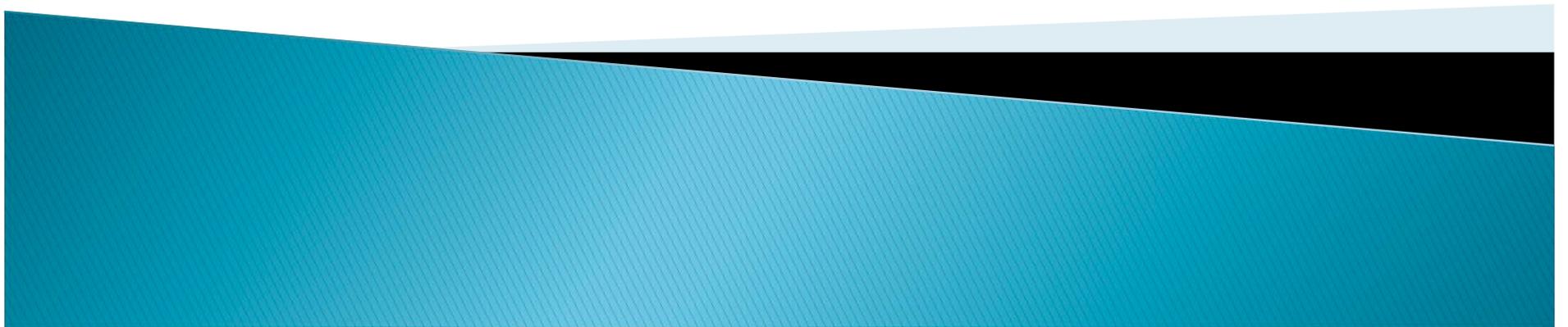


# Agenda

- ▶ An Overview of Classroom Discourse
- ▶ Productive Talk Moves
- ▶ Talk-Based Lesson Planning



“Using discourse in math class”:  
What does that really mean?

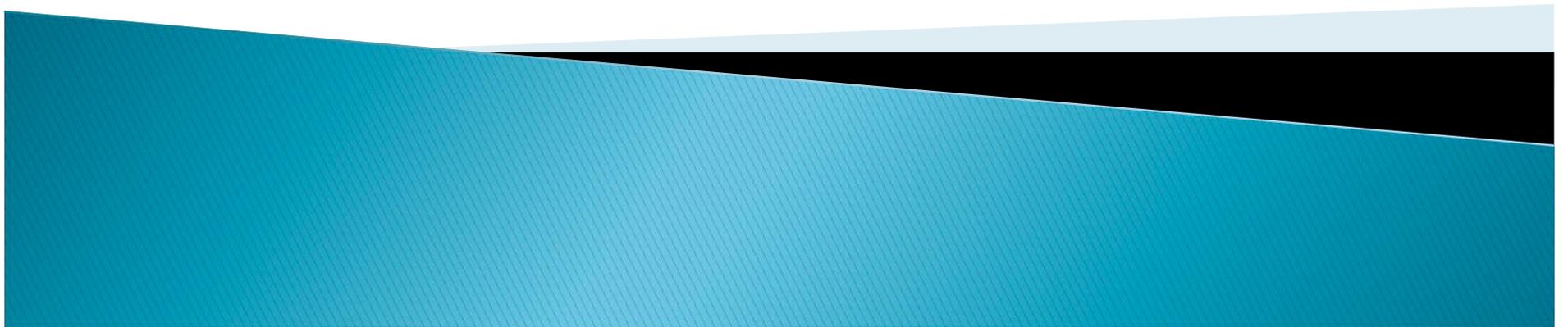


# Discourse-Intensive Instruction

- ▶ Heavily focused on student explanation
- ▶ Students do a lot of talking about key ideas
- ▶ Student talk is used to help students learn (not to show what they have already learned)
- ▶ A.k.a. mathematically productive talk, accountable talk, and math talk



# Discourse-Intensive Instruction: An example



# Lesson Topic: Comparing Fractions

- ▶ You, the teacher, pass out a worksheet with three pairs of fractions. You say, “Work with the people at your table to find the greater fraction in each pair. Be ready to explain your reasoning when we talk as a whole class.”
- ▶ Students work on the worksheet in groups of 3–4 students. You help as needed.
- ▶ The whole–class discussion begins.



