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INNOVATIONS

Learning Lab #1

Agenda

- Math Investigation
- Development of Numerosity & Number Sense from Age 3 to Grade 3: the BIG IDEAS
  - Video Analysis
- Changing Classroom Practice through COACHING
- High-Impact Strategies for Mathematics
  - ***Turn & Talk***
- High-Quality Books to Spark Mathematical Thinking & Action

Thinking About the BIG IDEAS of Numerosity & Number Sense

BIG IDEAS	Notes (examples, models, skills or other musings)
Quantity is an attribute of a set of objects, and we use numbers to name specific quantities.	
Number systems use a fixed sequence that allows for predictability.	
Because each number names a quantity one greater than the number before it, each number includes all the quantities named by those earlier numbers.	
As numbers grow larger, we group by tens to create new units. • Because we group by tens, we can represent all numbers using ten digits (0 to 9), and there are patterns to how numbers are represented.	
Numbers are used in many ways, including: • to indicate amount (cardinal) • to specify positioning a sequence (ordinal) • to provide names for members of a set (nominal) • to act as shared reference points (referential)	

How do children develop understanding of numerosity & number sense?

What are the ***Big Ideas***?

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A ***Big Idea***

Quantity is an attribute
of a set of objects
& we use numbers
to name specific quantities.

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Perceptual Subitizing

- You perceive the three or four dots simultaneously.
- You "just know."

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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

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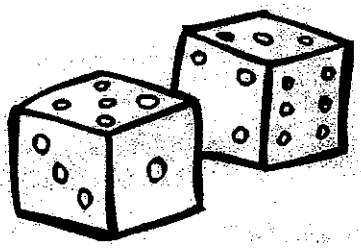
Developing Visual Number Sense
Through Models



Dice

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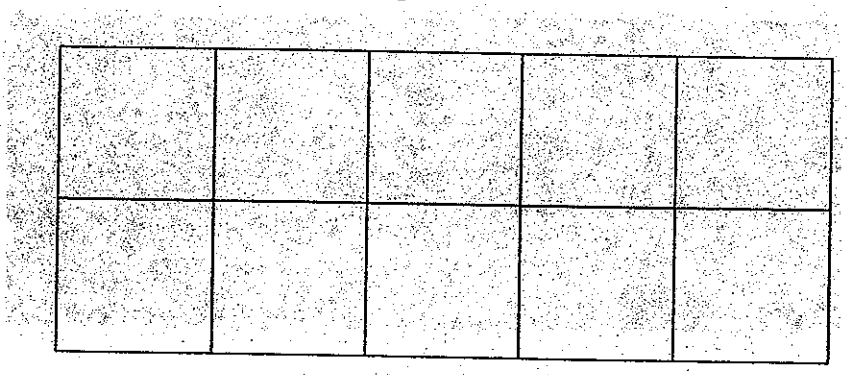
Developing Visual Number Sense
Through Models



Ten-Frames

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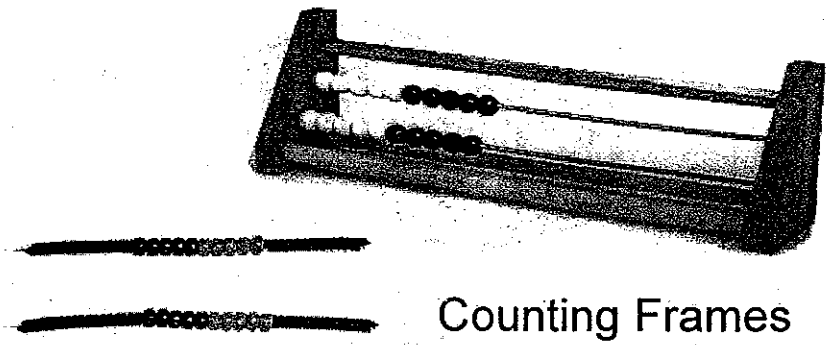
Developing Visual Number Sense Through Models



