K-2 Trajectories

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NCTM Regional Conference @ Indianapolis, IN on October 30, 2014

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Rationale for Assignment

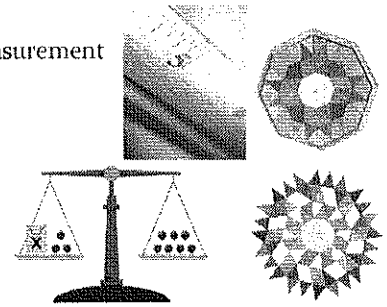
1. Making sense of the (Common Core) Standards
2. Linking "theory" to *effective* "practice"
   - More student-centered; less teacher-directed
   - More inquiry-based (involve students in exploring the big mathematical idea, making conjectures, and justifying their thinking)
3. Authentic Audience: sharing tasks/plans with other K-2 teachers, using a friendly format

K-2 Mathematics Methods Course

- Block 1: 1st course after being admitted into School of Education
- Some learning goals of the course include supporting interns' understanding of:
  - the big ideas in mathematics content at K-2 level
  - the development of children's mathematical thinking about those big ideas
  - effective ways to support the children's developmental understanding of those big ideas

Three Trajectory Presentations: Centers

- Linear Measurement
- Algebra
- Geometry



Learning Trajectory Assignment Description

Group Research Project on K-2 Learning Trajectories for Mathematics

Your final group product will consist of a packet of useful tools for K-2 mathematics teachers that includes:
- explanations/definitions of the big conceptual ideas for understanding the mathematics content in grades K-2,
- a developmental trajectory/map of how those conceptual ideas progress from Kindergarten to 2nd grade, using (Common Core) Standards as your guide, and
- About 4-5 tasks/problems that K-2 teachers could use to support students' understanding of each of those ideas all along the developmental trajectory.

You will need to cite references and include a reference page, using APA-6th format.

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QUESTIONS?

Feel free to email me at
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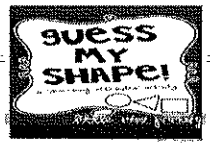
K-2 Geometry

Van Hiele Levels of Geometric Thinking:

Level 1: Visual level
Level 2: Descriptive/Analytic
Level 3: Abstract / Relational
Level 4: Formal Deduction
Level 5: Mathematical Rigor

Retrieved from http://www.math.kent.edu/~white/MIMEgeom/VanHiele.pdf

Effective Tasks for 1st Grade

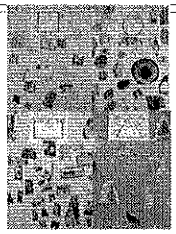


Need: Paper bags
Shapes
Paper and crayons

- Guess My Shape:
  Have a grab bag and a collection of several different shapes.
  - Have students work in pairs.
  - One at a time they can put their hand into the bag and feel what's in the bag and describe what they are feeling.
  - After they have an idea of what it might be, without looking in the bag, have the students draw what they think the shape is.
  - Have students compare the shape with the drawing.

- CCSS.Math.Content.1.G.A.1
- IAS.Math.1.G.1, 1.G.2

Effective Tasks for Kindergarten

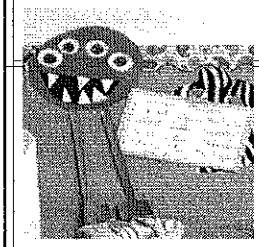


Shape Hunt
- Have students identify familiar shapes they see around the classroom.
- Have students explore the magazines, trying to find the shapes that were just named.
- After exploring the magazines, have the students cut out the shapes they find and make a poster with the shapes.

Need: Magazines, poster paper, glue sticks, scissors

CCSS.Math.Content.K.G.A.1, K.G.A.2
IAS.Math.Content.K.G.3

Effective Tasks for 1st Grade



- Shape Monsters
  Students make shape monsters or animals using only given shapes.
  - They must record what shapes they used and how many of each shape.

Need: shapes, glue sticks, recording sheet.

- CCSS.Math.1.G.A.2
  IAS.Math.1.G.1

Done by: Janelle Nolan

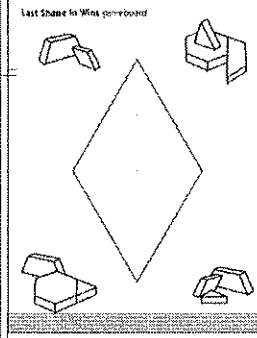
Effective Tasks for Kindergarten

Need: Paper, markers/crayons, list of directional words

Simon Says
- Have students pair up.
- Have one student give the other students directions in the "Simon Says" format using a list of directional words (i.e., above, under, over, near, etc.). Example: "Simon says to draw a triangle above a square to look like a house."
- The second student will try to draw the picture based on the first student's description.
- Have the students compare the picture to the description.
- Students will then switch roles and repeat the process.

