

**March 13-15, 1997**

**Zip to Zowie! Math Exploration in a Pre-Kindergarten Classroom**

**Grade Level:** Pre-Kindergarten/Head Start

**Presented by:** Debbie Riley, Three Oaks Elementary School, Ft. Myers, Florida

**Length of Unit:** four weeks

**I. ABSTRACT**

Create a classroom environment that promotes and develops math concepts in a pre-kindergarten classroom. This unit focuses on the development of centers that foster exploration and mastery of sorting and classification, patterning, and simple measurement. Since the development of these concepts is overlapping and continuing throughout the pre- school year, this unit is presented by concept development.

**II. OVERVIEW**

A. Mathematical Reasoning and Number Sense

B. 1. Sort and classify objects or pictures of objects

2. Duplicate and continue linear patterns

3. Perceive and recognize shapes

Use simple measurement and arrange objects in a series.

C. 1. 3-4 years: Identify identical/different pairs varying in large detail, by one attribute, or group association

Sort objects/pictures by a single attribute: color or shape

4-5 years: Identify identical/different pairs varying in minor detail

Sort objects/pictures by a single attribute: size or function

Orally, identify/label the criteria used to classify objects in a set

Sort objects/pictures according to two characteristics

Fill in the boxes of vertical and horizontal rows with objects using two criteria

2. 3-4 years: Duplicate a 1:1 pattern with 6-10 objects

Match objects arranged in a pattern

4-5 years: Create a more complex pattern with a pattern card [2:2 or 2:1:2] Using stickers or markers, continue an alternating pattern of one attribute-color, size, shape, or a two color pattern

Create and orally describe a pattern using concrete objects

3. 3-4 years: Complete puzzles with ten or more interlocking pieces

Match rectangle, square, circular, and triangular shapes to their respective outlines

Classify and name a circle

4-5 years: Classify and name a rectangle, triangle

Determine geometric shapes in everyday objects

4. 4-5 years: Divide an object into two pieces of relatively equal sizes

Examine pairs of objects using these terms:

length: long/short volume: full/empty

mass: heavy/light temperature: hot/cold

size: large/small, thick/thin, wide/narrow

height: tall/short

Compare objects using non-standard units of measure [blocks, hands]:

length: taller/shorter height: taller/shorter

Rank and order at least three items in a series by length, height, or size using descriptive terms:

length: longest/shortest height: tallest/shortest

size: largest/smallest

### **III. BACKGROUND KNOWLEDGE**

A. Baratta-Lorton, Mary. Mathematics Their Way. Menlo Park, CA: Addison-Wesley, 1979.

B. Harcourt, Lalie. Explorations for Early Childhood. Don Mills, Ontario: Addison-Wesley, 1988.

### **IV. RESOURCES\***

A. Manipulatives: colored blocks, pattern blocks, unifix cubes, collections of animals, counting chips, coins, links, transportation vehicles, attribute shapes, geoboards and geobands, buttons, magnetic shapes, flannel board shapes, lacing beads, assorted sets of picture cards

B. Pattern cards for each set of manipulatives

C. Storage containers for the manipulatives

D. Assorted recording materials: individually sized chalk boards and dry erase boards, clipboards, paper, rubber stamps and colored ink pads, crayons, dry erase markers, colored markers, pens, pencils, rulers

\* see APPENDIX A: a resource list of school supply catalogs that carry these items

### **V. LESSONS**

[lessons occur during transitions, small group, and large group settings]

[independent practice occurs during "tubbing" and center times]

## **Math Concept I: Sort and Classify Objects**

### 1. Objective/Goal:

Sort and classify objects or pictures of objects

### 2. Materials

- a. laminated construction paper, tongue depressors, shape patterns
- b. eight labeled storage containers, each filled with manipulatives to serve up to four children
- c. four workmats for each tub [easily made by laminating 2 sheets of 12" x 18" construction paper and then cutting the sheets in half to make 4 workmats]
- d. Labels for the storage tubs, workmats, and area of the classroom where the manipulatives will be used
- e. Three circular mats, rings, or trays for sorting objects during large group time [hula hoops work well]
- f. posterboard divided into 6 rows and 5 columns, 3" x 5" name cards for each student, 1" self-stick velcro tabs, 1 3" x 5" construction paper shape of each color-red, yellow, green, blue, and orange

### 3. Prior Knowledge for Students

- a. Determine the prior knowledge students possess once procedures for working with manipulatives in the classroom have been taught at the beginning of the year. Allow children to explore the objects during a set time each day. Use this time daily to observe at what levels the children interact with the materials to determine a baseline for their functioning level. These initial assessments provide the basis for instruction.