# Whole-Class Discussion on Comparing $\frac{2}{5}$ and $\frac{3}{4}$ (cont.)

Line	Speaker	Utterance
1	Teacher	Which is greater: $\frac{2}{5}$ or $\frac{3}{4}$ ? Alex?
2	Alex	I think $\frac{3}{4}$ is greater.
3	Teacher	Why do you think so?
4	Alex	Because I used a half.



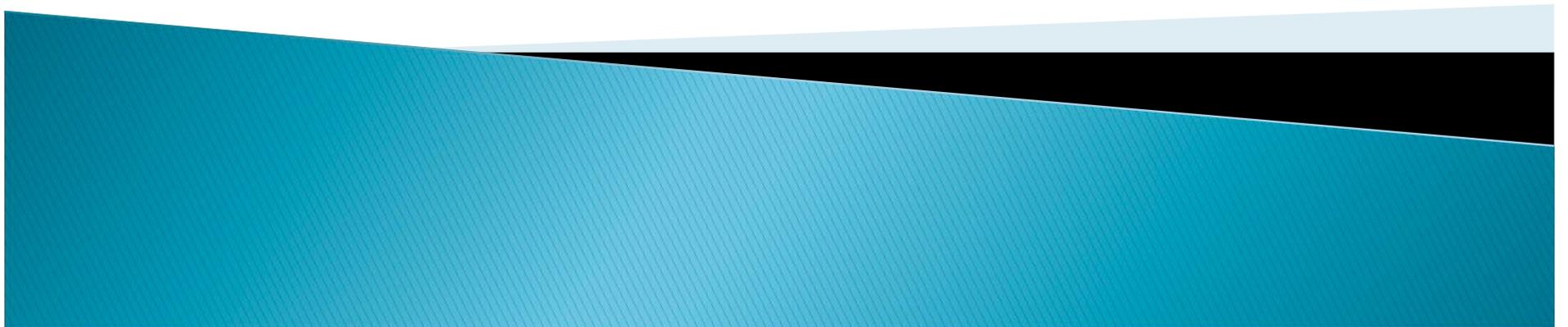
# Whole-Class Discussion on Comparing $\frac{2}{5}$ and $\frac{3}{4}$ (cont.)

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3	Teacher	Why do you think so?
4	Alex	Because I used a half.



# Productive Talk Moves

What does the teacher do next after the student tells how he got his answer?



# Press for Reasoning

*You ask a student to deepen, clarify, or support his initial explanation.*

Line	Speaker	Utterance
1	Teacher	Which is greater: $2/5$ or $3/4$ ? Alex?
2	Alex	I think $3/4$ is greater.
3	Teacher	Why do you think so?
4	Alex	Because I used a half.
5	Teacher	Okay, what do you mean 'you used a half'?



# Press for Reasoning (cont.)

*A sustained press for reasoning is often necessary.*

Line	Speaker	Utterance
1	Teacher	Which is greater: $2/5$ or $3/4$ ? Alex?
2	Alex	I think $3/4$ is greater.
3	Teacher	Why do you think so?
4	Alex	Because I used a half.
5	Teacher	Okay, what do you mean 'you used a half'?
6	Alex	That thing we learned where we see if it's more or less than a half.



# Press for Reasoning (cont.)

*A sustained press for reasoning is often necessary.*

Line	Speaker	Utterance
1	Teacher	Which is greater: $2/5$ or $3/4$ ? Alex?
2	Alex	I think $3/4$ is greater.
3	Teacher	Why do you think so?
4	Alex	Because I used a half.
5	Teacher	Okay, what do you mean 'you used a half'?
6	Alex	That thing we learned where we see if it's more or less than a half.
7	Teacher	Okay, so say more. How did you compare each fraction to one half?



