

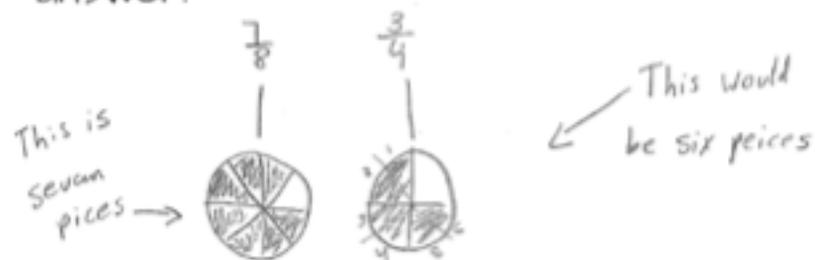
The Power of Discourse

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Downloadable resources available at

Sheliah thinks that $\frac{7}{8}$ is greater than $\frac{3}{4}$.
 Peter says that $\frac{7}{8}$ is less than $\frac{3}{4}$. Who is
 correct and why? Use numbers and
 symbols to thoroughly explain your
 answer.



Peter is wrong because $\frac{7}{8}$ is more than $\frac{3}{4}$
 Sheliah is correct because $\frac{7}{8}$ is more than $\frac{3}{4}$

Sheliah

Peter

~~—~~ = correct

Talk Comes First

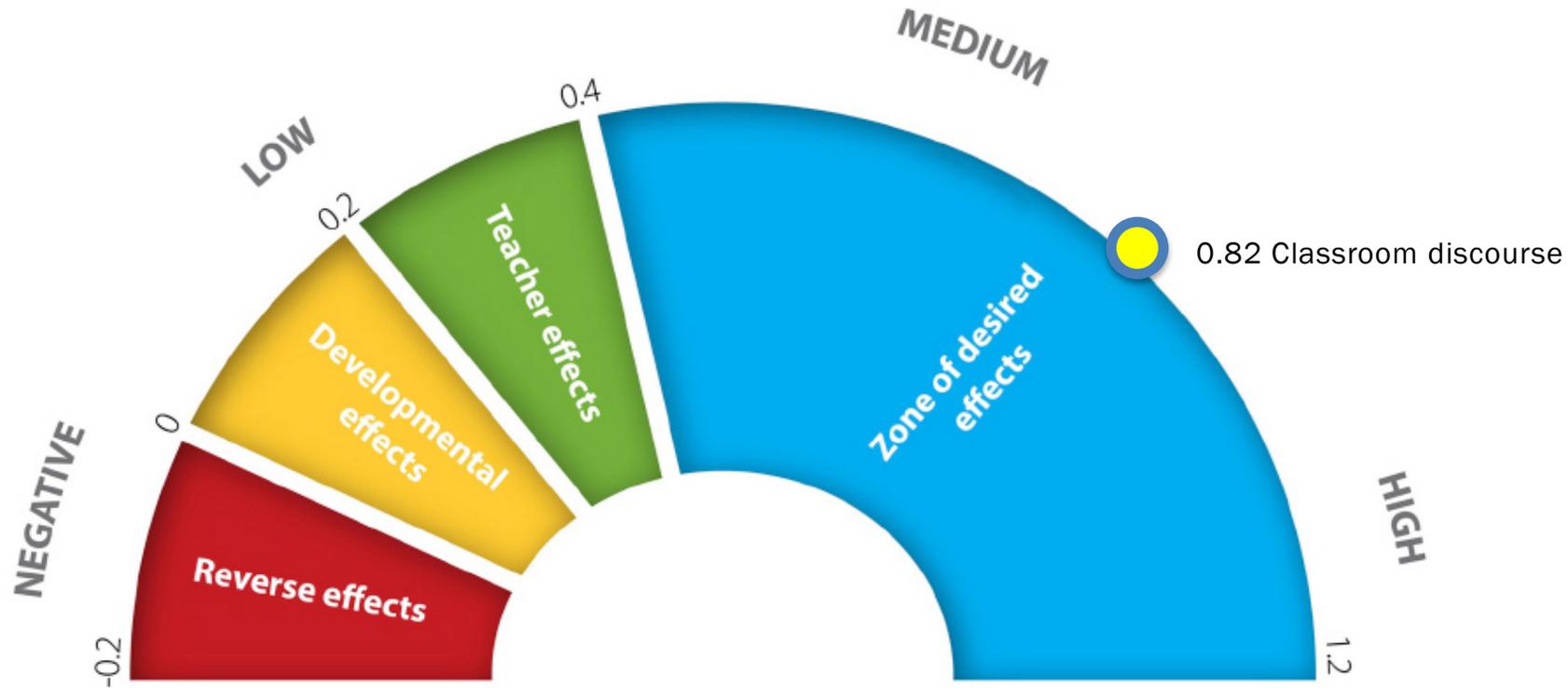
Mathematical
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“Literacy floats on a sea of talk.”