### Key Vocabulary

same, alike, different, matching, group, set, property

### 5. Procedures/Activities

#### Environment I

- a. Prepare the classroom before children begin the school year by labeling each child's storage space and/or workbasket with a colored geometric shape. For twenty children one of each of these shapes was made,- heart, circle, triangle, and square in these colors- orange, blue, green, yellow, and red. Upon entering class, each child chooses a shape he/she likes and that becomes his/her "symbol" for the year.
- b. Prepare job sticks and sleeping mats in the same way: using each child's symbol to identify job helpers and mats.
- c. Label areas in the classroom where children will work with the manipulatives as well as a place for storage when not in use. Label each of four sides of the "tub" container with the same color symbol used to label the room. Four workmats, also of the same color, should be made and available for each tub. The workmats define working space as well as number of children allowed to work at an individual tub.
- d. Refer to the shapes many times throughout the ensuing days- "...Whose cubbie is the green triangle?" ... "Yellow circle is feeding the rabbit today." ... "Who is the yellow circle?"

## Transitions/large Group I

### e. "Matching Games"

Distribute a colored block [red, yellow or blue] to each child as they sit in a circle for large group time.

f. Place large rings in the center of the circle for matching each color.

g. The teacher begins by placing a colored block in the center of one ring.

h. Each child takes a turn placing his/her block in a ring, determining where it belongs and why. Elicit vocabulary from children as they place their blocks in the ring-same, different, color name, etc. This game can be played again and again and made more or less challenging by substituting different objects and matching color, size, shape, thickness, function, or group association.

## Tubbing I

i. Children then practice this "matching" concept in groups and individually at the tubs.

j. Teachers extend and develop concepts during learning conversations with a child while he/she is working at a tub [eg: if matching sets are made, ask the child for the distinguishing characteristic].

k. Contents of tubs are exchanged for more challenging materials as the children's skill level increases [e.g: assorted sizes of red buttons are sorted by numbers of holes].

## Environment II

i. Make a "Who is here today?" chart \* on poster board drawing five rows and six columns. Trace these shapes on the bottom row to represent the "x" axis-circle, heart, paper along the vertical row to represent the "y" axis- red, yellow, green, blue, orange. Then make name cards for each of the students by gluing their symbol onto the card. Laminate both the graph and name cards.

\* see Appendix B: model and directions for making this graph

\* see Appendix C: Who is here today? label Transitions/large Group II

j. "Who is here today?"

Introduce the children with name tags during morning circle time [e.g: taking attendance], first using symbols, then name and symbol, and later by name only.

k. "Sorting Activities"

The cards may be sorted on the floor by color , shape, by beginning letters of the children's names, etc.

l. Model placing the name cards on the chart "Who is here today?" At first, only use the color "x" axis as a guide for placing the cards on the chart. Let the children begin placing their name cards on the row of the color of their symbol each morning. When the matching concept is grasped, play a switching game: cover up the colors and have the children place their name cards on the row with their symbol shape! Finally, let the students place their name card on the chart using both criteria, name and symbol.

## Tubbing II

m. Add new tubs or replace little used manipulatives with objects that could be sorted in two ways [e.g: color/shape, animals/number of legs] and create large grid construction paper workmats \*

\* see APPENDIX D: work mat grid

n. Children practice sorting, using two attributes, at these tubs.

o. Teachers assist, listen, and observe as children explain the criteria they have used to graph the tubing materials.

## 6. Evaluation/Assessment

concrete: observations during work with manipulatives, observations of transfer throughout the day, photographs, models

pictorial: matching objects to pattern cards

concrete: recording the matching objects on paper

## **B. Math Concept II: Duplicate And Continue Linear Patterns**

### 1. Objective/Goal:

a. Duplicate and continue linear patterns

### 2. Materials

a. balloons, calendar shapes reflecting colors or patterns

b. art print-"Rhythm" Sonia Delaunay

c. Eight labeled storage containers, each filled with manipulatives to serve up to four children plus four workmats for each tub

d. 2" x 18" construction paper or tagboard strips

3. Prior Knowledge for Students a. Explore and describe similarities and differences and attributes of things

b. Sort and match by one attribute

c. Determine the prior knowledge students possess once procedures for working with manipulatives in the classroom have been taught at the beginning of the year. Allow children to explore the objects during a set time each day. Use this time daily to observe at what levels the children interact with the materials to determine a baseline for their functioning level. These initial assessments provide the basis for instruction.

