Number in Context

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Welcome to Number in Context!

- Please complete the following tasks.
- How Many Buttons? Record the number of buttons on your clothing. Select one cube for each button and connect the cubes to make a cube train.
- Make Your Own Nametag – Write your first name on a piece of cardstock. Use the cardstock to make a table tent.

Principles to Actions

Think-Pair-Share

- Take a look at the 8 practices.
- Consider which practice is easiest for you to implement in your classroom.
- Consider which practice is most challenging for you to implement.

We will circle back to these practices throughout the institute.

Mathematics Teaching Practices
Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.
Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Commit and Toss

- You'll need an index card and a pen or marker.
- You have 30 seconds to write down your thoughts on number sense. What does it mean to you? What are strategies you could use to foster number sense?
- When you hear the signal, toss your card as far as you can.
- Pick up a card (not your own) and share and discuss with a partner.

Number Sense

"a good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms."

(Howden, 1989)

Number Sense

"As students work with numbers, they gradually develop flexibility in thinking about numbers, which is a hallmark of number sense… Number sense develops as students understand the size of numbers, develop multiple ways of thinking about and representing numbers, use numbers as referents, and develop accurate perceptions about the effects of operations on numbers"

(NCTM Principles and Standards for School Mathematics, 2000)

Workshop Goals

Activities will focus on the Measurement and Data domain.

- Participants will participate in activities and identify instructional strategies related to two big ideas:

1. Number is an extension of more basic ideas about relationships between quantities.
2. The selection of a unit makes it possible to use numbers in comparing quantities.

Related Essential Understandings

- Quantities can be compared without assigning numerical values to them.
- Using numbers to describe relationships between or among quantities depends on identifying a unit.

Related Essential Understandings

- The size of a unit determines the number of times that it must be iterated to count or measure a quantity.

- Quantities represented by numbers can be decomposed (or composed) into part-whole relationships.

Why Measurement and Number?

- "Early measurement activities are a very meaningful context for counting. Measurement of important objects in the familiar environment connects ideas of number to the real world, enhancing number sense."
- "One of the best ways for children to think of real quantities is to associate numbers with measures of things."

John Van de Walle, 2004

How Many Buttons?

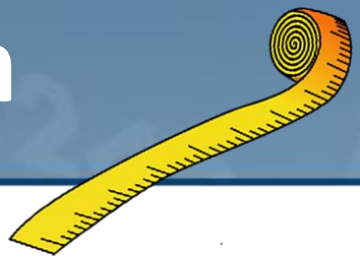
- Use the cube train that represents the number of buttons on your clothing to compare the number of buttons on your clothing to the number of buttons on the clothing of your tablemates. (Use comparative language such as: more, less, same, three buttons more, etc. to discuss and share findings.)
- What is the total number of buttons at your table?

A General Plan for Measurement Instruction

Concepts to Develop	Activity to Use
1. Understand the attribute to be measured.	1. Make comparisons based on the attribute.
2. Understand how a comparison of an attribute using units produces a measurement.	2. Use physical models of units to fill, match, or otherwise make the comparison of the attribute with the unit.
3. Understand the way measuring instruments work.	3. Make measuring instruments and use them along with actual unit models to compare how each works.

Elementary and Middle School Mathematics Teaching Developmentally 5th Edition, John A. Van de Walle (2004). Pearson Education.

CCSSM and Length



Kindergarten:

- Describe and compare measurable attributes.

First Grade:

- Measure lengths indirectly and by iterating length units.

Second Grade:

- Measure and estimate lengths in standard units.
- Relate addition and subtraction to length.

Think-Pair-Share

- Which standards in the cluster are familiar?
- What's new or challenging in these standards?
- Which standards in the cluster need unpacking or emphasis?

Protocol from *Common Core Mathematics in a PLC at Work Grades K-2*

Create a Measuring Stick

- Use pony beads and string to create your very own measuring stick.
- Record the lengths of the listed items on the recording sheet.

Focus Questions

Answer the following questions as you create your measuring stick:

- Where's the mathematics? (CCSSM standards)
- How would you modify, extend, and/or differentiate the activity to address student needs (varying ability levels, grade levels, etc.)?
- What mathematical practices did you observe?
- What evidence will you note that shows a child is learning the mathematics in the activity?