Britton, J. (1970). *Language and Learning*. Coral Gables, FL: University of Miami Press.

Research Says

Classroom Discussion: *Visible Learning in Mathematics*



Hattie, J., et. al. (2017). *Visible learning for mathematics, grades K-12: What works best to optimize student learning*. Thousand Oaks, CA: Corwin.

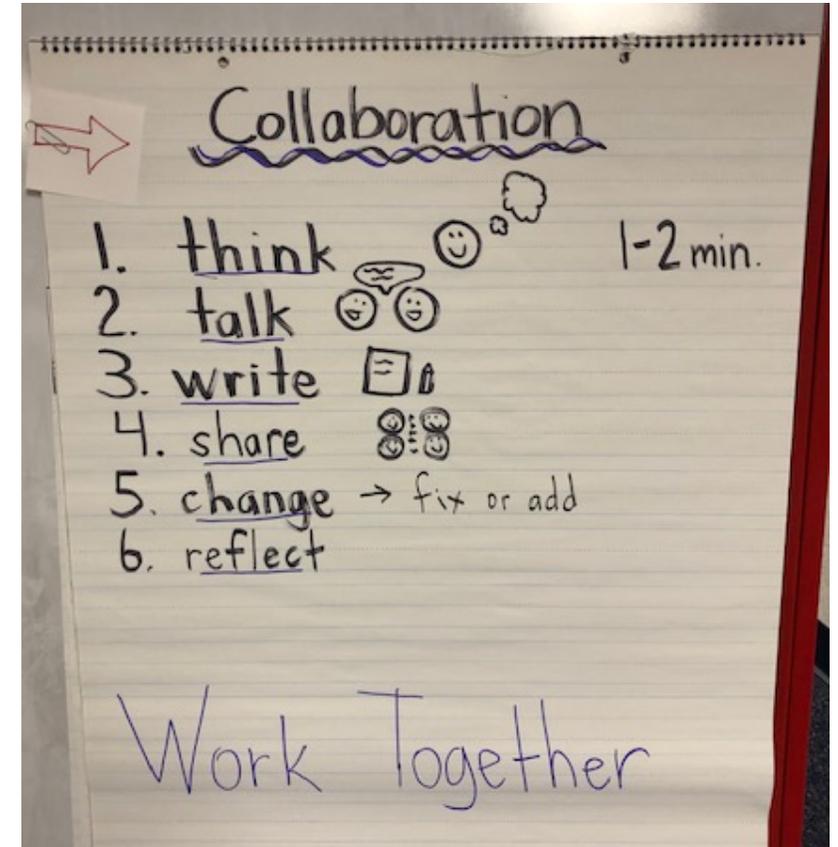
Mathematical Discourse Defined

Discourse reaches beyond discussion because it includes “ways of representing, thinking, talking, agreeing, and disagreeing. It is the way ideas are exchanged and what the ideas entail.”

Hattie, J., et. al. (2017). *Visible learning for mathematics, grades K-12: What works best to optimize student learning*. Thousand Oaks, CA: Corwin.

Supporting Discourse - Risk-taking Protocol

- Establish trust
- Give clear directions
 - Think on your own
 - Pair up - share ideas with a partner
 - Square up – share ideas with another pair
 - Group share
 - Focus on thinking, processes, strategies
 - Include sharing of written work (words and pictures)



Roles During Discourse

Teacher

- **Facilitate** discourse – more student talk, less teacher talk
- **Engage** students in sharing ideas using **multiple representations**
- **Select** and **sequence** shared work
- **Ensure progress** towards mathematical goals

Student

- **Present** and **explain** ideas and representations
- **Seek to understand** approaches used by others
- **Compare** and **contrast** various approaches
- **Listen carefully** and **critique** the reasoning of others