# Press for reasoning (cont.)

Line	Speaker	Utterance
6	Alex	That thing we learned where we see if it's more or less than a half.
7	Teacher	Okay, so say more. How did you compare each fraction to one half?
8	Alex	Well, for $2/5$ , I knew that half of 5 was $2\frac{1}{2}$ , and $2/5$ is less than that. So $2/5$ is less than $\frac{1}{2}$ .



# Who can repeat?

You ask the other students to repeat or rephrase a peer's contribution.

Line	Speaker	Utterance
6	Alex	That thing we learned where we see if it's more or less than a half.
7	Teacher	Okay, so say more. How did you compare each fraction to one half?
8	Alex	Well, for $\frac{2}{5}$ , I knew that half of 5 was $2\frac{1}{2}$ , and $\frac{2}{5}$ is less than that. So $\frac{2}{5}$ is less than $\frac{1}{2}$ .
9	Teacher	Who can repeat what Alex just said? How did he know that $\frac{2}{5}$ was less than $\frac{1}{2}$ ? Maria?
10	Maria	He said that half would be $2\frac{1}{2}$ over 5, but we only have 2 over 5, so that's less.

# Turn-and-Talk

You ask everyone to “turn and talk to the person next to them” about one student’s idea.

Line	Speaker	Utterance
8	Alex	Well, for $2/5$ , I knew that half of 5 was $2\frac{1}{2}$ , and $2/5$ is less than that. So $2/5$ is less than $\frac{1}{2}$ .
9	Teacher	Who can repeat what Alex just said? How did he know that $2/5$ was less than $\frac{1}{2}$ ? Maria?
10	Maria	He said that half would be $2\frac{1}{2}$ over 5, but we only have 2 over 5, so that’s less.
11	Teacher	This is an important but complex idea. Can everyone turn and talk to the person next to them about it. What did Alex do to find out that $2/5$ was less than $\frac{1}{2}$ ?



# What do you think about that?

You ask students to endorse, refute, challenge, or add on to a classmate's idea.

Line	Speaker	Utterance
1	Teacher	Who used a different strategy? Katya?
2	Katya	Well, I just looked at the 2 and 3. Since 3 is greater than 2, $\frac{3}{4}$ has to be greater than $\frac{2}{5}$ .
3	Teacher	What do other people think about that?



# What do you think about that? (cont.)

Line	Speaker	Utterance
1	Teacher	Who used a different strategy? Katya?
2	Katya	Well, I just looked at the 2 and 3. Since 3 is greater than 2, $\frac{3}{4}$ has to be greater than $\frac{2}{5}$ .
3	Teacher	What do other people think about that? Jan?
4	Jan	Well, yeah, it works but only 'cause 4ths are bigger than 5ths. So, $\frac{2}{5}$ is two small pieces and $\frac{3}{4}$ is three bigger pieces. Having more of bigger pieces is better.



# Do you agree or disagree.. and why?

Line	Speaker	Utterance
1	Teacher	Who used a different strategy? Katya?
2	Katya	Well, I just looked at the 2 and 3. Since 3 is greater than 2, $\frac{3}{4}$ has to be greater than $\frac{2}{5}$ .
3	Teacher	What do other people think about that? Jan?
4	Jan	Well, yeah, it works but only 'cause 4ths are bigger than 5ths. So, $\frac{2}{5}$ is two small pieces and $\frac{3}{4}$ is three bigger pieces. Having more of bigger pieces is better.
5	Teacher	Okay, so you said a lot. Let's back up a little. The first thing you said was that 4ths are bigger than 5ths. Who agrees or disagrees with that statement?



