K-2 Place Value: More Than Just 10s and 1s!
Exploring a sequence of tools and tasks to help K-2 students develop a robust understanding of place value.
Getting to know your Matteys!

- Where are you from?
- What do you do?
- Why are you here?
Today we will examine a sequence of proportional (Groupable & Pregrouped) and nonproportional models paired with tasks designed to help students develop a robust understanding of place value.
Why did you decide to attend this session?
What do you hope to walk away with?
tens and ones

22 = __ tens __ ones
34 = __ tens __ ones
16 = __ ten __ ones
43 = __ tens __ ones
29 = __ tens __ ones
20 = __ tens __ ones
47 = __ tens __ ones
38 = __ tens __ ones

This was: Easy Just Right Hard
1) What does it mean to understand place value?
2) What tasks would you expect students to be able to do?

Talk About It
Big Ideas of Place Value

- Unitizing: Moving from counting by ones to counting by groups
- Positionality: Face Value vs. Place Value
- Place Value Notation: The position of digits in numbers determine which size group to count
  Example: 32 vs 23
- Flexible Composition and Decomposition of numbers
Levels of Understanding of Place Value

1. **Single numeral.** The student writes 36 but views it as a single numeral. The individual digits 3 and 6 have no meaning by themselves.

2. **Position names.** The student correctly identifies the tens and ones positions but still makes not connections between the individual digits and the blocks.

3. **Face value.** The student matches 6 blocks with the 6 and 3 blocks with the 3.

4. **Transition to place value.** The 6 is matched with 6 blocks and the 3 with the remaining 30 blocks but not as 3 groups of 10.

5. **Full understanding.** The 3 is correlated with the 3 groups of ten blocks and the 6 with 6 single blocks.

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What tools or models do you use in your classrooms to help students develop a robust understanding of place value?
Physical models can help children construct the idea of ‘ten’ as a unit and as a set of ten single units. Though models can help children construct the concept, they do not ‘show’ the concept to children. Children must construct the concept, and impose it on the model.
Proportional Models

- Allow children to see group of ten ones is ten times bigger than a single unit.
- Distinctly show the proportional relationships between groups of ten and single units.
Two Types of Proportional Models: Groupable and PreGrouped

Which of these models are groupable? Which are pregrouped (trading)? Which models should students work with first? Why?
Proportional Models

Groupable Models (Trading)

Pregrouped Models

[Images of models for groupable and pregrouped models]
NC.K.NBT.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones by:
- Using objects or drawings.
- Recording each composition or decomposition by a drawing or expression.
- Understanding that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.
Understanding Place Value
NC.1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones.

• Unitize by making a ten from a collection of ten ones.
• Model the numbers from 11 to 19 as composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
• Demonstrate that the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens, with 0 ones.
When do I move students from groupable models to pregrouped (trading) models?
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Considerations:

● Pay close attention to students' explanations for when and why they have made groups

● As students become comfortable with groupable models, collections of tens can be made in advance.

● Children who don't have adequate experience with groupable models revert to rules and procedures rather than understanding
Kindergarten Cluster 7 Centers

Working with Teen Numbers

Math centers are intended to provide students with practice of recently-taught content, as well as spiraled review of concepts and skills from previously-taught Clusters. This specific collection of center activities focuses around the major work of Cluster 7: understanding and using teen numbers.

Making Ten (Spiral Review) K.OA.4

**Materials:** Missing addend mats, objects to count

Partner 1 uses an object to build the first number in the equation. Partner 2 uses a different object to find how many more objects are needed to get to 10. Partners switch roles for the next mat.

*Extension:* Record the correct numbers in the equation.

Building Teens K.NBT.1

**Materials:** Pop cubes, number cards 11-19

Choose a card. Build the teen number shown on the card. Count to ten using one color of cubes. Use another color of cubes for the other ones.

*Extension:* Write the equation for each model.

Rolling Teens K.NBT.1

**Materials:** ten frame in a page protector, counters, die, marker

Fill a ten frame. Roll a die to make the number left over. Place the number of left over counters under the ten frame to make a teen number.

*Extension:* Write the equation.

A Serving of Teen Numbers K.NBT.1

**Materials:** teen number bond cards, divided plate, counters

Decompose teen numbers using a divided plate to show the part (ten), part (leftover) and whole.

*Option:* Use party plates with animal faces as the sorting mat.
**Grouping Tasks**

### Groups of Ten

Adapted from Van de Walle (2018)

**Materials:** recording sheet, individual bags of beans, toothpicks, paperclips, cubes, etc. (anything countable)

**Task:** Students dump the objects onto the table and count them. The quantity is recorded as a number word. Then students group the objects in as many groups of ten as possible. The number of groups of ten and ‘leftovers’ or additional ones is recorded.

**Considerations:** Some students may benefit from the use of a 10 frame to support their counting and grouping. Later this structure should fade as students learn to make groups on their own.

### Measuring with Ten

**Materials:** recording sheet, nonstandard units for measuring (connecting cubes, small blocks, paperclips etc.), classroom objects to be measured (desks, books, chairs, etc.)

**Task:** Assign students objects in the classroom to measure using nonstandard units. After students have measured the object, students count the number of units needed and record the quantity as a number word. Then students group the units in as many groups of ten as possible. The number of groups of ten and ‘leftovers’ or additional ones are recorded.

**Extension:** When students become comfortable with creating and counting groups of ten, transition to using pregrouped models like precreated sets of ten or base ten blocks.

**Considerations:** Think carefully about the size of the unit students are using to measure and the object they are measuring. Make certain the number range of the measurement is appropriate. Ten frames can be used to support students in making groups of ten as needed.

### Hand Grab

**Materials:** recording sheet, container of objects for counting

**Task:** Students reach into the container and grab a handful of objects. Students count the handful of objects and record the number amount as a number word. Students group the objects in as many groups of ten as possible. The number of groups of ten and ‘leftovers’ or additional ones are recorded.

**Extension:** Two players can play together and compare their quantities to determine who has the ‘most’ each round.

**Considerations:** Carefully choose the objects students will be grabbing. It may be necessary for younger children to do a two hand grab if objects or larger. Ten frames can be used to support students in making groups of ten as needed.

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A note on using Non-Proportional Models

- more efficient when working with larger numbers (500+)
- Do not show the size relationship between tens and ones.
- Rely on trading or exchanging.
- Children as young as 2nd grade can work with them, but it should follow work with proportional materials.
Caution in Using Coins Too Early

- Difficult for young students to understand because the sizes of the coins are not representative of the relationship between the quantities they represent. (Non proportional)
- Dimes are physically smaller than pennies but represent a quantity that is 10 times larger.
Making Connections

● What tasks are you already using with students to help them build a robust understanding of place value?
● What new ideas will you add to your toolkit?
Contact Information:

Leigh Belford
belfordl14@ecu.edu
(belford + L + 14)