How Does *NUMBER SENSE* Begin?

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Meeting, Greeting, & Sharing

• Introduce yourself to your partner.

• Share with each other what it means to have strong number sense.
What do you notice?
What do you see?
Visual Number Patterns for Adults

• Look at the sheet with dots - *What do you notice?*
  Highlight with colors, if desired.
• Work with elbow partner to find things that look alike, that seem to belong to the same “family.”
• As a table group, sort the cards by “family.”
  *What makes these a set?*
  *What attribute(s) did you use to sort the cards?*
  *What relationships do you notice?*
What can you see quickly?

Some dots will flash on the screen briefly –
try to see how many without counting.
Perceptual Subitizing

• You perceive the three or four dots intuitively & simultaneously.

• You “just know.”
A Big Idea

The quantity of a small set can be intuitively perceived without counting.

Let’s try some more “quick looks” …
Conceptual Subitizing

• You perceive the parts and put together the whole
• All of this happens quickly and often is not conscious—it is still subitizing
A Big Idea

Quantity is an attribute of a set of objects.
A Big Idea:
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A Collection Can Have Many Attributes

- Red color is an attribute
- Round shape is an attribute
- Sweet smell is an attribute
- Quantity is another attribute:
  there are THREE roses in this collection.
A Big Idea:
Quantity is an attribute of a set of objects.

3 elephants might seem obviously bigger when compared to 3 mice ...

... if you used the attribute of size, but, for the attribute of number/ numerosity, they are identical.
A Big Idea:
Quantity is an attribute of a set of objects.

• We call this *numerosity* - the “threeness” of 3.

• Numerosity exists apart from number words and written symbols. Words and symbols vary from language to language - numerosity does not.
  
  – *What other ways can we say 3?*

• Humans are biologically programmed to automatically perceive the numerosity of small sets. *(subitizing)*
## Big Ideas of Number Sense

<table>
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<tr>
<th>Topic</th>
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| **Uses of Number**    | ● Numbers are used many ways, some more mathematical than others.          | ● Tommy has 5 books. (cardinal)  
● Ava is fifth in line today. (ordinal)  
● Numbers on basketball jerseys, home addresses, telephone numbers (nominal)  
● *Let’s meet at 5 pm on December 5.* (referential) |
| **Numerosity**        | ● Quantity is an attribute of a set of objects and we use numbers to name specific quantities.  
● The quantity of a small collection can be intuitively perceived without counting. | ● 5 mice and 5 elephants are alike in quantity, though different in other ways.  
● Children just “see” three objects and know it’s 3. |
Video Analysis: Focus on the Child

• 1\textsuperscript{st} clip: preschooler is comparing quantities of blocks
• 2\textsuperscript{nd} clip: preschooler using chips to match quantity of dots on a card
• When watching these clips, consider:
  – *What does this child seem to understand about quantity and number?*
  – *What does this child say or do that is evidence of thinking?*
Video – Focus on Child: Comparing Quantity-EMTR005
How do children develop the idea of quantity as an attribute?

• Older infants often learn signs/words for “more” and “all gone” before other ideas.

• Toddlers can tell that a pile of 5 is more than a pile of 2, even before they know any number names.

• Preschoolers are building a firm sense of the numerosity of 3, 4 & 5.

• Kindergarteners solidify number combinations to 10.
What is Number Sense?

“...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)
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Implications for Teaching & Learning

• Subitizing is foundational.
  – Subitizing relies on visual patterns.
    • Not all arrangements of a number are equally easy to “see.”
  – How is subitizing different than counting?
    • Quantify small sets with number, without enumerating.
  – Subitizing builds an understanding of cardinality.
    • When quantifying a set, state the name of the object in addition to the number name “It’s 3”, “Yes, it’s 3 cups.”
  – Expect children to subitize small sets; avoid “counting to be sure.”
Implications for Teaching & Learning

• Children learn about quantity even without exact numbers.
  – “Which pile has more?”
  – “Put one napkin on each plate.”

• Smaller numbers are foundational
  – With infants and toddlers, talk about “1” and “2” and “1 more” and “2 more”
  – With preschoolers, spend a lot of time exploring “3” and “4” and “5”

• Fingers are great tools for understanding small numbers, then building to 5 & 10.

• Children need repeated exposure to amounts in order to associate number name and quantity.

• Provide authentic opportunities for children to count
Use those fingers!

The five-ness of the fingers on one hand & the ten-ness of the fingers on two hands.

Composing & de-composing numbers with different arrangements of fingers.

Using fingers with songs and chants to reinforce learning of number word list.
Materials to build visual number sense

- Dice
- Dominoes
- Dot Cards
- Five Frames
- Ten Frames
How can we use quantity cards to build visual number sense?

• “Quick looks” to transition children

• “Quick looks” in small groups or games that use subitizing
Quantity Card dismissal

If you show a card with this quantity on it . . .

You might prompt ...
• Show me with your fingers how many dots you see ...
• Can you show me how many dots you see using 2 hands?
Quantity Card dismissal

Using the same card:

You might prompt …
Use your fingers to show me one more than this many dots.
Use your fingers to show me one less than this many dots.

Let’s try it!
Subitizing Matching Game

• Each table has 10 cards – place them face up. Take turns finding two cards that have the same quantity (even though the arrangement might be different)

• Teacher can comment, “you have 2 dots and 2 lines, but they are both 2 objects.”
Stop & Reflect