### 4. Key Vocabulary

repeating, pattern, continue the pattern, extend the pattern

### 5. Procedures/Activities

#### Environment I

a. At the beginning of the year, set up a "Days of the Week" bulletin board that includes a balloon hanging below each school day name each week. The balloons are arranged in a 1:1 color pattern at the beginning of the year. Later in the year, the patterns can be made more challenging [e.g: alternating shapes, 2:1:2].

### Large Group I

- b. Beginning on the first day of school, hang balloons for every day of that week beneath the day label, creating a visual pattern for the children. Prior to popping a balloon to signify the day, repeat the colors of the pattern that the balloons have made.
- c. Repeat the color pattern of the balloons daily. After the last balloon color has been stated, begin to ask the children to guess which color would extend the pattern.. [Later change the balloon shapes to create a new type of pattern]

### Environment II

- d. Each day, a student holds a miniature American flag during the *Pledge of Allegiance*. Since it is a popular responsibility, children notice the bright red and white stripe pattern the flag possesses.

### Transition/Large Group II

- e. Regularly point out patterns in children's clothing, and create patterns through music, clapping, children lining up, etc. [e.g: *Hot Cross Buns*, *Peas Porridge Hot*, etc.]
- f. During large group, introduce the American flag and point out the red and white stripe pattern.
- g. Model patterning for the children by recreating the flag's striped pattern on lined paper with their assistance.

### Tubbing I

- h. Introduce new ways to interact with tubbing materials during large group, small group, or transition time. Adding links and lacing beads is popular with the children for patterning.
- i. During tubbing, the children may create and extend patterns of their own choosing. Center Activities j. home living: beading, jewelry making, weaving, quilting k. office center: stamps and ink pads, stickers l blocks: post and lentil style architecture m. woodworking: nail patterns n. science: magnetic shape patterns o. writing: paper, dry erase boards, clip boards and paper as well as writing utensils p. art: clay, mosaics, collage materials [also painting and drawing; see Environment 3]

### Environment III

- q. Display the art print "Rhythm" by Sonia Delaunay.

### Transition/large Group III

- r. Introduce the art print "Rhythm" during large group. Have the children examine it to see if they can determine any patterns in her art work. [eg: colors, wide/narrow lines] s. The children then may suggest how they would create a painting or drawing in the style of Delaunay, using repeating patterns. Each individual may choose the medium.

### Tubbing II

t. Encourage the children to begin creating or replicating patterns on paper using shapes, colors, letters, etc. Then have them restate how they created the pattern they made.

#### 6. Evaluation/Assessment

concrete: observations during work with manipulatives, observations of transfer

throughout the day, photographs, models pictorial: matching objects to pattern cards

abstract: drawing or creating a pattern on paper, chalk board, or dry erase board

### **C. Concept III: Use Simple Measurement Skills and Seriate Objects**

#### 1. Objective/Goal:

a. Use simple measurement and seriate objects

#### 2. Materials

a. yarn,

b. butcher paper, marker, crayons

c. Cuisenaire Rods

d. measuring cups, spoons

e. balance

f. cutting board, sharp knife

3. Prior Knowledge for Students a. Explore and describe similarities and differences of things

b. Determine the prior knowledge students possess once procedures for working with manipulatives in the classroom have been taught at the beginning of the year. Allow children to explore the objects during a set time each day. Use this time daily to observe at what levels the children interact with the materials to determine a baseline for their functioning level. These initial assessments provide the basis for instruction.

#### 4. Key Vocabulary

short/tall (er) (est), short/long (er) (est), heavy (ier) (iest), measure 5. Procedures/Activities Environment I

a. Label sets of increasing/decreasing sized objects in the class from largest to smallest or the reverse for daily storage [e.g: pots and pans, measuring cups, measuring spoons, water table buckets, etc.]

#### Transition/Large Group/Small Group I

b. Introduce stacking bowls, nesting cups, or stacking rings to the children.

c. Begin with only three of any set and determine the largest, smallest, and middle sized objects.

#### Tubbing I

d. Add items to tubing materials that can be ordered by size, weight, or color intensity.

e. Students practice, through trial and error, to determine the relative order of the tubing objects.

#### Environment II

f. Daily, measure the outside temperature with red construction paper strips held against a classroom thermometer for guidance. Keep track of the temperature daily to determine patterns. The longer the red strip, the warmer the weather is, and vice versa.

g. Also place a growth chart in the classroom as well as a large tape measure to pique children's interest in measuring their height.