CCSSM and Time

First Grade:

- **Tell and write time.**
  - 1.MD.3. Tell and write time in hours and half-hours using analog and digital clocks.

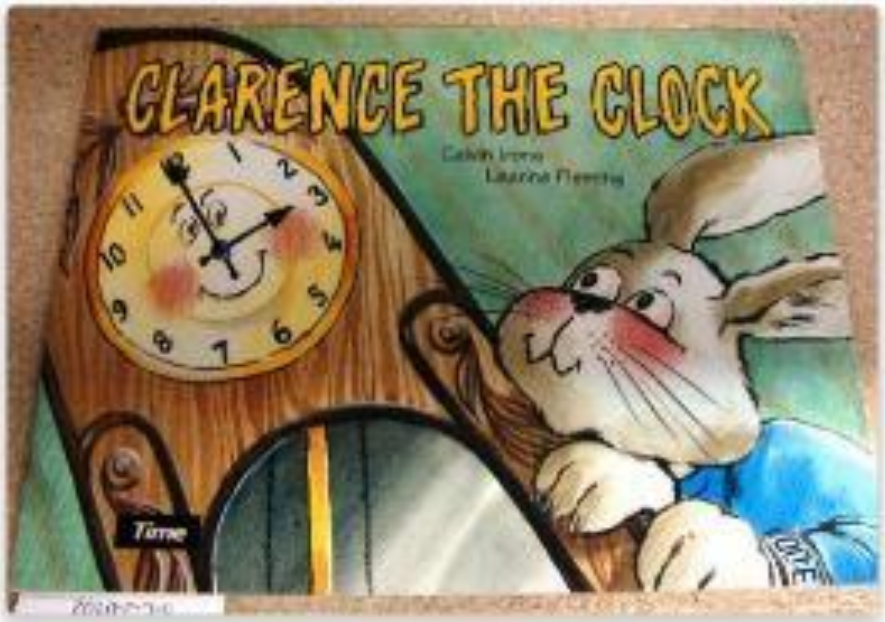
Second Grade:

- **Work with time and money.**
  - 2.MD.7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

Turn & Talk

- Based on your experiences, what do you find challenging in these standards?
  - Discuss your thoughts with your neighbor.

Clarence the Clock



Materials:

- Mini-clocks
- Book: Clarence the Clock or similar literature book

- Directions:
  - "As I read the book, Clarence the Clock, use your clocks to show the different times."

Suggestions To Help Students Understand And Read Analog Clocks

1. Begin with a one-handed clock and use approximate language (It's about 7 o'clock, it's a little past 9 o'clock)
2. Discuss what happens to the big hand as the little hand goes from one hour to the next
3. Use two real clocks, one with only an hour hand and one with two hands
4. Teach time after the hour in five minute intervals
5. Predict the reading on a digital clock when showing an analog clock and vice versa; Set an analog clock when showing a digital clock
6. Relate the time after the hour to the time before the next hour.

- Van de Walle, Karp & Bay-Williams (2013)

CCSSM and Money

Second Grade:

- **Work with time and money.**
  - 2.MD.8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.

Two types of Money Problems

Problem 1:

Dot has two quarters.

Jim has three dimes.

Hank has a nickel.

How much money do they have altogether?

Problem 2:

I have six coins worth 42 cents. What coins do you think I have?

Money Bingo

- Each person gets a bingo mat and a sheet of sticky dots.
- Use the sticky dot to cover the coin I call.
- If you get 5 dots in a row, column, or diagonal, call Bingo.
- The first person to call Bingo wins!

	10¢	half dollar		1¢
		dime	5¢	
50¢	quarter	 free		
penny			25¢	
		nickel		

Why is it so difficult for children to understand the concept of money?

It is not that money is hard for children but rather that skip counting by different amounts is difficult.

- Van de Walle (2001)

Money

Skills usually required in Elementary grades

- Recognizing coins
- Identifying and using the value of coins
- Counting and comparing sets of coins
- Creating equivalent coin collections (same amounts, different coins)
- Selecting coins for a given amount
- Making change
- Solving word problems involving money

Van de Walle, Karp, Bay-Williams (2013)

Focus Questions

Answer the following questions after you complete Money Bingo.

