Module 4: Prompting and Supporting Argumentation:
Focus on Implementation- Classroom Discourse
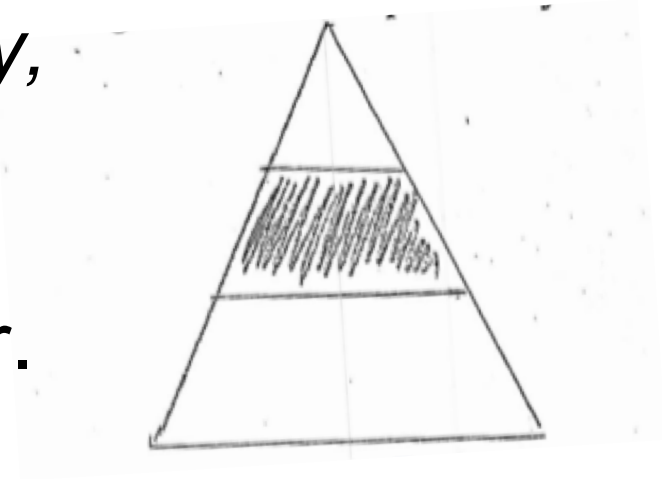
"The math serves the conversation. The conversation doesn't serve the math."

- Dan Meyer

UCONN

Opening Activity

Opening Activity
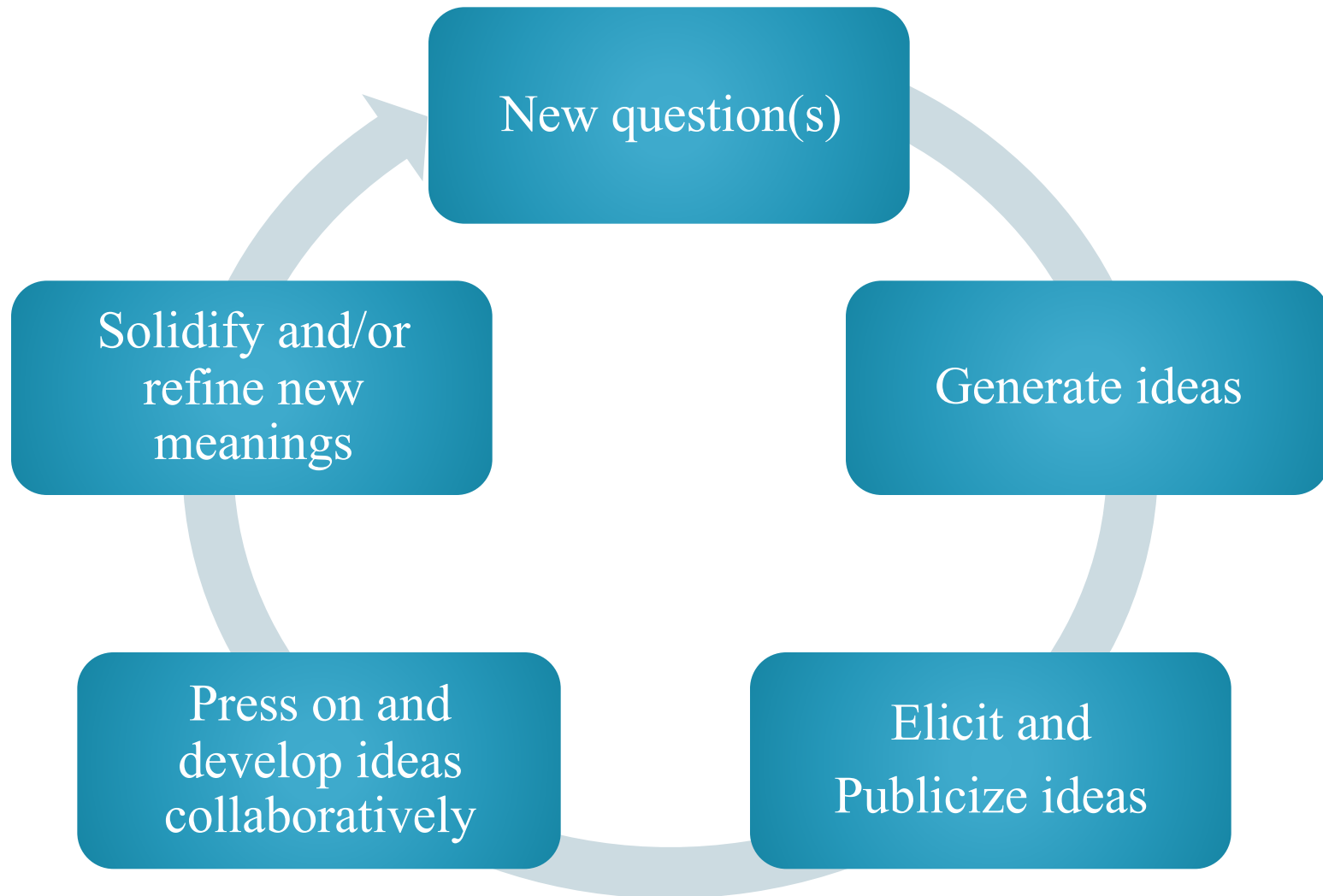
Under what conditions, *if any,* will the area of the shaded region be 1/3 the area of the triangle? Justify your answer.

