Understanding Place Value: When 97 Isn't Just 90 + 7

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About This Session

- Role of counting and the development of foundational ideas of place value
- Eliciting and assessing student thinking through teacher questioning and observation
- Connection to computational fluency
- Examples of student thinking: classroom vignettes, video, student work

Aspects of Counting

- Knowing the rote counting sequence (forward/back/from any #)
- Counting each object once and only once (1:1)
- Having a system for organizing and keeping track
- Knowing the last number said represents the total
- Knowing that *** = XXX
- Connecting number word, quantity, numeral ("three," ***, 3)
- Counting by groups
- Unitizing

Counting Opportunities

- Opportunities to:
  - hear and use the rote counting sequence (forward and back)
  - create a set, recognize a set, and move between the quantity and the numeral
- Routines (whole class)
  - taking attendance; counting around the class; choral counting; lining up; collecting data; lunch count
- Activities (partner/individual)
  - counting bags/collections; classroom inventory; games; measuring

Materials and Tools

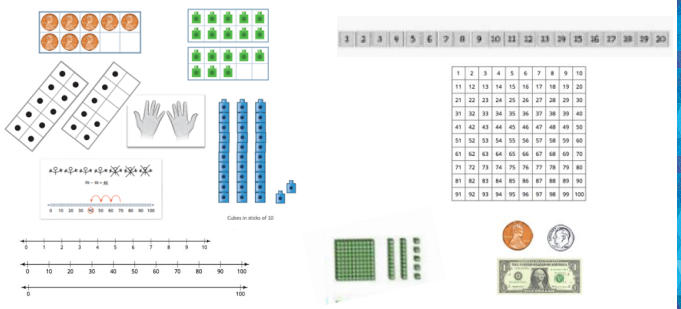
- Groupable, flexible materials, rather than pre-grouped, that allow students to compose and decompose tens
  - cubes, counters, blocks etc.
- Tools that support
  - Ten frames; counting mats, number paths
- Scaffolding support not over-supporting

Why these materials?

"Ample experiences with a variety of groupable materials that are proportional (e.g., cubes, links...beads) and ten frames allow students opportunities to create tens and break apart tens, rather than "trade" one for another. Since students first learning about place value concepts primarily rely on counting, the physical opportunity to build tens helps them to 'see' that a 'ten stick' has 'ten items' within it. Pre-grouped materials (e.g., base ten blocks, bean sticks) are not introduced or used until a student has a firm understanding of composing and decomposing tens."

- Van de Walle & Lovin, 2006

Place Value Models, Representations and Tools:
What do they mask or reveal? Are they flexible?



Unitizing

- Unitizing requires using numbers to count objects *and* groups simultaneously (e.g. 1 group of 10)
- Unitizing requires a shift in perspective; the ability to see [10] objects as [10] ones and also as one group of [10]

Aspects of Place Value

- Counting by 1s and groups
- Understanding that 10 ones is the same as 1 ten; and that 10 is an important number
- Understand a number's relationship to other numbers, particularly multiples of 10 (78 is closer to 80 than to 70)
- Adding/subtracting 10 (or a multiple of 10); noticing what happens to the numeral
- Understand that numbers can be expressed in different ways (e.g. 78 is 7 tens and 8 ones and also 6 tens and 18 ones)
- Understand that numbers are made up of 1s, 10s, 100s, and that the way a number is written communicates that information

Questions that reveal student understanding

- Can you predict how many 10s will be in the sum?
- How many *10s* do you have? How many *dots/ cubes* do you have? How many 1s do you have?
- How many more [1s] to get to [a multiple of 10]? How many more [10s] to get to [100]?
- How many will you have if I give you 10 (or 20) more? If I take away 10 (or 20)?

Questions that reveal student understanding

- You have [57] cubes. What if I ask you to give me back [17]?
- Where on your sheet would you record [7]? … Can you think of a number you would record in [the 1 ten] column?
- In the first problem you combined 3 tens and 4 tens and the sum had 7 tens. This time there were 3 tens and 4 tens but the sum has 8 tens? How can that be?
- The first problem was 30 something plus 40 something and your answer was 70 something. This problem was 30 something plus 40 something and your answer is in the 80s. What's going on here?

Aspects of Computational Fluency

- Understand the base 10 number system and its place value notation
- Understand the meaning of operations and their relationships
- Become fluent with basic facts
- Interpret problems embedded in contexts (and applying the operations correctly to problems
- Communicate and represent mathematical thinking
- Learn to articulate, represent and justify generalizations

Understanding Place Value is more than 90 + 7

- A set of related, complex ideas that students must work with over time
- Activities, models, and materials should reveal relationships, offer flexibility, and provide opportunities to engage with the ideas in different ways
- Experiences should encourage and support exploration, investigation, and consolidation of those ideas
- Teacher observation and questioning - based on the aspects of place value -informs decisions about how to support students
- Understanding place value is critical to developing fluent strategies for addition and subtraction

Thank You!

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