Welcome to Learning Lab # 8 of Erikson Early Math iNNOVATIONS!

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early mathematics education

Greetings

Will we fit?

Name that cohort!

Setting Norms:

How do we want our cohort to work together?

honor start & end times

share the floor

confidentiality

have a focus (follow agenda)

reach closure (next steps...)

be fully engaged

respect varying perspectives

participate equally

maintain momentum

other ideas?

A Sod Story:
A Math Investigation for Adults

- Turn & Talk: How would you solve this problem?
  - **Focus on figuring out how, not the answer.**
- Make poster explaining your strategy for solving problems.
  - What materials would you need?
  - Why would this get you the answer?

What did we learn about measurement?

- Perimeter is about surrounding all the way.
- Area is about covering up completely.
- The tale of Cormac shows the confusion that can arise due to the vagueness of everyday language.

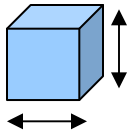
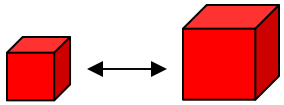
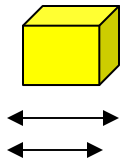
Long ago in the days when Ireland was made up of kingdoms fighting over little patches of land, Cormac sage of Kilfenora approached Duke Devan who had claimed rights to all of Cormac's land, including where his house and gardens lay. "It's the way of the world," says Cormac to Kevin, "that the mighty take much and the poor are left with little. But I'd ask you to show your royal spirit by leaving me just so much land as I can cover with this oxhide."

Duke Devan looked at the oxhide Cormac had laid out and laughed, "If all you want is the bit of land you can cover with that, take it and welcome to it." So he said with all his followers listening and bearing witness.

Cormac sage of Kilfenora gave a deep bow and commenced to cut the oxhide into thin strips beginning at the edges and spiraling into the center until he had a long, long thin strip which he then staked out around a broad area---big enough to include all the land he had originally.

He then sent again for the Duke and showed him what he had done and made his claim. The Duke laughed again, more rueful than amused—for he had given his word in front of witnesses and there was naught to be done but honor his promise.

Big Ideas about Measurement

Topic	Big Ideas	Examples
Attributes 	• Many different attributes can be measured, even when measuring a single object.	• A bucket has many measurable attributes, including height, weight, capacity, or circumference: *What kind of "big" is it?*
Comparison 	• All measurement involves comparison. • To be accurate, measurement must be "fair."	• Weighing rocks on a pan balance (direct); using a length of string to measure a table in one room and chairs in another (indirect). • A fair comparison measures the same attribute. **Units** must be of equal size, with no gaps or overlaps.
Precision 	• Quantifying a measurement helps us describe and compare more precisely.	• Nonstandard **units** (such as blocks) and standard **units** (such as inches) allow for more precision than direct comparison. • There is always a more precise measurement possible – we never get it exactly "right," but it must be "good enough."