Counting Frames

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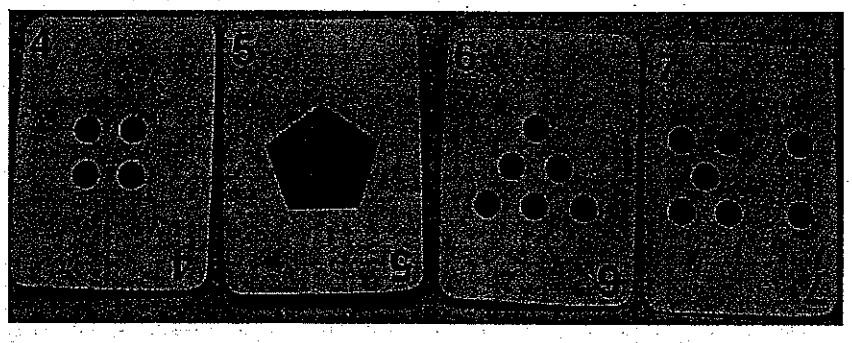
Developing Visual Number Sense Through Models



Number Cards

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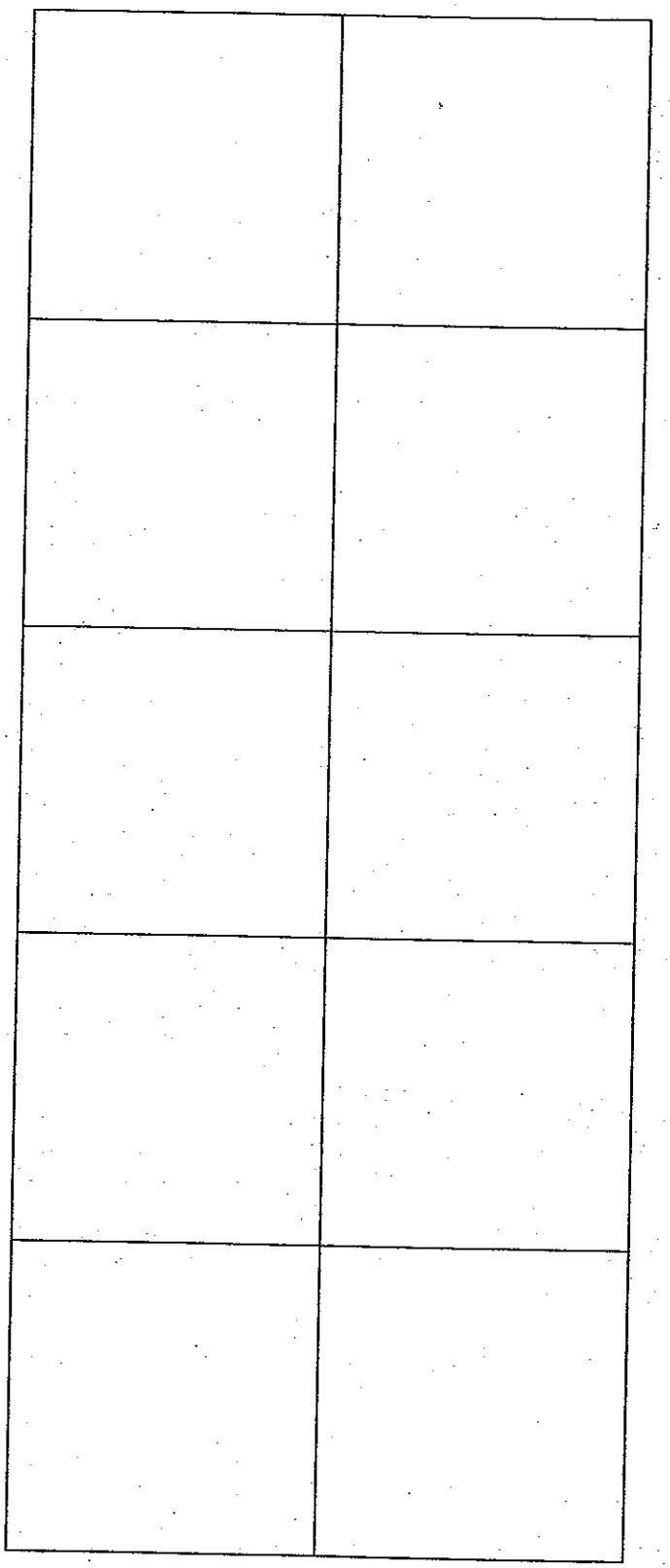

A *Big Idea*

Number systems use
a fixed sequence
that allows for predictability.

