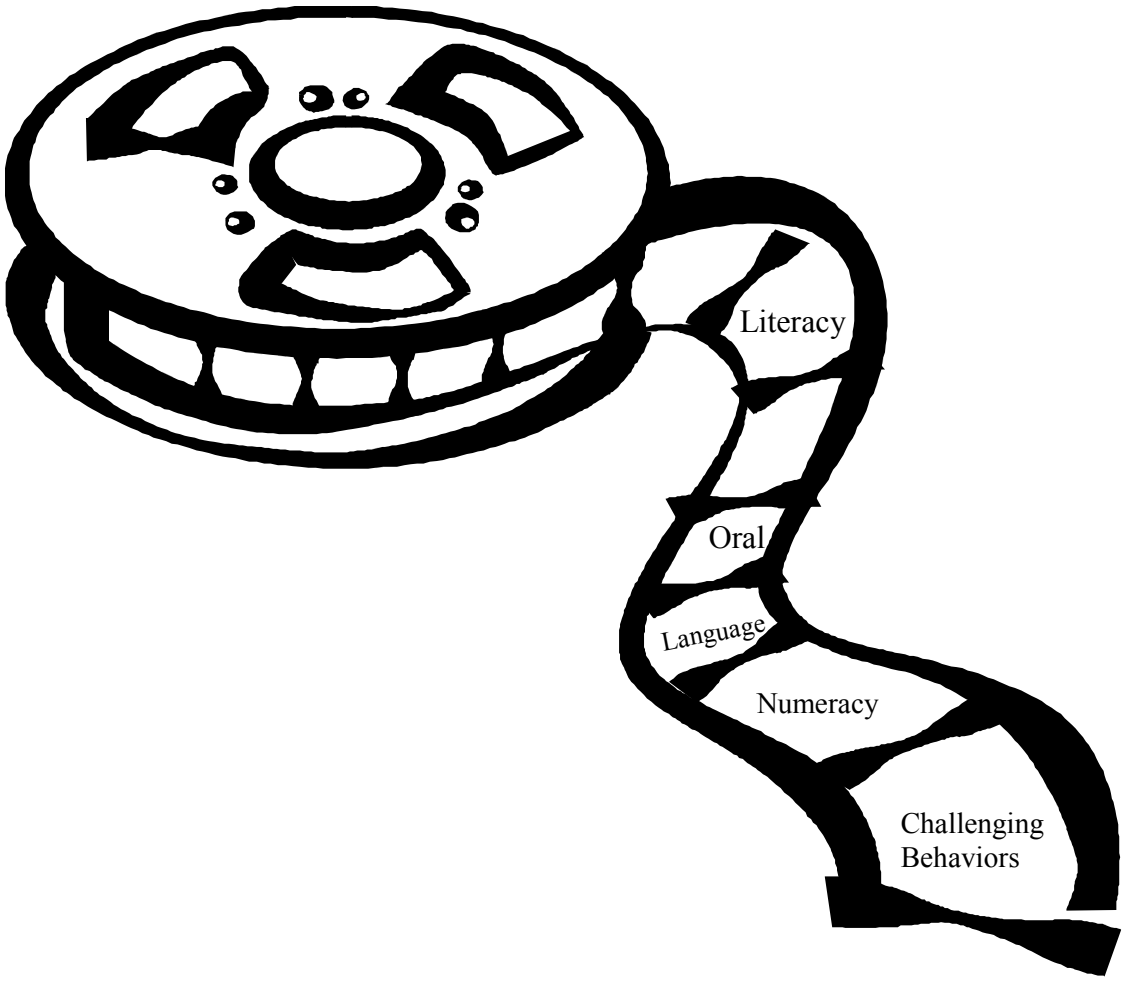
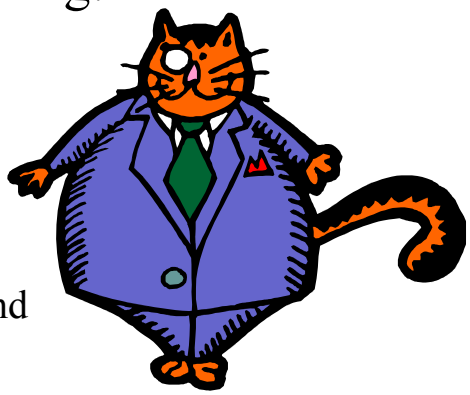
Project REEL



Resources for Early Educator Learning

Five Big, Fat Ideas

to remember about young children's learning:



1. Children learn best in a social setting.

   Therefore, avoid independent seat work.

2. Children learn best through play.

   Therefore, immerse them in a richly active play and avoid worksheets.

3. Children learn best when they are allowed to approximate adult behaviors.

   Therefore, demonstrate adult practices and accept children's attempts at those adult practices **as if** they were already conventional efforts.

