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INNOVATIONS

Learning Lab #11

Agenda

- Investigation: *The Important Book of Polygons*
- CCSS for Geometry: Attribute & Composition
- Investigation: Shape & Number Composition
- Video Analysis
  - HIS-EM framework
  - CCSS for Mathematical Practice

The Important Book of Polygons:
A Math Investigation for Adults

- *The Important Book* by M.W. Brown
- *The Important Book of Polygons* by us
  - As a cohort, we'll write, "The important thing about a pentagon is …" verse.
    - A pentagon is a 5-sided polygon.
  - Each small group will write "The important thing about a *[shape]* is…" verse.
    - Start with your first/last line ("The important thing…")
    - Read the definition of your shape; revise first/last line if necessary.
    - Add a few lines for the middle.
    - Write your verse on chart paper.

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Video Analysis:
Sorting Solids in Kindergarten

What do these children understand about attributes?

A Big Idea about Shapes

Shapes can be defined & classified by their attributes.

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Attribute: A key concept in all areas of mathematics

- What kind of shape is it?
  - Geometric thinking: definition & classification
- What kind of big is it?
  - What & how do we measure?
- What kind of thing are we counting?
  - What is the unit?
  - What is the set?

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Geometry in the CCSS for Mathematics

- Look for the idea of analysis by *attribute*.
  - Why do you think it appears so often?
- A Big Idea about Shapes: Shapes can be combined & separated (composed & decomposed) to make new shapes.
- Highlight all words relating to *composing* or *partitioning* shapes.
  - Why do you think they appear so often?
  - How do composing and partitioning shapes relate to other areas of math?

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Common Core State Standards Relating to Geometry

Kindergarten	1st Grade	2nd Grade	3rd Grade
Identify and ***describe*** shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). • Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*. • Correctly name shapes regardless of their orientations or overall size. • Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). Analyze, compare, create, and compose shapes. • Analyze and compare two- and three dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/ "corners") and other ***attributes*** (e.g., having sides of equal length). • Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. • Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*	Reason with shapes and their ***attributes.*** • Distinguish between defining ***attributes*** (e.g., triangles are closed and three-sided) versus non-defining ***attributes*** (e.g., color, orientation, overall size); build and draw shapes to possess defining ***attributes***. • Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. • Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.	Reason with shapes and their ***attributes.*** • Recognize and draw shapes having specified ***attributes***, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. • Partition a rectangle into rows and columns of same-size squares and count to find the total number of them. • Partition circles and rectangles into two, three, or four equal shares; describe the shares using the words *halves*, *thirds*, *half of*, *a third of*, etc.; and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.	Reason with shapes and their ***attributes.*** • Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared ***attributes*** can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. • Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.* Geometric measurement:: understand concepts of area and relate area to multiplication and to addition. • Recognize area as an ***attribute*** of plane figures and understand concepts of area measurement. • Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). • Relate area to the operations of multiplication and addition. Geometric measurement:: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures. • Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

A riddle to consider:
A kindergartener says,
"Teacher! I figured out that
a triangle equals a square!"
How could this child be right?

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Pattern Block Puzzles

- Complete the puzzles as many different ways as you can.
  - How did you figure out different ways?
- What are shape & number equivalences?
  - How much is  worth …
    - … if  = 1?  = __
    - … if  = 1?  = __
    - … if  = 1?  = __
  - Fill out the shape & number equivalence chart for the puzzles.

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What about the challenge?

If □ = 1,

how much is  worth?

Let's use the Virtual Manipulatives Library
to show our thinking.
http://nlvm.usu.edu/en/nav/vlibrary.html

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We'll see you again
at Erikson
on Thursday, April 4,
or Saturday, April 6.

>>> Share Fair Dates <<<
Friday, April 12
Wednesday, May 8
Look for more info from your coaches!

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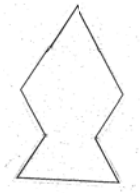
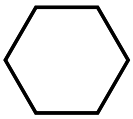
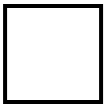
Equivalences with Shape & Number

How much is the pattern block puzzle worth ...		
... if  = 1?		
... if  = 1?		
... if  = 1?		
... if  = 1?		

A Pattern Block Shape & Number Equivalence Challenge

If  = 1 ...

... How much is  worth?

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What evidence of these TEACHER practices do you see in the video?
Are there missed opportunities for engaging in these practices?
What INSTRUCTIONAL DECISIONS has this teacher made?

HIS-EM dimension: Student Engagement
High-Impact Strategies: Teachers ask learners to rephrase other learners' thinking. Teachers scaffold students' explanation of mathematical ideas.
Who is doing the bulk of the math work - the thinking, explaining, and justification?

What evidence of these STUDENT practices do you see in the video?
Are there missed opportunities for engaging in these practices?

CCSS for Math Practice #5: Use appropriate tools strategically.

Who is doing the bulk of the math work - the thinking, explaining, and justification?

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on Thursday, April 4,
or Saturday, April 6.

>>> Share Fair Dates <<<
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Look for more info from your coaches!

MATH DAYS

Celebrate mathematical holidays with this handy list!

Symbol	Value	Day
π	3.14159...	March 14 (any year)
e	2.71828...	February 7, 1828
ϕ	1.61803...	January 6, 1803
$\sqrt{23}$	4.79583...	April 7, 9:58am
i	$\sqrt{-1}$ (imaginary)	The day that people like math jokes

people DO SO like math jokes! GOD!!!