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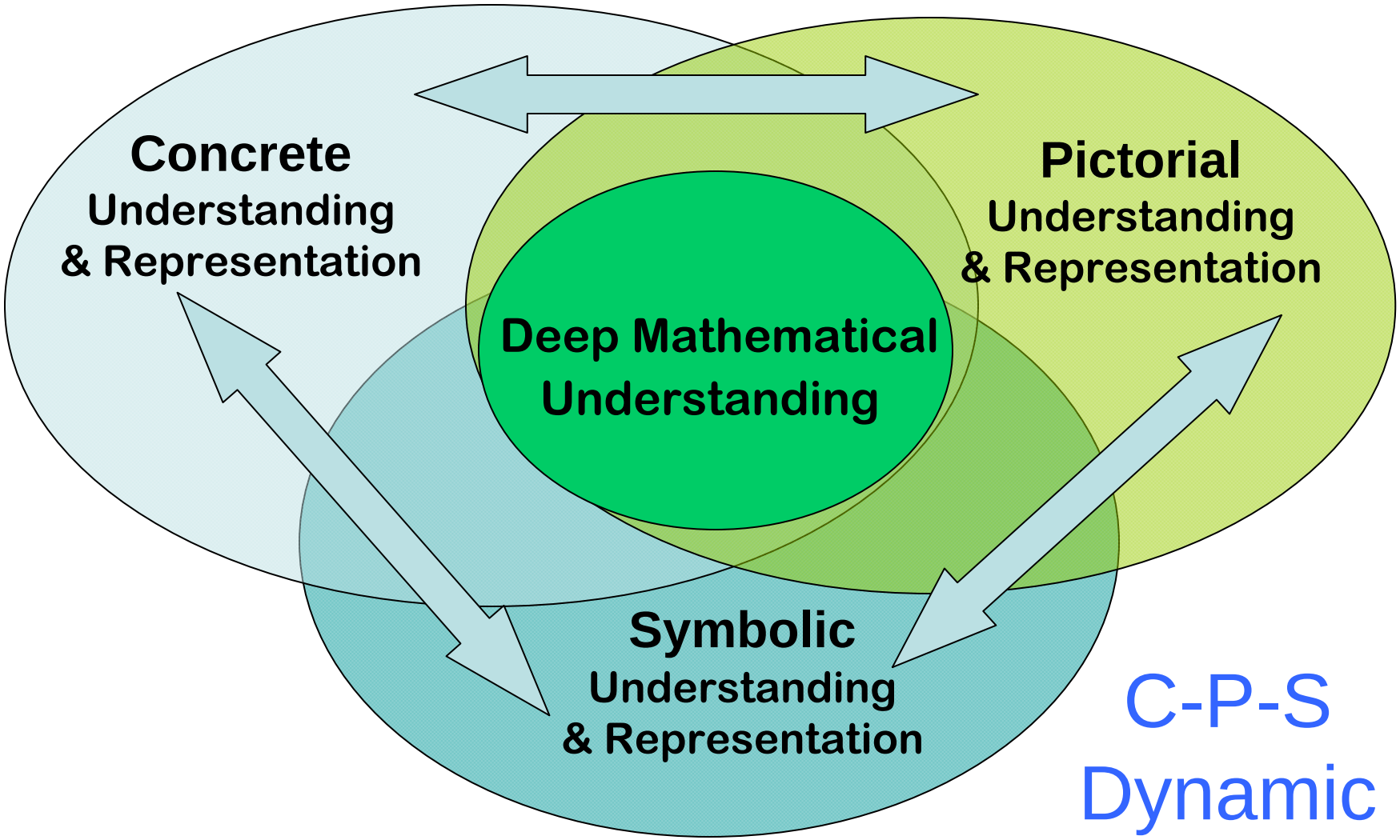
Area as Measurement Model of Multiplication

- Why multiply to figure out area?
- When have we used grids or arrays in earlier learning labs?
  - Multiplication – grouping groups
  - Fractions – equal-sized groups

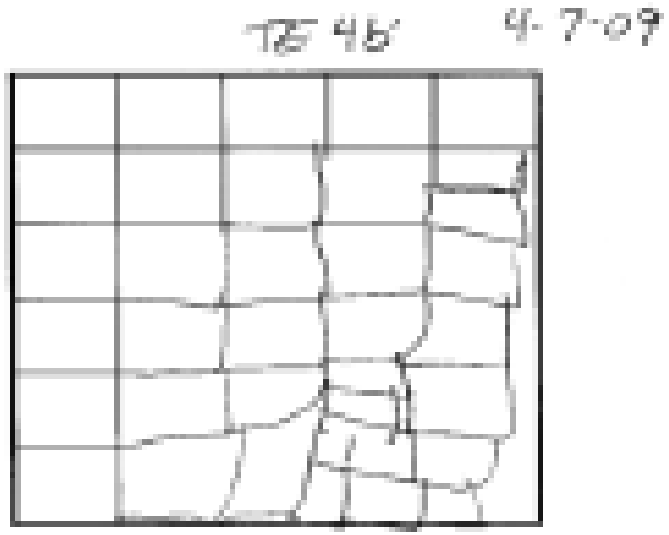
How do we move children from exploring tiling & grids to solid understanding of area & multiplication?