# Do you agree or disagree.. and why?

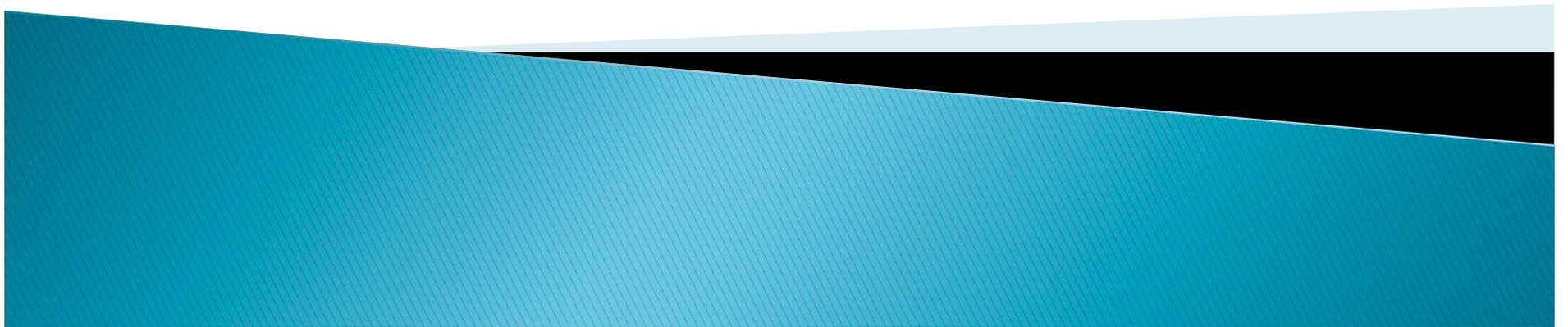
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1	Teacher	Who used a different strategy? Katya?
2	Katya	Well, I just looked at the 2 and 3. Since 3 is greater than 2, $\frac{3}{4}$ has to be greater than $\frac{2}{5}$ .
3	Teacher	What do other people think about that? Jan?
4	Jan	Well, yeah, it works but only 'cause 4ths are bigger than 5ths. So, $\frac{2}{5}$ is two small pieces and $\frac{3}{4}$ is three bigger pieces. Having more of bigger pieces is better.
5	Teacher	Okay, so you said a lot. Let's back up a little. The first thing you said was that 4ths are bigger than 5ths. Who agrees or disagrees with that statement?
6	Louie	I agree.
7	Teacher	Why?
8	Louie	'Cause it's true.

# *Families of Talk Moves*

- ▶ Press for reasoning
  - Say more about that.
  - What did you mean by [x]?
  - Can you say that again?
- ▶ Who can repeat?
  - Who can put that in their own words?
  - What else can say it again?
- ▶ What do you think about that?
  - Do you agree or disagree...and why?
  - Does that idea make sense to you?
  - Who can add on to that idea?



Sounds like a good idea  
but ...is it really worth it?

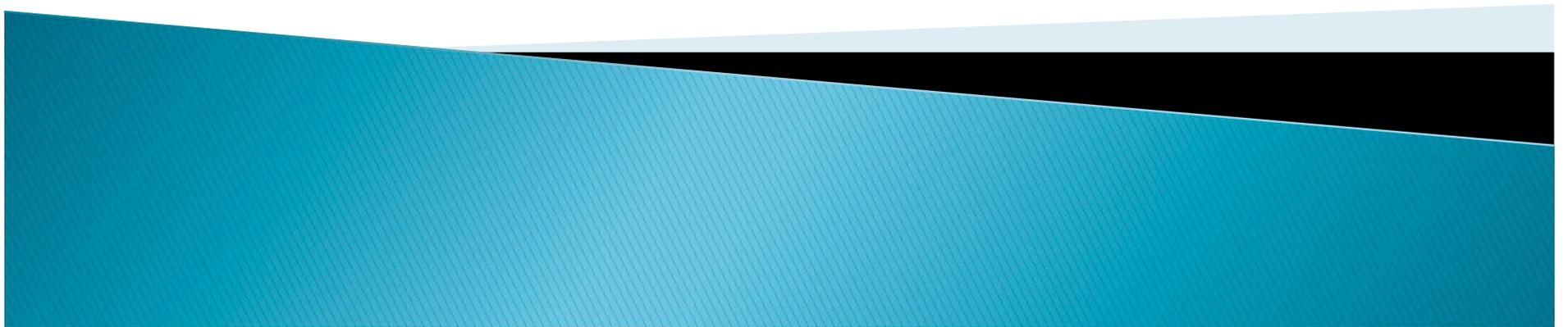


# Research Findings

- ▶ Press for reasoning keeps the cognitive demands of a task high
- ▶ Giving explanations is associated with high achievement
- ▶ Constructive activity after receiving an explanation is associated with high achievement
  
