

## Using Number Talks to Inform Instructional Decisions

NCTM Interactive Workshop 2019

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#### Learning Outcomes

- 1. How can I use Number Talks to support my students' learning goals?
- 2. How can I assess students' thinking to inform instructional decisions?
- 3. How can I implement a Number Talks to elicit students' thinking?

#### Agenda

- Rights of the Learner
- What are Number Talks?
  - Problem: How Do Children Conceptualize the Equal Sign?
  - Solution: Using Number Talks as an Assessment Tool to Inform Instructional Decisions
- Unpacking Students' Thinking: How Can It Inform Instructional Decisions?
- Developing a Number Talk to Inform Your Instructional Decisions
- Sharing and Questions

#### Rights of the Learner

- The right to be confused
- The right to claim a mistake
- The right to speak, listen, and be heard
- The right to write, do, and represent what only makes sense

#### What are Number Talks?

- A tool for helping students develop procedural fluency
- Rich and thoughtful <u>discussion</u> around a purposefully selected problem
- Promotes conceptual understanding
  - Students learn through a shared experience
  - Students make sense of what numbers mean
  - Students reason about mathematics
  - Students *justify* solutions
  - All students have *access* to mathematics

#### A Number Talk



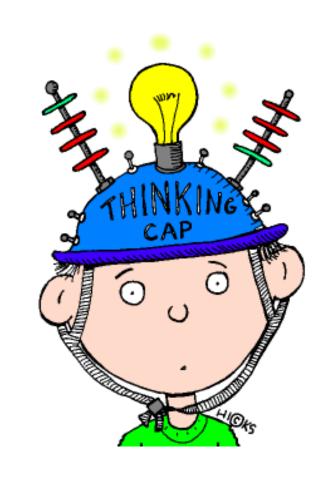
## True or False:

$$40 \div 4 = 10 \times 4$$

#### Think - Pair - Share

#### True or False:

 $40 \div 4 = 10 \times 4$ 



#### HOW DO CHILDREN CONCEPTUALIZE THE EQUAL SIGN?

## Equality and Children's Conceptions of the Equal Sign

$$8 + 4 = \square + 5$$

## Equality and Children's Conceptions of the Equal Sign

				Оіл	$=$ $\cup$	
Response/Percent Responding				0 + 4	+ 5	
Grade	7	12	17	12 and 17	Other	Number of Children
1	0	79	7	0	14	42
1 and 2	6	54	20	0	20	84
2	6	55	10	14	15	174
3	10	60	20	5	5	208
4	7	9	44	30	11	57
5	7	48	45	0	0	42
6	0	84	14	2	0	145

## Understanding the Equal Sign as a Symbol of Mathematical Equality

Level	Description	Examples		
Rigid Operational	Solve equations or evaluate true-false statements that only have operations on the left side of the equal sign.	4 + □ = 7 3 + 4 = □ □ + 4 = 7	T or F: 3 + 4 = 7 T or F: 3 + 4 = 8 T or F: 5 + 4 = 8	
Flexible Operational	<ol> <li>Solve equations with operations on the right side of the equal sign.</li> <li>Interpret statements that have no operations.</li> </ol>	□ = 3 + 4 7 = □ + 4 7 = □ □ = n	T or F: 8 = 3 + 4 T or F: 7 = 3 + 4 T or F: 7 = 7 T or F: n = n	
Basic Relational	Solve or evaluate statements with operations on both sides of the equal sign. Begins to recognize or explain a relational understanding of the equal sign.	5 + 7 = 6 + □		
Comparative Relational	Use short cuts (e.g., compensation strategies) and properties of the operations to solve equations or evaluate statements. Consistently explains and generates a relational understanding of the equal sign.	Uses strategies to find most efficient ways to solve		

## Equal Sign Knowledge a Predictor of Algebraic Skills

- Second-grade equal sign knowledge a powerful predictor of later algebraic competence
- Therefore, it is important to foreground equal sign knowledge to promote educational equity

# UNPACKING STUDENTS' THINKING

How Can It Inform Instructional Decisions?

#### What is Formative Assessment?

- A process of gathering evidence (within the stream of instruction) to inform teaching and learning (Black, Harrison, Lee, Marshall, & William, 2004)
- To be formative, the evidence must be "elicited, interpreted, and used by both teachers and learners" (William, 2011, p. 43)
- "... involves getting best possible evidence about what students have learned and using this information to decide what to do next" (William, 2011, p. 50)

## Norms for Investigating Teaching and Learning

- Assume positive intent (especially on teacher's part)
- Stay away from global evaluations and reserve judgment
- Focus on evidence of teaching and learning and be as descriptive as possible

## Activity: How Do Students Understand Equality?

- Read the case
- Use the analysis tool and your group members to unpack and understand students' thinking
- Create a visual that describes
  - The mathematical ideas that the students are working on
  - The math talk that shows students' understanding of equality
  - The math talk that shows that students may need support to develop an understanding of equality

#### How Do Students Understand Equality?

#### Focus

- What are students getting out of the talk and interaction?
- How is the classroom discourse serving as a formative assessment?
- Observe (connect the learning trajectory to your observations)
  - What math talk shows that students understanding equality?
  - What math talk shows that students may need support to develop an understanding of equality?

#### How Do Students Understand Equality?

#### Analysis

- Drawing on your observations, what did you learn about students' talk and interactions?
- What did you learn about the classroom discourse serving as formative assessment?

#### Next Steps

• Drawing on the analysis, what are one or two things you could implement in your (future) classroom practice?

## How can Number Talks Be Used to Inform Instructional Decisions?



# DEVELOPING A NUMBER TALK TO INFORM INSTRUCTION

#### The Number Talk Routine

- Teacher presents the problem
- Students figure out the answer
- Students share their answers
- Students share their thinking
- The class agrees on the answer for the problem
- The steps are repeated for additional problems

#### Your Role

- Select and present problems that make number relationships evident to students
- Provide all students access to the problem
- Value everyone's thinking
- Provide adequate wait time
- Record, clarify, restate
- Figure out students' ability and begin instruction at that point

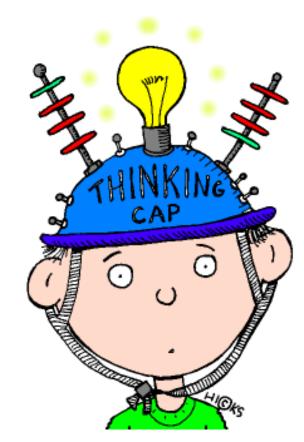
## Talk Moves to Support the Number Talk Routine

- Talk moves are actions that have been found to support mathematical thinking and learning
- Talk moves support the development of classroom culture as students learn to listen and respond to others' thinking



### What Could a Number Talk Look Like in Your Classroom?

- K-2: Number Sense, Fluency with Small Numbers, Subitizing, Making Tens
- 3-5: Number Sense, Place Value, Fluency, Properties, Fractions, Connecting Math Ideas
- 6-8: Number Sense, Fluency, Properties, Fractions, Decimals, Percent, Algebraic Thinking



#### Developing a Number Talk



# SHARING AND QUESTIONS

## Connecting Number Talks to Your Classroom

 How could the information you unpack during Number Talks inform your instructional decisions?





#### Thank You!

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