#### Transition/Large Group/Small Group II

h. Measure the circumference of a large object with a string of yarn. [eg: a pumpkin in October] Then as a class find someone or something that is as tall as the object is round. i. During large group time, measure a child with a length of yarn. Have the child look for something or someone in the class that measures the same length as the yarn. j. Trace children's shapes on butcher paper and allow them to measure their shapes and compare to one another. Elicit terms such as taller, shorter, tallest, and shortest.

Tubbing II k. Introduce Cuisenaire Rods to tubbing. Begin to explore how to build steps using only three of the rods at first. Increase the number of rods to determine the tallest and shortest rods.

l. Look for students to place them in graduated order.

Center Activities m. science: measurement with the balance beam, selecting familiar objects. Encourage comparisons. [e.g: which is heavier?] n. water and sand table: introduce measuring cups, again encouraging comparisons.

Extend this use of measuring cups to the science center, comparing the weight of one cup of one solid to another. [eg: one cup of rice: one cup of flour]

p. art: rulers and protractors for creating lines and arcs of various sizes

q. blocks: roads and tunnels, ramps

r. cooking: cutting/ breaking food items in half and one of the halves in half again.

placing the three pieces in graduated order [e.g: pretzels]

#### 6. Evaluation/Assessment

concrete: observations during work with manipulatives, observations of transfer

throughout the day, photographs, models pictorial: matching objects to pattern cards abstract: drawing or creating a pattern on paper, chalk board, or dry erase board

### **VI. CULMINATING ACTIVITY**

N/A

### **VII. HANDOUTS/STUDENT WORKSHEETS**

**APPENDIX A: Early Childhood Educational Supplies Catalog Resource List**

**APPENDIX B: Attendance Chart**

**APPENDIX C: "Who is here today?" Label**

**APPENDIX D: Workmat Grid**

**APPENDIX A**

*Early Childhood Educational Materials*

*Catalog Resource List*

1. ABC School Supply, Inc. 1-800-669-4222

3312 N. Berkeley Lake Rd. <http://www.abcchoolsupply.com>

Box 100019 Fax: 1-800-933-2987

Duluth, GA 30136-9419

2. Center for Innovation in Education, Inc. Materials Catalog

20665 4th Street 1-800-395-6088

Saratoga, CA 95070-5878 <http://www.best.com/~center>

1-888-44-CENTER Fax: 1-408-741-6290

3. Ideal 1-800-845-8149

5623 West 115th Street Fax: 1-800-328-5131

Alsip, IL 60482-9931

4. J.L. Hammett Co. Early Learning Catalog 1-800-333-4600

PO Box 859057 <http://www.hammett.com>

Braintree, MA 02185-9057 Fax: 1-800-873-5700

5. Kaplan 1-800-334-2014

PO Box 1310 Lewisville-Clemmons Road Fax: 1-800-452-7526

Lewisville, NC 27023-0609

6. Lakeshore Learning Materials 1-800-421-5354

2695 E. Dominguez Street Fax: 1-310-537-5403

PO Box 6261

Carson, CA 90749

7. Nasco Fort Atkinson 1-800-558-9595

901 Janesville Avenue <http://www.nascofa.com>

PO Box 901 Fax: 1-414-563-8296

Fort Atkinson, WI 53538-0901

## **APPENDIX B**

*"Who is here today? Graph"*

orange

blue

green

yellow

red

circle

heart

square

triangle

**Directions:**

1. Make a graph using a 22" x 24" sheet of poster board. For twenty children, draw lines to create five columns and six rows. Each rectangular shape in the matrix should be

3.5" x 5.5".

2. On the far left vertical column, beginning with the top left rectangle, place a 3" x 5" construction paper in the rectangular space in one each of these colors: orange, blue, green, yellow, and red.

3. On the bottom row, leave the far left rectangle blank. Beginning with the second rectangle, trace one of these shapes in each rectangular space: circle, heart, square, triangle.

4. Laminate the graph.

5. Place a one inch square of velcro [prickly side] to the top of each rectangle in the matrix.

6. Prepare 3" x 5" blank index cards by writing the name of a student on each one. Attach a small

replica of the child's symbol on his/her name card as well.

7. Laminate the name/symbol cards.

8. Attach the soft piece of one inch square of Velcro to the top center of each name card.

## **APPENDIX C**

**APPENDIX D**

*Workmat Grid*

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