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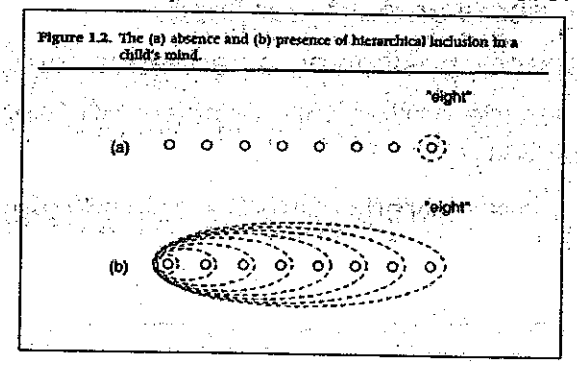
A *Big Idea*

Because each number names a quantity one greater than the number before it, each number includes all the quantities named by those earlier numbers.



From Kamii,C. *Young Children continue to Reinvent Arithmetic, 2nd Grade.* Teachers College Press, 2004.

A *Big Idea*

- As numbers grow larger, we group by tens to create new units.
  - Because we group by tens, we can represent all numbers using ten digits (0 to 9), and there are patterns to how numbers are represented.

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A *Big Idea*

- Numbers are used in many ways, including:
  - to indicate amount (cardinal)
  - to specify positioning a sequence (ordinal)
  - to provide names for members of a set (nominal)
  - to act as shared reference points (referential)

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Classroom Teaching

I have concluded that classroom teaching ... is perhaps the most complex, most challenging, and most demanding, subtle, nuanced, and frightening activity that our species has ever invented. In fact, when I compared the complexity of teaching with that much more highly rewarded profession, "doing medicine," I concluded that the only time medicine even approaches the complexity of an average day of classroom teaching is in an emergency room during a natural disaster.

- Lee Shulman, 2004 (p. 504)

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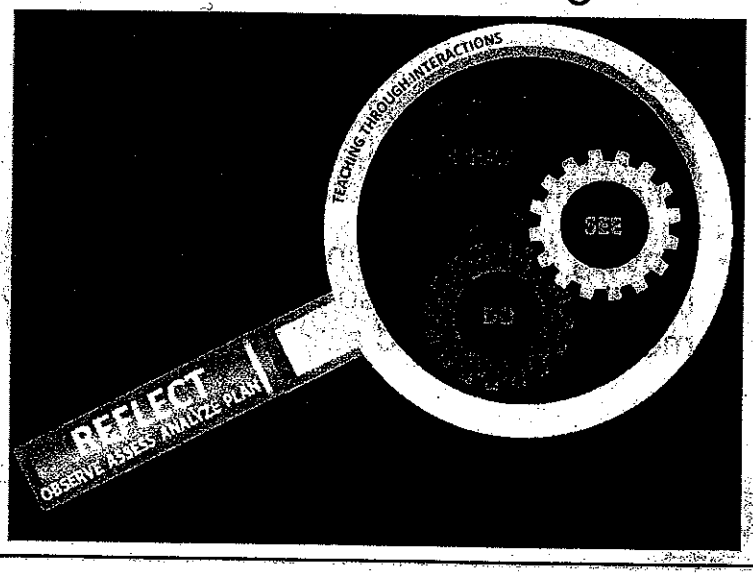
Bridget Hamre's framework for change



KNOWING

• Understanding foundational mathematics and current information on how to children learn these concepts as well as current knowledge of how to promote the development of these concepts.

SEEING

• Identifying effective teacher-child interactions that promote the kind of mathematical dispositions that lead to mathematizing in action – both in others as well as in one's own interactions.

DOING

• Enacting effective teacher-child interactions that lead to mathematizing in the classroom.

REFLECTING

• Engaging in self-observation and critical analysis of teaching with goal of becoming more effective

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Goals of Coaching

- Moving the conscious acts of effective teaching into unconscious, automatic schemas than can be enacted more efficiently and consistently
- Moving ineffective, unconscious schemas into the conscious so that teachers can be more aware of and stop these behaviors

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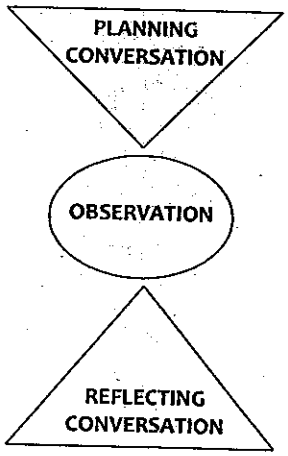
The Overall Coaching Process



