Early Math Collaborative @ Erikson
&
Kentucky Center for Mathematics

Associate Facilitators Materials

Session 3

Number Sense Counts more than Counting

erikson
early mathematics education

Did you enjoy the Shepherd's Counting System Problem?

Can you count this flock iin Shepherd?

What is the difference between asking you to recite yan, tan, tethera, pethera, pimp…

vs. Having you explore it as a **system**?

FYI—this system was actually used into the 18th &19th century in Sussex England; we came across it in a South owns Living history museum

Do you have any thoughts about:

- Why it seems to have stopped at 20?
- How many number words you would have to learn if it went up to 100?

Why might we have chosen the Shepherd's counting system activity in light of recent findings by cognitive scientist David Geary:

One in five adults in the United States lacks a math competency that correlates to lower scores on a seventh grade math test used to determine employability and wages in adults. :

The particular math skill Geary identified, "number system knowledge,"

is ***the ability to conceptualize a numeral as a symbol for a quantity and understand systematic relationships between numbers****.*

In Geary's research, having this knowledge at the beginning of first grade predicted better functional mathematical ability in adolescence.

On the other hand, skill at solving math problems by counting didn't correlate to later ability.

Students who started behind in counting ability were able to catch up, whereas students who were behind in number system knowledge stayed behind their peers.

Pondering Points

Did you draw on any of the following mathematical understandings as you solved the problem?

- Our number system is a pattern, (specifically a growing pattern), and thus has predictability and can be generalized)
- Our base ten system is highly efficient, and can be represented by using of only 10 digits (0,1,2,3,4,5,6,7,8,9)
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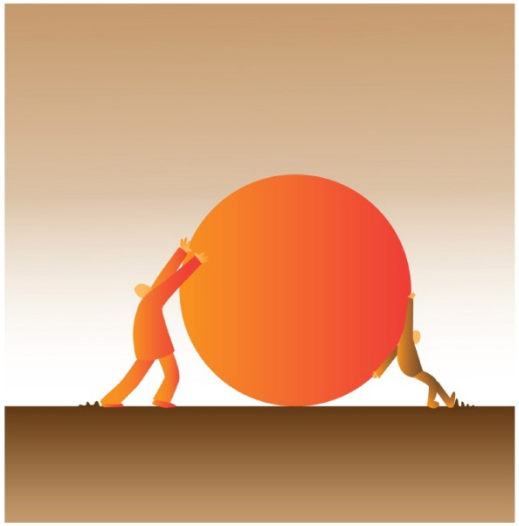
Pondering Points

As you facilitate this activity, consider

- At least some of our participants will be in Geary's 20 percent. Will they be able to quickly access those mathematical understandings?
- Think carefully about the questions and conversations you will use so that you can support their construction of understanding instead of doling out the answer.

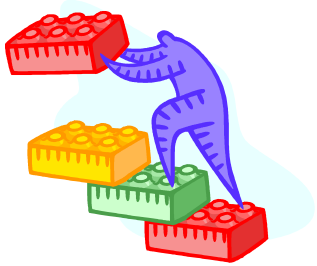
A Big Idea for
Teaching for Understanding

Learners need to construct their own understanding by struggling with a problem situation that challenges them but is set at a level that makes success likely.



Skills needed for teaching for understanding!

- ✓ **Facilitate conversations vs lecturing**
- ✓ **Use questions that move up and down the ladder of inquiry**
- ✓ **Guide the discussion so it remains focused**



What makes it so hard for adults (or even older children) to appreciate how hard it is to master our number system for young children, especially before the 5-7 shift?

Innate number sense only goes to about 5, children need to be able to generalize before they can go higher.

But they need a very strong foundation in small numbers.

How does using a system like the Shepherd's counting system help adults (or even older children) to appreciate how hard it is to master our number system for young children, especially before the 5-7 shift?

Think About:

Number names and Numerals are specific to a language and culture; the quantity they name is universal.

Numbers are attributes: the part of speech called adjectives. They are not nouns.

It is essential that young children see counting as a meaningful activity—we need to be counting something—for a reason.

Number words and symbols are tricky—for first and second language learners:

"One, this one or 1,2—and how about won,

Four, for, fore???

And how about the close resemblance in handwriting between

1 and lower case l, 7?

5 vs S ?

Research finding:

“Math Talk” from the earliest years counts.

But, saying, “How many sheep? And then pointing and counting “1,2,3,4”

Is not nearly as effective as

Adding a statement of cardinality:

“There are 4 sheep in this picture.”

As you watch the research lesson, reflect on the importance of providing young children with many experiences getting the numerosity for 5 into their eyes, hands, bodies and minds.

This is what Geary's research is talking about—

the more intentional we are in providing formal and informal *math all around us* experiences with the

3ness of 3

4ness of 4

5ness of 5

The stronger the foundation we are providing for adult mathematicians!

As you watch the research lesson, reflect on the importance of providing young children with many experiences getting the numerosity for 5 into their eyes, hands, bodies and minds. (This is what Geary is talking about).

Think about how the Research lesson video reflects what happened over 3 or 4 months—What is the evidence that the children's understanding has developed as a result of repeated experiences with 3, 4, and 5?

Be sure to try the lesson yourself with preschoolers

Counting vs Number Sense/ Estmation

All the Focus on the Child videos are insightful. But please take time to think about the implications of the "Estimating quantity" ones—notice that being able to rote count to a higher number doesn't translate to accurate number sense.

Before we meet February 14

- Please Post on the discussion board

1) A reflective Practice statement on what happened as you facilitated Learning Lab 2: Patterns.
2) A short but specific point of content and practice you want to focus on while attending the Lexington Learning Lab:

Example:

- *"What questions seem most effective in supporting participants as they try to figure out the system and make their posters?*
- *"What insights am I constructing about the difference between "counting" and a number system?*