4. Children learn best in an atmosphere of respect where their dignity is protected.

   Therefore, establish appropriately high expectations for children, focusing on positive guidance instead of punishment.

5. Children learn best when they have daily opportunities to use diverse social, language, literacy, and numeracy practices and receive extensive feedback from the caring adults in their classroom.

   Therefore, offer children time to use new ideas and respond to them in ways that enriches their understandings.

Project REEL: Workshop 6

A FOCUS ON NUMERACY

" I was surprised by how much hidden mathematics I found in my classroom when I stopped to think about it. Everyday occurrences and events in the classroom furnish many rich mathematical experience for children. These experiences give students a strong foundation in mathematical concepts that will be built on by many people as they progress through school. Through such experiences, our children naturally learn mathematics."

(McGee, 2005, p. 347)

"High-quality teaching in mathematics is about challenge and joy, not imposition and pressure. Good early childhood mathematics is broader and deeper than mere practice in counting and adding. It includes debating which child is bigger and drawing maps to the 'treasure' buried outside…Quality preschool mathematics is not elementary arithmetic pushed onto younger children. Instead, it invites children to experience mathematics as they play in, describe, and think about their world."

(Clements, 2001, p. 270)

Tennessee Early Learning Developmental Standards (Birth to Age Three)
SECTION 3: MATH **Component: Problem Solving and Spatial Sense** **Component: Numbers** **Component: Spatial Sense to Develop Understanding of Conservation, Geometry, and Numbers** **Component: Numbers** **Component: Patterns** **Component: Spatial Sense** **Component: Problem Solving**
LEARNING EXPECTATIONS:
Pays attention to what is happening in the environment (0-4 mos.)
Aware of surroundings; makes things happen, most often unintentionally (0-4 mos.)
Displays short term memory (5-8 mos.)
Makes things happen (5-8 mos.)
Makes things happen through use of senses of sight, sound, taste, and touch (9-12 mos.)
Begins to explore physical properties of objects and to identify their use (12-18 mos.)
Begins to group objects by their function (19-24 mos.)
Begins to recognize objects as the same and different (19-24 mos.)
Begins to use number words in songs and finger play with little or no understanding (19-24 mos.)
Begins to build understanding of "more" (19-24 mos.)
Explores her world and begins to understand her position in space and how to get around (19-24 mos.)
Begins to build understanding of more and one-to-one correspondence (2 – 2 1/2 yrs.)
Begins to understand the relationship between objects, solving simple jigsaw puzzles, and matching similar shapes (2 – 2 1/2 yrs.)

Matches circle, square, and triangle shapes (2 – 2 1/2 yrs.)
Explores world, and understands position in space and how to get around (2 – 2 1/2 yrs.)
Explores materials and understands simple acts of cause and effect (2 – 2 1/2 yrs.)
Continues to build understanding of quantity and size (2 1/2 – 3 yrs.)
Begins to count by rote (2 1/2 – 3 yrs.)
Continues to understand the relationship between objects, solving simple jigsaw puzzles and matching similar shapes (2 1/2 – 3 yrs.)
Explores world and understands position in space and how to get around (2 1/2 – 3 yrs.)
Explores materials and understands simple acts of cause and effect (2 1/2 – 3 yrs.)

Tennessee Early Learning Developmental Standards (ages 3-5) Aligned with The Creative Curriculum® Developmental Continuum for Ages 3-5	
Tennessee Early Learning Developmental Standards (ages 3-5) **SECTION 3: MATH** **Component: Number and Operations** **Component: Patterns and Algebra** **Component: Measurement** **Component: Geometry and Spatial Sense** **Component: Problem Solving and Analyzing Data**	**The Creative Curriculum® Developmental Continuum for Ages 3-5**
LEARNING EXPECTATIONS:	
Begins to identify and label objects using numbers (ages 3-4)	See #s 33 & 34
Explores and begins to sort and classify objects (ages 3-4)	See #27
Begins to identify, describe, and extend patterns (ages 3-4)	See #30
Begins to demonstrate understanding of time, length, weight, capacity, and temperature (ages 3-4)	See #s 28 & 31
Becomes aware of his body and personal space during active exploration of physical environment (ages 3-4)	See #32
Begins to explore the size, shape, and spatial arrangement of real objects (ages 3-4)	See #s 27 & 32
Begins to develop foundation for linking concepts and procedures with active experiences (ages 3-4)	See #s 26, 34, & 37
Begins to identify and label objects using numbers (ages 4-5)	See #34
Develops understanding of numbers and their association with objects (ages 4-5)	See #33
Explores and begins to sort and classify objects (ages 4-5)	See #s 27 & 29
Identifies, describes, and extends patterns (ages 4-5)	See #30
Begins to demonstrate understanding of time, length, weight, capacity, and temperature (ages 4-5)	See #s 28 & 31
Becomes aware of personal space during active exploration of physical environment (ages 4-5)	See #32
Explores and recognizes the size, shape, and spatial arrangement of real objects (ages 4-5)	See #s 27 & 32
Begins to develop foundation for linking concepts and procedures with active experience (ages 4-5)	See #s 26, 34, 37