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Planning Conversation

Focus attention on
specific elements of practice

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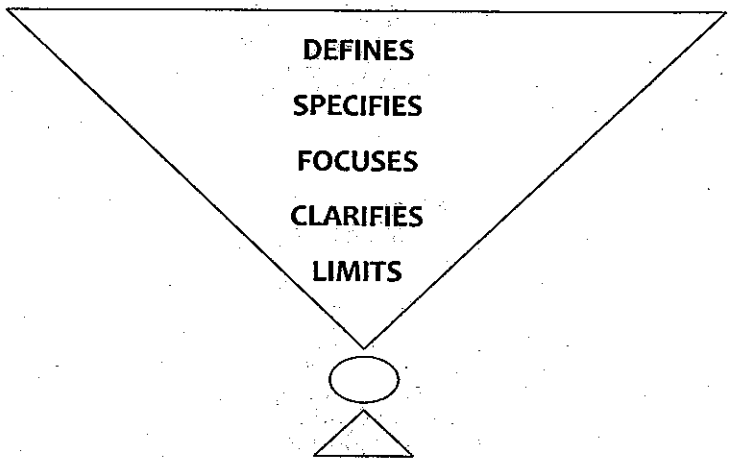
The Planning Conversation: ***Narrowing*** the Scope



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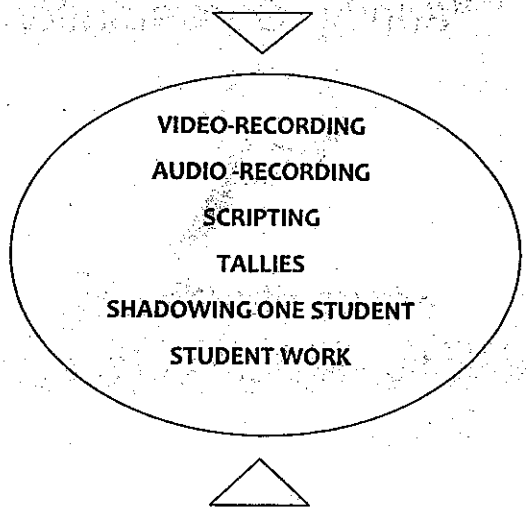
Classroom Observation: ***Data Gathering***



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Reflecting Conversation

To reflect effectively, teachers need to:

- ***look*** at the data collected during the observation;
- ***compare*** it to what they expected to get;
- ***observe*** their video-recorded lesson;
- ***assess & analyze*** the data in light of lesson goals & identified High Impact strategies;
- ***plan*** for change.

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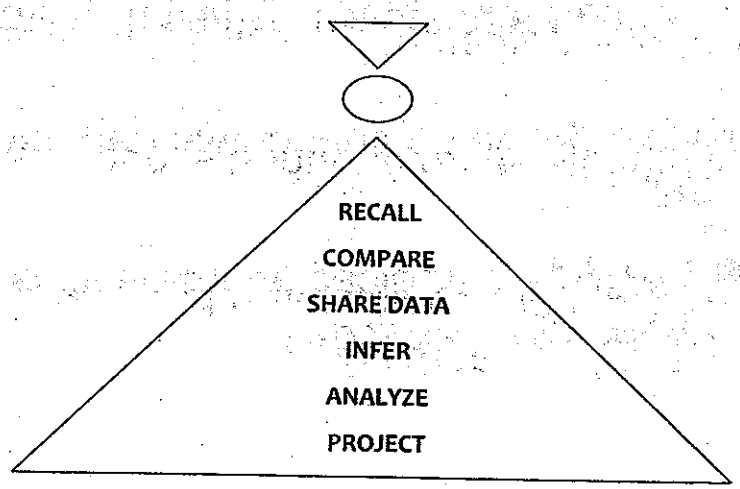
The Reflecting Conversation: WIDENING the Scope



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What happens in an effective mathematics classroom?

- Students & teachers believe & experience that math is a sense-making activity to help us understand our world.
- Students & teachers model math in multiple ways.
- Students & teachers talk about math.
- Students & teachers ***do*** math.

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High-Impact Strategies to Promote Mathematical Thinking & Action

- What did we do during this learning lab?
- How did our choices and practices affect your learning?

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Focus Strategy: ***Turn & Talk***

- Why is it effective?
- How can you make it work for mathematics in your classroom?

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Using good books to help students explore numerosity & number sense

- Where's the math in the book?
  - What are the Big Ideas?
- How can you bring the math out of the book?
  - What kind of activities could you use to develop children's thinking about the math of the book?