Module Objectives

- <u>Develop</u> a deeper understanding of argumentation and its potential in the math classroom.
- <u>Analyze</u> mathematics classroom discourse interactions that can support students to engage in argumentation
- <u>Reflect</u> on current instructional strategies to consider how they will promote discourse and argumentation in the classroom

A Pedagogical Model to Support a Culture of Thinking

New question(s)

Generate ideas

Elicit and Publicize ideas

Press on and develop ideas collaboratively

Solidify and/or refine new meanings

Bridging Math Practices Project – Module 4

Additional Routines to Support Argumentation
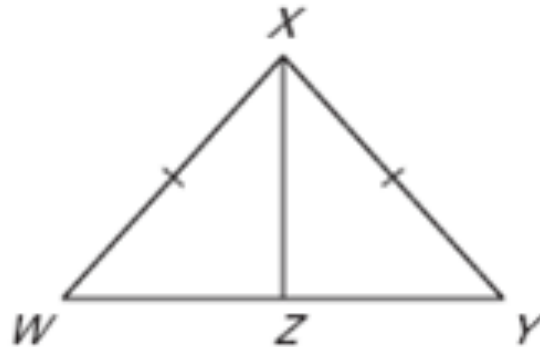
A culture of thinking

can be supported by a range of other, "smaller" routines you use throughout math instruction

- can be verbal or written
- may engage students in argumentation even though they may not write an argument

Smaller Routines to Support Argumentation

1. How Do You Know?

Are the two triangles congruent? How do you know?

How does the routine support the Pedagogical Model?

Smaller Routines to Support Argumentation

1. How Do You Know?

Which expression is larger? How do you know?

i. 790 + 135 + 232   795 + 133 + 230

ii. 5% of 7 billion   7% of 5 billion

How does the routine support the Pedagogical Model?

Smaller Routines to Support Argumentation

2. Eliminate It

Cross out the one that does not belong.

Create a mathematical argument to support your decision.

How does the routine support the Pedagogical Model?

Smaller Routines to Support Argumentation

2. Eliminate It

$y = -8x(x + 1)$	$f(x) = 6x^2 - 1 - (6x + 1)$
$f(x) = 2x^2$	$y = x^5 + 3x^2 - 5$

Cross out the one that does not belong.

Create a mathematical argument to support your decision.

How does the routine support the Pedagogical Model?

Smaller Routines to Support Argumentation

3. Would you rather?

HAVE A POOL THAT IS

OR

40 ft × 9 ft × 4 ft   7 yds × 4 yds × 2 yds

Create a mathematical argument to support your decision.

How does the routine support the Pedagogical Model?

Smaller Routines to Support Argumentation

3. Would you rather?

HAVE 38 BASKETS OF 12 APPLES

OR

40 BASKETS OF 10 APPLES?

h/t @tracyzager

Create a mathematical argument to support your decision.

How does the routine support the Pedagogical Model?

Many more at… http://www.wouldyourathermath.com

Smaller Routines to Support Argumentation

How might you incorporate these routines (or others like them) into your classroom practice?