Feathering the Nest

- Model and practice a climate of trust, respect, and support
 - Celebrate mistakes
 - Arrange the room to make talking together easier
 - Post and practice talk moves and sentence stems
 - Define roles
- Plan for questioning and appropriate tasks

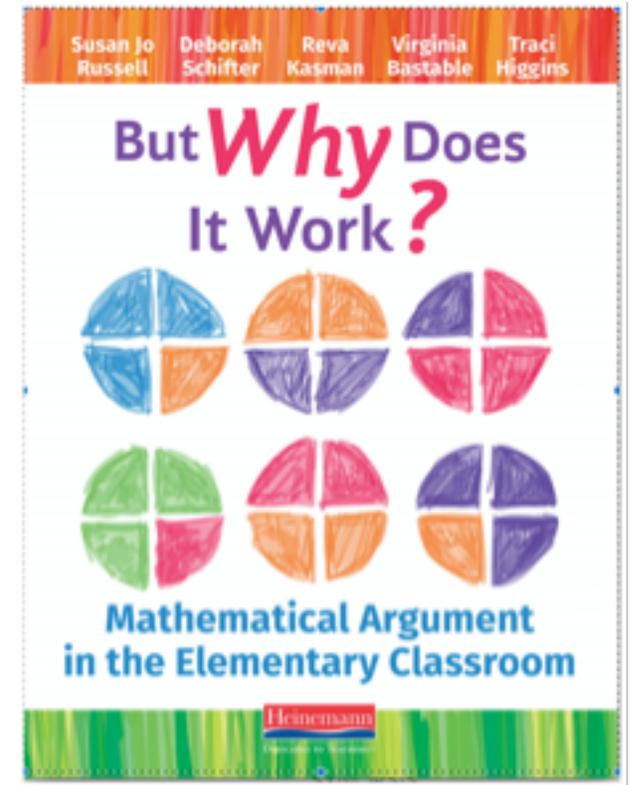
Let's Give 'Em Something to Talk About: The Influence of Tasks on Discourse

- Does the problem involve meaningful mathematics?
- Does the problem provide an opportunity for students to apply and extend mathematics?
- Is the problem interesting to students?
- Is the problem challenging for students?
- Does the problem support the use of multiple strategies?
- Will students' interactions with the problem reveal information about students' mathematical understanding?

Dixon, J. K., Adams, T. L., Nolan, E. C., & In Kanold, T. D. (2015). *Beyond the common core: A handbook for mathematics in a PLC at work.*

Encouraging Mathematical Thinking

- Remember to include
 - Articulation of mathematical ideas
 - Connecting representations and abstractions
 - Productive lingering



Russell, S.J., et.al. (2017). *But why does it work?: Mathematical argument in the elementary classroom*. Portsmouth, NH: Heinemann

Discourse and Metacognition

- Self-questioning
 - What do I know about the problem?
 - What is the problem asking me to find out?
 - What strategies can I use to understand the problem better?
 - Have I seen something like this before?
- Self-reflection
 - How is my answer similar to/different from my other students' solutions?
 - How do I know my solution is correct?
 - How well did I communicate my thinking?
 - Could I have done this a different way?
 - What if...?

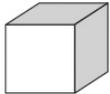
High Level Discourse

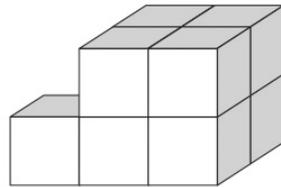
- Teacher as facilitator, guide on the side
- Student initiated talk, including questions directed to each other
- Teacher guides students to contrast strategies
- Students justify own thinking
- Students use math drawings to describe their thinking and the thinking of other students
- Students support and shape each other's thinking

Hufferd-Ackles, K., Fuson, K., & Sherin, M. G. (2004). Describing levels and components of a math-talk community. *Journal for Research in Mathematics Education*.

Think Tanks Grade 1

1

How many  in this building?



Thinking Mathematically and Problem Solving

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**HEAD
POLISHERS**

Yellow Tank

Think Tank Grade 2

2

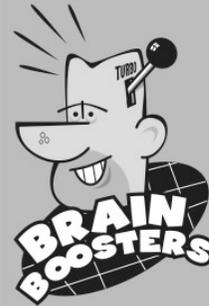
Jose is 8 years old.

Previn is 2 years older than Jose.