C-P-S
Dynamic

FIGURE 2

Although Isaac used the algorithm to find a rectangle's area, he did not demonstrate an understanding of the array structure of area. Asked to draw area tiles to complete a grid, he drew individual tiles, not equal-size units in rows and columns.



McCool & Holland. "Investigating Measurement Knowledge." *Teaching Children Mathematics,* May 2012.

Pattern & Structure
Mathematics Awareness Program

"Children are encouraged to seek out and represent pattern and structure across different concepts and transfer this awareness other concepts."

- Mulligan, English, Mitchelmore & Robertson (2010)

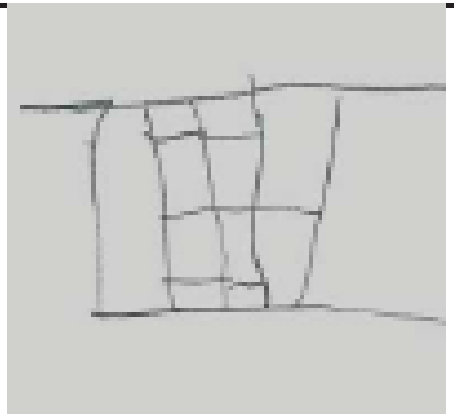


Figure 4. Drawing of ten frame from memory, initial attempt.

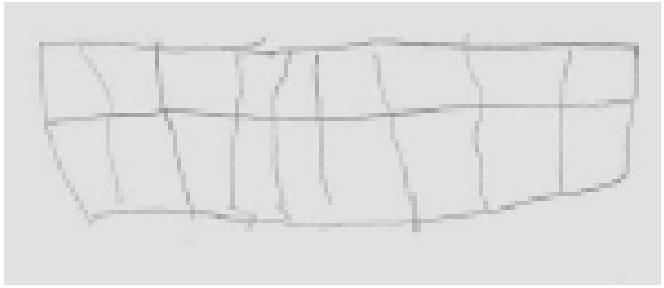


Figure 5. Drawing of ten frame, later attempt.

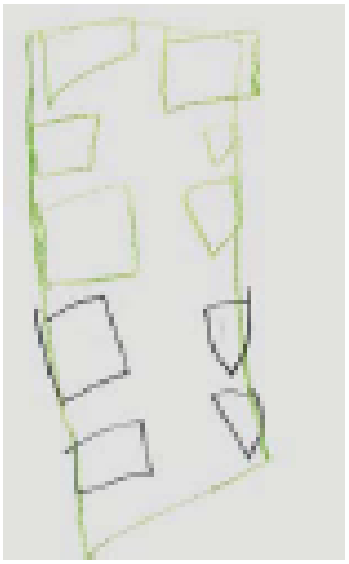


Figure 6. Drawing of ten frame, final attempt.

As an assessment task children were required to draw the frame from memory and describe how they did this and why the frame was used. Figures 4, 5 and 6 compare different attempts to provide the correct ten frame structure, 2 x 5 units.

- Mulligan, English, Mitchelmore & Robertson (2010)

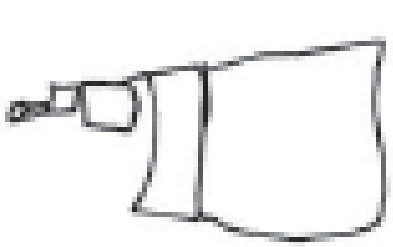


Figure 1. Drawing of 2 x 2 squares, initial attempt.