Training Objectives

Early Childhood Educators will be able to:

- ✓ define the five content areas of math
- ✓ demonstrate through their curriculum their understanding that concepts are critical for children's later school success
- ✓ demonstrate in their teaching the foundational concepts of early childhood numeracy
- ✓ demonstrate in their teaching the typical sequence of math development from birth to age five
- ✓ create a math rich environment that is developmentally appropriate for their age-level focus
- ✓ select appropriate numeracy books for the varying age levels of children in their settings
- ✓ demonstrate using math activities with small groups and individual children, avoiding whole-group teaching scenarios
- ✓ collect and integrate math materials into interest areas <u>in addition to</u> the math center
- ✓ demonstrate a focus on counting songs, fingerplays, nursery rhymes and numeracy books with infants and young toddlers
- ✓ demonstrate multiple activities that support young children's knowledge of number and operation
- ✓ demonstrate multiple activities that support young children's knowledge of algebra
- ✓ demonstrate multiple activities that support young children's knowledge of geometry
- ✓ demonstrate multiple activities that support young children's knowledge of measurement
- ✓ demonstrate multiple activities that support young children's knowledge of data analysis and probability
- ✓ demonstrate that children with special needs require more frequent and intensive experiences in emergent literacy activities and responsive scaffolding of their present abilities
- ✓ actively support families' involvement in their children's math development
- ✓ demonstrate strategies to provide additional support to a child who is learning English as a second language

List of training materials:

- Participant manuals
- IDPs for participants and directors
- Children's literature from Project REEL collection (including board books)
- Examples of environmental print for modeling (match, memory)
- Examples of sandpaper numbers and wallpaper matching
- Examples of playing card puzzles and environmental print puzzles
- Math manipulatives for modeling

MATHEMATICS IN EARLY CHILDHOOD SETTINGS

In 2002, the National Association for the Education of Young Children (NAEYC) and the National Council of Teachers of Mathematics (NCTM) published a joint position statement "Early Childhood Mathematics: Promoting Good Beginnings." This statement confirms that "high-quality, challenging, and accessible mathematics education for 3-to 6-year-old children is a vital foundation for future mathematics learning. In every early childhood setting, children should experience effective, research-based curriculum and teaching practices." Classroom practice should be directed by the following ten research based recommendations of the joint position statement:

1. Enhance children's natural interest in mathematics and their disposition to use it to make sense of their physical and social worlds.
2. Build upon children's experience and knowledge, including their family, linguistic, cultural, and community backgrounds; their individual approaches to learning; and their informal knowledge.
3. Base mathematics curriculum and teaching practices on knowledge of young children's cognitive, linguistic, physical, and social-emotional development.
4. Use curriculum and teaching practices that strengthen children's problem-solving and reasoning processes as well as representing, communicating, and connecting mathematical ideas.
5. Ensure that the curriculum is coherent and compatible with the known relationships and sequences of important mathematical ideas.
6. Provide for children's deep and sustained interaction with key mathematical ideas.
7. Integrate mathematics with other activities and other activities with mathematics.
8. Provide ample time, materials, and teacher support for children to engage in play, a context in which they explore and manipulate mathematical ideas with keen interest.
9. Actively introduce mathematical concepts, methods, and language through a range of appropriate experiences and teaching strategies.
10. Support children's learning by thoughtfully and continually assessing all children's mathematical knowledge, skills, and strategies.

www.naeyc.org/about/positions/psmath.asp

What are the content standards for the early childhood classroom?

Principles and Standards for Mathematics (NCTM 2000) lists contents standards in five areas for pre-kindergarten through twelfth-grade:

- Number and operations
- Algebra
- Geometry
- Measurement
- Data analysis and probability

" A child learns by doing, talking, reflecting, discussing, observing, investigating, listening, and reasoning… Both NAEYC and NCTM emphasize the learning process– thinking, integrating, applying, and investigating– the children's active involvement in learning."