CCSS.Math.Content.K.G.A.1,K.G.B.5
IAS.Math.Content.K.G.1

Effective Tasks for 1st Grade



- Students in pairs take turns placing one pattern block on the game board at a time.
- Each new shape needs to touch one of the shapes already on the board.
- The player who places the piece that completes the rhombus wins.

Need:
Pattern blocks: hexagons, trapezoids, triangles, blue rhombuses. Organize sets of pattern blocks: 4hexagons, and 12 each of the other shapes for each pair.

One game board for each pair.

Retrieved from:
http://catalog.mathlearningcenter.org/files/pdfs/PBLAXSSK2-04120v.pdf

CCSS.Math.1.G.1, 1.G.2
ISA.Math.1.G.1, 1.G.3

Effective Tasks for 2nd Grade

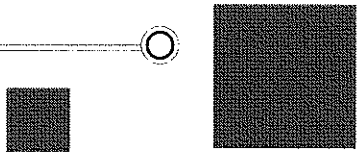
Dividing a Rectangle into Equal Parts

Materials: geoboards, rubber bands, rulers, geoboard paper

1. Make a rectangle on your geoboard.
2. How many different ways can you divide your rectangle in two equal parts?
3. How many different ways can you divide your rectangle in three equal parts?
4. How many different ways can you divide your rectangle in four equal parts?
5. Record each way you find and label the parts.

CCSS.Math.2.G.A.2, 2.G.A.3
IAS.MA.2.G.5

A Shape's Size Determines Name (Undergeneralization)



Square "Rectangle"

Bamberger, et al. (2010) found that children will often identify the same shape as a different name if it is a different size. However, size is not a defining characteristic. For example, a student may mistakenly think the square on the right is a rectangle because it is larger than the square on the left.

Done by: David Bucksten

Effective Tasks for 2nd Grade

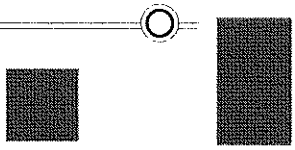
Build-4-Less sheet 4

- Build this picture with the fewest possible pattern blocks.
- Show your solution by coloring the pattern blocks you used.

Need
- Pattern Blocks—hexagons, trapezoids, triangles, and blue rhombuses only.
- build for less sheets 1-6 found at http://catalog.mathlearningcenter.org/files/pdfs/PBL.CCSSK2-0412w.pdf
- red, green, yellow, and blue crayons.

CCSS.Math.2.G.1, 2.G.3
ISA.Math.2.G.3

Some Characteristics are Omitted (Overgeneralization)

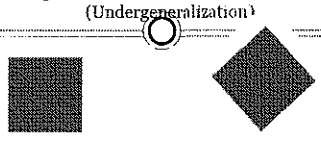


Square "Square"

Bamberger, et al. (2010) tell us that children often omit key characteristics of a shape. Here, a child might name both shapes above as squares because each shape has four sides.

Done by: David Bucksten

Shape's Orientation Determines Name (Undergeneralization)

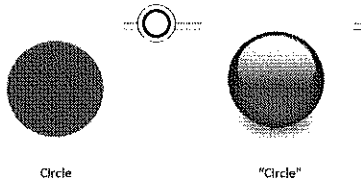


Square "Diamond"

Bamberger, Oberdorf, and Schultz-Ferrell (2010) found a common misconception children have is that a shape's position determines it's name. However, position is not a defining characteristic of shapes. The example shows two identical squares. A child may think because one square is positioned in a different way, that it is not a square. Instead, the child may call it a diamond.

Done by: David Bucksten

Geometric Concepts Formed by Average Representations (Overgeneralization)

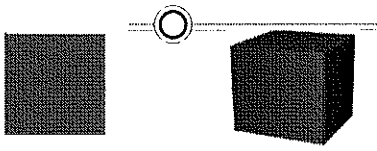


Circle "Circle"

Bamberger, et al. (2010) inform us that children often form ideas of shapes on an average representation. So if a study was being done on round objects, both of these would be defined as circles, although the shape on the right is a sphere.

Done by: David Bucksten

Visual Discrimination



Square "Square"

Bamberger, et al. (2010) tell us that "some children have yet to develop the ability to distinguish similarities and differences between objects" (p. 87). This is similar to an average representation, but differs in that a child cannot yet define any differences between these two shapes: a square and a cube.

Done by: David Bucksten

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