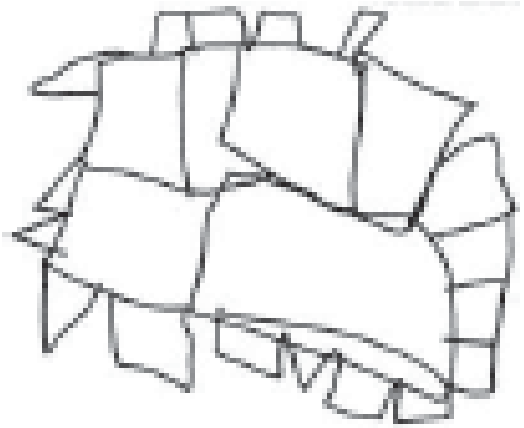


Figure 2. Drawing of 2 x 2 squares, later attempt.

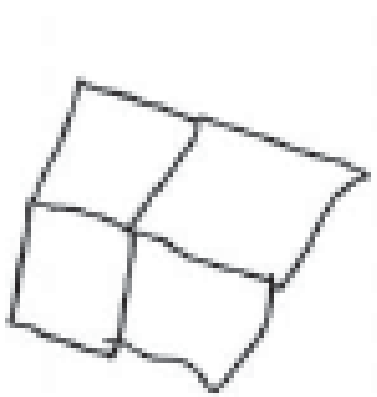


Figure 3. Drawing of 2 x 2 squares, final attempt.

Excerpt of transcript accompanying the representation in Figure 3: “ I made them the same…the squares have the same on each side . It doesn’t matter if they are big or small, they got the same sides. You have to put only the squares that you need. They have to be same size… I know they have to match if they are on top and on top you know… I made a four with two and two ”.

- Mulligan, English, Mitchelmore & Robertson (2010)

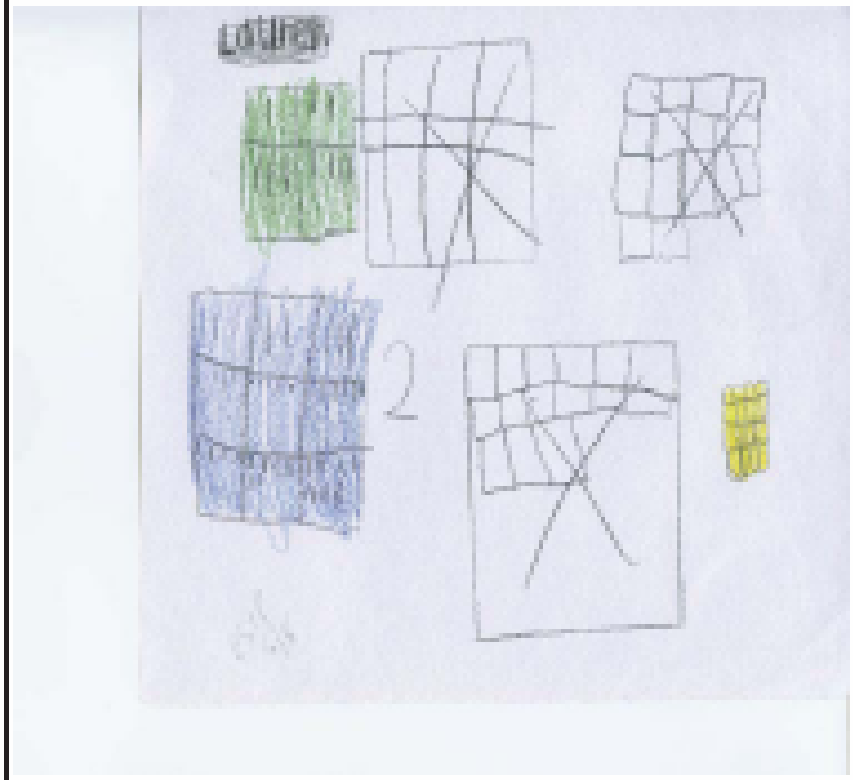


Figure 7. Drawing of pattern of squares from memory, initial attempt.