- Where's the mathematics? (CCSSM standards)
- How would you modify, extend, and/or differentiate the activity to address student needs (varying ability levels, grade levels, etc.)?
- What mathematical practices did you observe?
- What evidence will you note that shows a child is learning the mathematics in the activity?

Center Time!

Measurement Centers: Focus for Interaction

- Task 1: Use Table 3.5 Domain-by-Domain Cross-Grade Analysis to identify clusters from the Measurement and Data domain addressed in the activities.

- Task 2: Think about CCSS Mathematical Practice #5: *Use Appropriate Tools Strategically.* How is student learning supported by the use of tools?

Length **Orange**	**Time** **Green**	**Money** **Yellow**
Wiggly Worms	Clock Matching Game	Make 25 cents
Measuring with Cuisenaire Rods	What Time is It?	Money Word Problems
Shortest Stick/Longest Stick	Time Riddles	A Word's Worth
Measurement Word Problems	Clock Dominoes	Money Match

Length Activities

- Wiggly Worms
- Measuring with Cuisenaire Rods
- Shortest Stick/Longest Stick
- Measurement Word Problems

Time Activities

- Clock Matching Game
- What Time Is it? Board Game
- Time Riddles
- Clock Dominoes

Money Activities

- Make 25 cents Game/Make $1.00 Game
- Money Word Problems
- A Word's Worth
- Money Match

Group Task During Centers

Each person must complete at least one activity for each attribute.

1. Use the Domain by Domain Cross Grade Analysis chart to identify the clusters from the Measurement and Data domain addressed in the activities.
2. How is Mathematical Practice #5 addressed in the activities?
3. Use chart paper to respond to the Focus Questions for your “must do” attribute. Be prepared to share.

Focus Questions

Answer the following questions as you examine each task:

- Where's the mathematics? (CCSSM standards)
- How would you modify, extend, and/or differentiate the activity to address student needs (varying ability levels, grade levels, etc.)?
- What mathematical practices did you observe?
- What evidence will you note that shows a child is learning the mathematics in the activity?

DEBRIEFING

Illuminations Resources

- How Many Steps?
  http://illuminations.nctm.org/LessonDetail.aspx?id=L187
- Ladybug Lengths
  http://illuminations.nctm.org/LessonDetail.aspx?id=L123
- Magnificent Measurement
  http://illuminations.nctm.org/LessonDetail.aspx?ID=U66
- We're Going on a Length Measurement Hunt
  http://illuminations.nctm.org/LessonDetail.aspx?id=L873

Illuminations Resources

- Coin Box

http://illuminations.nctm.org/coinbox/

- Exploring Pennies and Dimes

http://illuminations.nctm.org/Lesson.aspx?id=554

- Trading for Quarters

http://illuminations.nctm.org/Lesson.aspx?id=561

- Coin Blocks

http://illuminations.nctm.org/Lesson.aspx?id=3762

Teaching Children Mathematics Resources

- “Tales, Tasks, Tools, and Talk” by Timothy S. McKeny & Gregory D. Foley, Vol. No. 5 December 2012/January 2013
- “Investigating Measurement Knowledge” by Jenni K. McCool & Carol Holland, May 2012
- “A Super Way to Soak in Linear Measurement” by Terri L. Kurz, May 2012

Wrap Up

Measurement and Data Domain

- Two Big Ideas:
  - Number is an extension of more basic ideas about relationships between quantities.
  - The selection of a unit makes it possible to use numbers in comparing quantities.

Essential Understandings

- Quantities can be compared without assigning numerical values to them.
- Using numbers to describe relationships between or among quantities depends on identifying a unit.
- The size of a unit determines the number of times that it must be iterated to count or measure a quantity.
- Quantities represented by numbers can be decomposed (or composed) into part-whole relationships.

Where did you see the Mathematics Teaching Practices in these ideas about number in context?

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3- 2- 1- Reflection

To reinforce ***number in context*** concepts for students …

- 3 things I will start doing
- 2 things I want to learn more about
- 1 thing I will keep doing

Share your reflections with a partner.

THANK YOU!

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