- ▶ \*See References



# Planning a Talk-Based Lesson about Graph Conclusions (Grade 3)



# Lesson Background

- ▶ Mrs. Schineller's third-grade students had recently begun a unit on graphing.
- ▶ Goals of this unit include creating bar graphs with scales greater than 1 and writing conclusions about the data using terms and phrases including the following: more, less, more than half, less than half,  $x$  times as many, almost all, almost none.



# Our Goal for Today

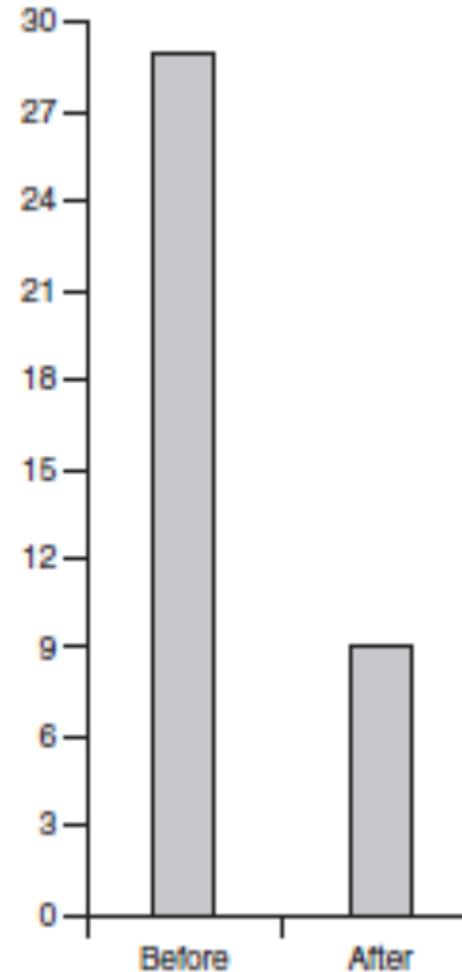
- ▶ We are going to imagine we are Mrs. Schineller as she prepares for this lesson.
- ▶ We will write a talk-based lesson plan for the graphing lesson.
- ▶ But, first we will explore the mathematics in the lesson as a group.



# Writing Graph Conclusions

- ▶ Work with a partner to write at least three conclusions about the data using the following terms or phrases: more, less, more than half, less than half,  $x$  times as many, almost all, almost none.

Do you prefer to do your homework before or after dinner?



# Graph Conclusions

- ▶ How are the following three statements similar? How are they different?
- ▶ Why is it important for students to be able to state and explain each one?
  - Statement 1: More students prefer to do their homework before dinner.
  - Statement 2: More than half of the students prefer to do their homework before dinner.
  - Statement 3: About three times as many students prefer to do their homework before dinner than after.



# Lesson Planning Template

- ▶ Time
- ▶ Materials
- ▶ Vocabulary
- ▶ Identifying the Mathematical Goals
- ▶ Anticipating Confusion
- ▶ Planning the Implementation



# Lesson Planning Template

- ▶ Time: 45 – 60 minutes
- ▶ Materials: the graph, paper, pencils
- ▶ Vocabulary: (see goals below)



# Identifying the Mathematical Goals

- ▶ Students will write and justify conclusions about the graph using the following terms or phrases: more, less, more than half, less than half, times as many, almost all, almost none.



# Anticipating Confusion

- ▶ What mistakes will students likely make as they write graph conclusions?
- ▶ What misconceptions might they have about the lesson goals?
- ▶ What might be most difficult for them?