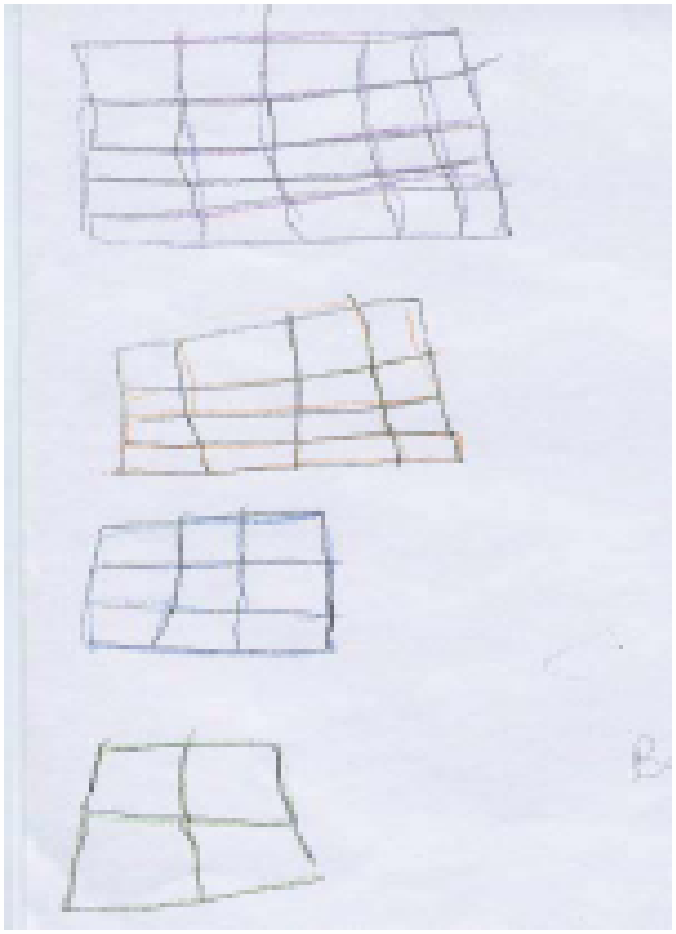


Figure 8. Drawing of pattern of squares, later attempt.

The child was able to visualize the structure of the pattern accurately because they focused on both the shape and the increasing row and column structure more so than remembering a numerical pattern.

- Mulligan, English, Mitchelmore & Robertson (2010)

Filling Up

During our break, write down
about how many of each type of cube
you think can fit in the container.

How did you figure it out?

What are we figuring out?

Considering CCSS for Mathematical Practice

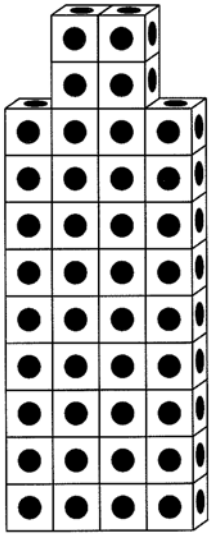
2. Reason abstractly and quantitatively.

7. Look for and make use of structure.

Name _____ Date _____

City Buildings

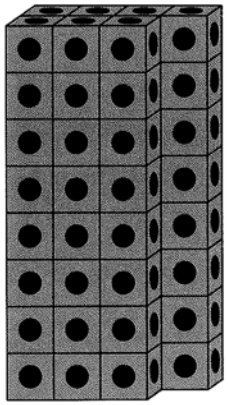
Build cube models that look like the three drawings below. Find the volume of each building and write a number sentence to show your strategy.



A. Quad City Towers

Volume _____

Number sentence _____



B. Six Corners Gym

Volume _____

Number sentence _____

Volume _____

Number sentence _____

C. Stair Step Apartments

Video Analysis

Evidence of practices 2 & 7

Strategies and routines that make CCSS for math practice possible

- In grade level groups, discuss what has to take place before students can:
  - use manipulatives to solve problems;
  - work in pairs while teacher circulates.

Reflecting on today's learning …

There's still time to complete the on-line survey!

We'll see you again at Erikson on December 13th or 15th!

We will let you know new 2013 learning lab dates as soon as we confirm them.