Mathematical Discourse to Promote Student Reasoning

- How do our approaches to math classroom **discourse** impact student reasoning & conceptual understanding?
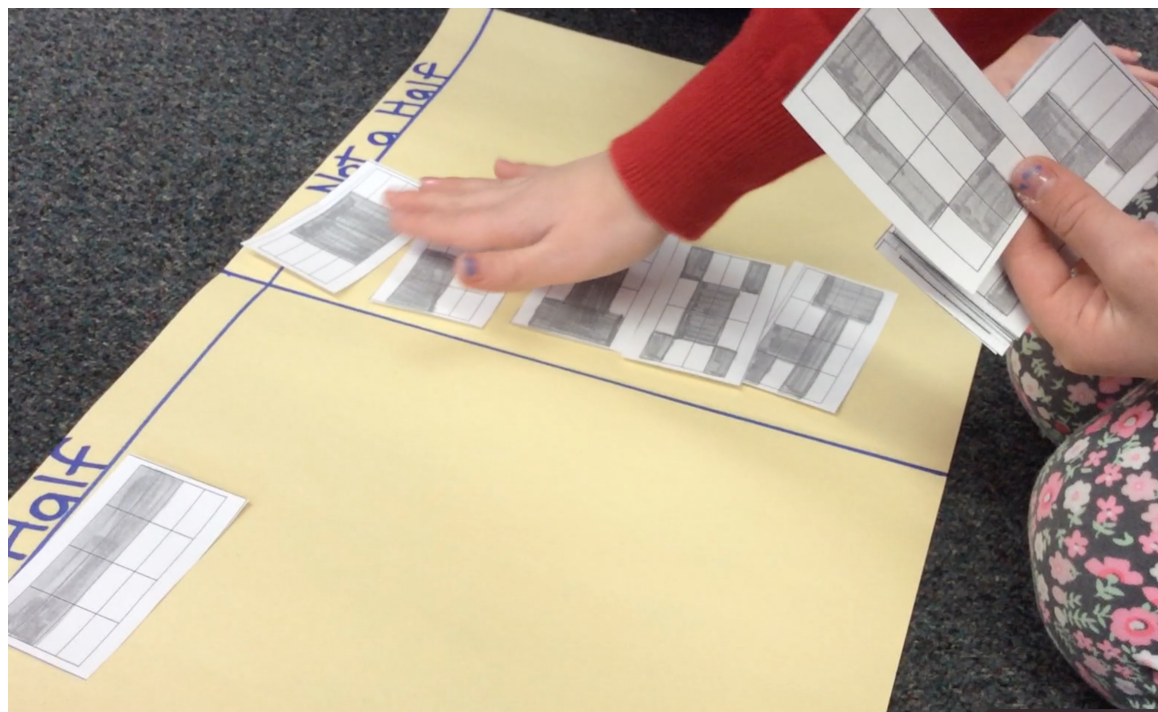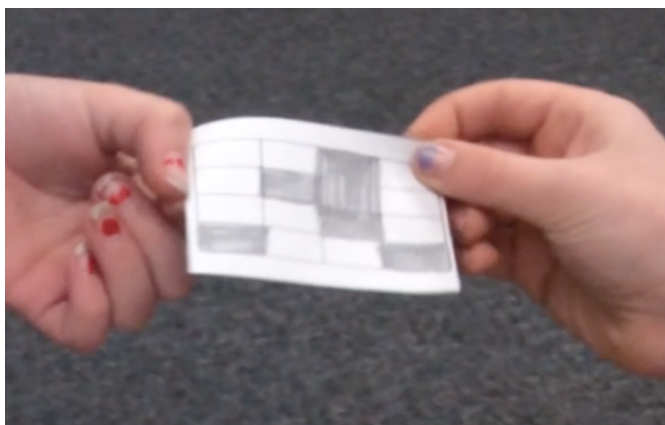
Watching Classroom Videos

- Productive for helping us think of some students' interactions.

- Focus on Argumentation as the purpose of the video

- Focus closely on student thinking (you can't see the full class)

- Focus on teacher interactions with students

Is It a Half?

Sorting task

Half	Not a Half

3rd grade – Manchester school
Bridges teacher
Megan working with the pair

"Is It a Half?" Video

1. What kinds of questions and prompts are being asked?

2. How is argumentation being supported?

"Is It a Half?" Video

Let's Watch the Video

"Is It a Half?" Video

1. What kinds of questions and prompts are being asked?

2. How is argumentation being supported?

3. As a teacher, what would you do next to continue supporting these students to develop argumentation?

"Is It a Half?" Part 2

https://youtu.be/3okhIZsE3G4

Always remember…

- **Stay Calm & Argue On**

- **It's Worth the Time Now - You'll make it up later**

- **Students WILL get better at this**

Funneling & Focusing

Ways of approaching classroom discourse...