Sam is younger than Jose.

When you add their ages, you get 25.

How old is Sam?



Think Tank Grade 3

4

This is a mixed-up multiplication table.

Copy the table.

×	3	2		
	15			20
2			10	
		6		
	12			

The top row should show the numbers 2, 3, 4 and 5.

The first column should show the numbers 2, 3, 4 and 5.

Complete the table.

Thinking Mathematically and Problem Solving

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Purple Tank

Think Tank Grade 4

3

Binh is thinking of 2 different prime numbers.
Their sum is 30.
Their difference is 4.

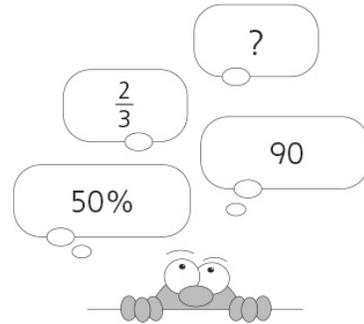
What are the 2 numbers?



Think Tank Grade 5

2

- a. How much more than **50%** of **90** is $\frac{2}{3}$ of **90**?
- b. Write how you figured it out.



Purposeful Classroom Questioning

Focusing Questions

- Help push student thinking forward
 - Where could you start?
 - What are you trying to figure out?
 - Why does that work?
 - Is there another way to approach it? To represent it?
 - How are these ideas related?

Funneling Questions

- Guide the student down the teacher's chosen path.
 - What if you tried *this* here?
 - So you could find *this* first?
 - What if you did *this* instead of *that*?

Roles for Questioning

Teacher

- Advance student **thinking** with **focusing questions**
- Ask questions that require **justification**
- Ask **intentional** questions that make the mathematics **visible**
- **Allow wait time**

Student

- Expect to be asked to **explain, clarify, and elaborate**
- **Reflect** and **justify** reasoning
- Listen to, **comment** on, and **question** classmates comments
- **Think carefully** and **take time** to craft a clear response

Support Discourse: Talk Moves and Sentence Stems

- Clarification and explanation
 - Could you describe what you mean?
- Justification
 - How did you know?
- Recognize and challenge misconception
 - I don't agree because..
 - Have you considered an alternative?
- Interpret and use other's statements
 - I heard Charla say...and that makes me think...
- Require evidence
 - Can you give me an example?

Additional Questions to Support Discourse

- What decisions did you make?
- Can you tell me more about...?
- Can you explain a different way?
- What patterns do you notice?
- How does ____ relate to ____?
- What can you tell me without solving the problem (performing computation)?
- Rather than trying to *add* the numbers, try thinking about the pattern.
- What do you think about Jorge's question/statement?
- Who can repeat what Jessica said in their own words?

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References Cited

Britton, J. (1970). *Language and Learning*. Coral Gables, FL: University of Miami Press

Dixon, J. K., Adams, T. L., Nolan, E. C., & In Kanold, T. D. (2015). *Beyond the common core: A handbook for mathematics in a PLC at work*.

Hattie, J., et. al. (2017). *Visible learning for mathematics, grades K-12: What works best to optimize student learning*. Thousand Oaks, CA: Corwin.

Hiebert, J., & Grouws, D. A. (2007). The Effects of Classroom Mathematics Teaching on Students' Learning. In F. Lester (Ed.), *Second Handbook of Research on Mathematics Teaching and Learning*. Charlotte, NC: Information Age.

Hoffer, Wendy Ward. (2012). *Minds on mathematics: Using math workshop to develop deep understanding in Grades 4-8*. Portsmouth, NH: Heineman.

Hufferd-Ackles, K., Fuson, K., & Sherin, M. G. (2004). Describing levels and components of a math-talk community. *Journal for Research in Mathematics Education*,.

(2014). *Principles to actions : ensuring mathematical success for all*. Reston,VA:NCTM, National Council of Teachers of Mathematics,

Russell, S.J., et.al. ((2017) *But why does it work? Mathematical argument in the elementary classroom*. Portsmouth, NH: Heinemann.

Russell, Schifter, & Bastable. (2011) *Connecting arithmetic to algebra*. Thousand Oaks, CA: Heinemann.

Wong, H. K., Wong, R. T., & Seroyer, C. (2009). *The first days of school: How to be an effective teacher*. Mountain View, CA: Harry K. Wong Publications.