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# Using Number Talks to Inform Instructional Decisions

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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 discussion 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?

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# Equality and Children's Conceptions of the Equal Sign

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

# Equality and Children's Conceptions of the Equal Sign

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

## Response/Percent Responding

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.	$4 + \square = 7$ $3 + 4 = \square$ $\square + 4 = 7$	T or F: $3 + 4 = 7$ T or F: $3 + 4 = 8$ T or F: $5 + 4 = 8$
Flexible Operational	1. Solve equations with operations on the right side of the equal sign. 2. Interpret statements that have no operations.	$\square = 3 + 4$ $7 = \square + 4$ $7 = \square$ $\square = n$	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.	$5 + 7 = 6 + \square$	
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

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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

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# 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

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# 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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