Herbel-Eisenmann, B. A. & Breyfogle, M. L. (2005). Questioning our patterns of questioning. *Mathematics teaching in the middle school, 10*(9), 484-489.

Funneling & Focusing

- **Funneling:** When teacher asks a series of questions that *guide the students to a procedure or to a desired end.*

- **Focusing:** Requires the teacher to *listen to students' responses* and *guide them based on what the students are thinking* rather than how the teacher would solve the problem.

Two Dialogues

Excerpt #1:
Brownies Problem

Teacher: Ms. Carter

Excerpt #2:
Simplifying Fractions

Teacher: Ms. Reardon

$$\frac{12}{21} = ?$$

- Please take notes as the dialogues are being read. What do you notice?
- How do teacher questions (& other verbal moves) impact student reasoning?
- How might these relate to funneling and focusing?

Two Dialogues

- Please share some of your observations …

Helping Ms. Reardon

- Work in groups of 3.

- Choose one or more of Ms. Reardon's verbal moves, or a small section of the dialogue, and re-write it to include **focusing questions/verbal moves** (rather than funneling questions/verbal moves)

- Keep your ideas in mind as we move forward …

Comparing Student Participation
Two dialogues with student turns only

Two Classroom Dialogues : Excerpt 1

Excerpt 1: The Brownie Problem
Students in Ms. Carter's class were exploring the concept of equivalent fractions. The specific problem follows:
The problem: I invited 8 people to a party (including me). My mother got home with 9 brownies. How much did each person get if everyone got a fair share?

Sarah:	The first four, we cut them in half. [Jasmine divides squares in half on an overhead transparency. See figure below.]

Sarah:	Because when you put it in half it becomes ... eight halves.

Sarah:	Each person gets half

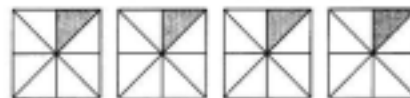| Sarah:	Then there were five boxes [brownies] left. We put them in eighths.

Sarah:	It's easiest. Because then everyone will get ... each person will get a half and [whispers to Jasmine] How many eighths?
Jasmine:	[Quietly to Sarah] 5/8.

Jasmine:	We did eighths because then if we did eighths, each person would get each eighth, I mean 1/8 out of each brownie.

Jasmine:	Person one would get this ... [Points to one eighth.]
Sarah:	Out of each brownie, one person will get 1/8.
Jasmine/Sarah:	They got a 1/2 and 5/8.

The dialogue continues...

Two Classroom Dialogues : Excerpt 2

Excerpt 2: Fractions and Factors (from Truxaw, 2004)
Ms. Reardon is reviewing for a test with her seventh grade class.

Steven:	Turn it into the lowest fraction possible that equals the 12 twenty-firsts.
Class:	Number
Lucas:	1 and 12
Sheila:	6 and 2
Roberto:	3 and 4
Class:	Yeah.
Class:	No.
Student:	1 & 21 *[almost inaudible]*
Garth:	3 and 7
Joseph:	Um, 1 and 21

The verbal exchanges continue similarly, finding the common factors of 21. Then...

Amanda:	You see them more than once.
Taylor:	One.
Breanna:	Three
Class:	[No response.]

The dialogue continues...

Tips for questioning ...

Bridging to Practice

Bridging To Practice: Routines to Support Argumentation

Think about content for the start of the school year (first 2 weeks)

(25 mins) Select (or develop!) a routine and create a problem to use with that routine

As you find helpful, work with people from your school/district or from your grade level

(30 mins) Workshop the routines!

(10 mins) Revise, record next steps

Session Closure

Acknowledgements

- Bridging Math Practices Project was supported by a Math-Science Partnership Continuation Grant from the Connecticut State Department of Education, 2015-2016

- The initial 2014-2015 Bridges project was a collaborative project among UConn, Manchester Public Schools, Mansfield Public Schools, and Hartford Public Schools