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Using an Interactive Read-aloud to Spark Mathematical Thinking

- **Book title & author:**
    - **Genre** *(informational picture book? concept book? story/narrative?)*
    - **Type of illustrations** *(photographs? realistic illustrations? playful illustrations?)*
    - **Text density and Features of print** *(Is there a lot, a little or a moderate amount of text? Are there any ways attention is drawn to the text by playing with size or position?)*

- **Where's the Math?** *Which of the big ideas about math could this book be used to illustrate, explain, demonstrate or mathematize? Be specific.*

- **Making Connections:** *What is something you might say as you introduce the book that will direct the children's attention to your mathematical focus?*

- **Creating Conversations:** *Consider both the text and the illustrations as you develop at least three open-ended questions to use to encourage the children to think about the math in the book.*

- **Bringing books to life:** *What kind of activities could you use to extend the book? How will these inspire the children to explore the big ideas about math in the book and other connected mathematical concepts?*

Using an Interactive Read-aloud to Spark Mathematical Thinking *An Example*

- **Book title & author:** *Five Creatures* by Emily Morris
    - **Genre** *(informational picture book? concept book? story/narrative?)*
      This is more of a concept book since it doesn't really tell a story.
    - **Type of illustrations** *(photographs? realistic illustrations? playful illustrations?)*
      The illustrations look a little like a child's drawings; they focus on details that the reader can point to and explain what the text says.
    - **Text density and Features of print** *(Is there a lot, a little or a moderate amount of text? Are there any ways attention is drawn to the text by playing with size or position?)*
      Very little text; it is printed in curvy playful lines at the bottom of each page so the pictures really stand out.

- **Where's the Math?** *Which of the big ideas about math could this book be used to illustrate, explain, demonstrate or mathematize? Be specific.*
  The book really emphasizes that a collection can be sorted in many different ways, depending on the attribute(s) used. All the statements in the book are given in ways that make you observe the details of the pictures and then to explain the categories mentioned.

- **Making Connections:** *What is something you might say as you introduce the book that will direct the children's attention to your mathematical focus?*
  I would start by having them look at the cover picture and talk about who the "Five Creatures" are and why the title uses "creatures" instead of people. Then I would remind them of how we are all the same and different and say that this book is another way of looking at same and different.

- **Creating Conversations:** *Consider both the text and the illustrations as you develop at least three open-ended questions to use to encourage the children to think about the math in the book.*
  After I read the first few pages, I will stop and ask the children some ways the 5 creatures are the the same and different. I will call on different children to point out details in the illustrations that show wha the text is saying. At the end, I will ask some children how many creatures are in their house and one way they are the same or different.

- **Bringing books to life:** *What kind of activities could you use to extend the book? How will these inspire the children to explore the big ideas about math in the book and other connected mathematical concepts?*
  I will refer back to it when doing People Sort activity.

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INNOVATIONS

High Quality Books to Spark Children's Thinking about Numerosity & Number Sense

Anno, M. *Anno's Counting Book.* HarperCollins Publishing, 1975.

Bang, M. *Ten, Nine, Eight.* Greenwillow Books, 1983.
Tambien en espanol: Bang, M. *Diez, Nueve, Ocho.* Mulberry.

Crews, D. *Ten Black Dots.* Greenwillow Books, 1986.
Tambien en espanol: Crews, D. *Los Diez Puntos Negros.* Greenwillow Books.

Hoban, T. *26 letter and 99 cents.* Greenwillow Books, 1987.

Hoban, T. *Count and See.* Simon & Schuster, 1972

Hoban, T. *Let's Count.* Greenwillow Books, 1999.

Hoban, T. *More, Fewer, Less.* Greenwillow Books, 1998.

Kellogg, S. *How Much is a Million?* Harper Collins Publishing, 1985.

Merriam, E.*12 Ways to Get to 11.* Aladdin Paperbacks, 1993.

Princzes, E. *One Hundred Hungry Ants.* Houghton Mifflin Company,1993.

Tang, G. *The Grapes of Math.* Scholastic, 2001.
Tambien en Espanol: Tang,G. *Come Una y Cuenta 20.* Everest

Tang, G. *Math for All Seasons.* Scholastic, 2002.
Tambien en Espanol: Tang, G. *Un, Dos, Tres, El Ano se Fue.* Everest.