**\*\*Be specific!\*\***



# Asking Questions

- ▶ What questions will you ask students as they work in small groups?
- ▶ What questions will you use to facilitate the whole-class discussion(s)?
- ▶ What questions will you ask to target the misconceptions you identified earlier?

**\*\*Be specific!\*\***



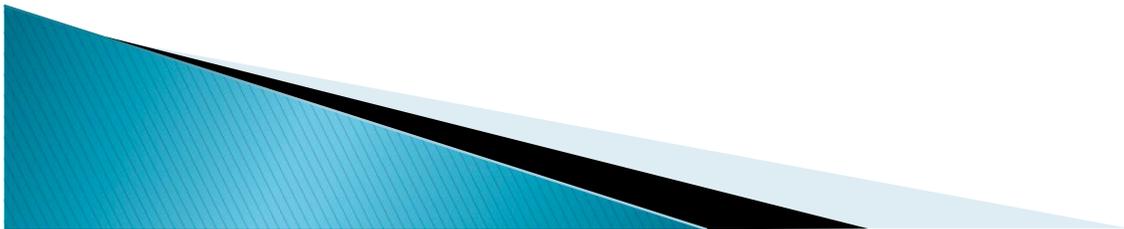
# Planning the Implementation

- ▶ How will you use small group work time to prepare students for the whole-class discussion?
- ▶ In the whole-class discussion, when will you use:
  - Turn-and-Talk
  - Press for reasoning
  - Who can repeat?
  - What do you think about that?
- ▶ How will you make sure the discussion stays focused on the lesson goals?



# The Talk-Based Lesson Template

- ▶ Time
- ▶ Vocabulary
- ▶ Materials
- ▶ Identifying the Mathematical Goals
- ▶ Anticipating Confusion
- ▶ Planning the Implementation



# Guidelines for Successful Video Showing

1. Assume that there are many things you don't know about the students, the classroom and the shared history of the teacher and students.
2. Assume good intent and expertise on the part of the teacher.
3. Focus on the following question, "What does the discussion reveal about student understanding?"



# Discussion Questions: Clip 8.2a

- ▶ How does the teacher, Mrs. Schineller, use partner work time to prepare students for the whole-class discussion?



# Discussion Questions: Clip 8.2b

- ▶ Before the discussion started, Mrs. Schineller decided to begin the discussion with Zoe's statement that "more people like to do their homework before dinner." What are the educational advantages of choosing this statement to begin the whole-class discussion?



## Discussion Questions: Clip 8.2b (cont.)

- ▶ What talk moves does Mrs. Schineller use during this excerpt? When does she use them? What do they reveal about student understanding?
- ▶ Mrs. Schineller ends this part of the discussion without asking Zoe to justify the conclusion or asking other students why they agree or disagree with the statement. Why might she have made this decision?



# Discussion Questions: Clip 8.2c

- ▶ What talk moves does the teacher use in this clip? When does she use them? What do these talk moves reveal about student understanding of  $x$  times as many graph conclusions?
- ▶ What other talk moves might Mrs. Schineller have used during this part of the lesson? Why?



# Discussion Questions: Clip 8.2d

- ▶ Mrs. Schineller asks four students to repeat Lucas's statement that twenty-nine is bigger than nineteen. Why might she have made this decision?
- ▶ How does Mrs. Schineller respond when one student cannot repeat the previous student's statement? Why might she have made this decision?
- ▶ Mrs. Schineller also repeats Lucas's explanation herself. How might this help students make sense of Lucas's idea?



# Final Thoughts

- ▶ Productive math talk is often messy.
- ▶ If you don't understand a student's statement,...
  - Don't be afraid to persist and use *press for reasoning* several times in a row.
  - Use turn-and-talk as your own personal wait time.
- ▶ Remember that you don't need to pursue every student's idea.



# Final Thoughts (cont.)

- ▶ Remember that it's still okay to tell.
- ▶ Start with only one move.
- ▶ Tell your students what's going on.
- ▶ Email me at [nan@bu.edu](mailto:nan@bu.edu).



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