(Copley, 2000, p. 29)

Development of Math Concepts Age by Age

	0 -3 years	4 years	5 years	6 years
General Development	Children may:	Children may:	Children may:	Children may:
Forming Concepts	learn concepts in action	learn concepts in an example-by-example way	learn concepts through a particular example	more easily learn concepts that are thought of in terms of rules
Representing and Symbolizing	at age 2, begin to develop mental representations, including symbols			represent and mentally 'undo" a process
Number Concepts	recognize very small numbers, nonverbally, and then with numerical labels such as *two*; at about age 2, represent numbers exactly; begin to use the *stable-order rule*, and even the *abstraction rule*, in counting small collections	maintain the *one-to-one rule* in counting increasingly large collections; understand the *cardinal rule* (the last number word in counting tells how many are in the collection)	begin to count, not just discrete objects, but *classes* such as how many different colors of blocks there are, and units, such as how many whole eggs, when some halves are together and some are not; begin to understand the implications of the *order-irrelevance rule*	conserve numbers, recognize that no matter how a collections arranged, it has the same number of items
Comparing Numbers	visually determine whether very small collections have the same amount, or which has more	use counting or matching to compare two collections up to five objects, despite deceptive appearances	use counting to compare two collections, even if the objects they contain are a mixture of sizes	use counting to accurately compare two collections, even if the collection with the smaller number has objects that are larger in size
Adding and Subtracting	recognize how many objects should be present when one is added or taken away from a very small collection	solve word problems using objects, with sums of up to five	solve word problems using counting-based strategies; for example, when asked "if you had four toys and got two more toys, how many would you have?" will count four fingers, then count up with two more fingers	solve problems with sophisticated counting strategies; for example, when asked, 'You had some toys, then got five more. Now you have 11. How many did you start with?" will count, while putting up fingers to keep track
Shapes	match simple shapes	recognize and name variations of the circle, square, triangle, and rectangle	recognize and name shapes in various orientations, sizes, and types; start to recognize the parts of shapes, such as sides and angles	sort shapes into classes based on their attributes, such as triangles having three straight sides
Maps	understand and use ideas such as over, under, above, on, beside, next to, between	build a simple but meaningful map with landscape toys, such as houses, cars, and trees; learn a simple route from a map	place toy objects in the correct relative position to make a map of the classroom	make and follow maps of familiar areas, using some measurements
Patterns and the Number Patterns Leading to Algebra	act out patterns, such as jumping to the left, right, left, right; observe repeating patterns, such as a block standing, then lying down, then standing	copy simple repeating patterns, such as AB-BABBABB	separate the "core unit" in patterns, such as ABA in ABAA-BAABA; find patterns in math, i.e. adding one to a number results in the next "counting number"	create, recognize, and use early algebraic patterns; for example, subtracting a number from itself gives you zero, or n-n=0

Clements & Sarama, 2004 p. 40

ACTIVITIES and STRATEGIES : Infant and Toddler

What Children Might Do

- Dump blocks out of a bucket and put all of the blue ones in a pile.
- Beat on a drum, shake a tambourine, or play another musical instrument.
- Pretend to drink from a cylinder block or use blocks in other creative (abstract) ways
- Fit containers (such as plastic bowls) of different sizes inside each other.
- Help a teacher slice bananas for snack or return blocks to shelves labeled with shapes.
- Crawl through a tunnel or in and out of a cardboard box.
- Fill and empty containers at sand and water tables.
- Make patterns using blocks or beads and string.

What Teachers Can Do

- Provide plenty of blocks and other toys and items of different shapes, colors, and sizes.
- Play with children, notice what they do, and record observations.
- Use words that describe attributes such as size, shape, and color: "You made a big pile of blue blocks."
- Provide plenty of sound makers (e.g., wrist bells, pots and wooden spoons, rhythm instruments) so children can experiment and experience rhythm and beat.
- Encourage children to play and move along with recorded music.
- Talk with children and describe what they are doing: "Shake, shake-shake, shake. You made your own music."
- Set up a simple dramatic play area with many props that encourage children to compare, sort, contrast, manipulate, and explore properties such as size and shape.
- Provide a variety of toys that invite children to explore with their sense and motor skills and allow them to compare and contrast objects by size, color, texture, and sound. Some good toys for this purpose include xylophones, stacking rings, shape boxes, and texture balls or books.
- Point out mathematical and relational comparisons during daily activities. For example, serve two kinds if fruit and say, "These apples are hard and crunchy. The bananas are soft and mushy."
- Introduce mathematical words to children in matter-of-fact ways: 'These blocks are *longer* than those blocks." "These are *square* and those are *round*."
- Encourage children to explore how their own bodies fit in space and to see things from different perspectives (e.g., *inside* and *outside*, *high* and *low*). Provide an expanding tunnel or one made by taping together cardboard boxes.

- Let children climb on a stack of soft pillows. Talk about what children are doing so they can begin to learn the words that describe mathematical concepts: "You were *in* the box, then you climbed *out*." "You climbed *up* on the pillows, then you jumped *down*."
- Offer materials such as sand and water (or other safe materials) and containers of different sizes, shapes, and capacities. Allow children to interact by filling and emptying the containers and noticing what happens. Teachers can focus a child's thoughts by asking questions such as, "What might happen if you pour that into this jug?" or "Do you think all of the sand will fit in this bucket?"
- Observe and comment on patterns children make. Engage in patterning with children. Make or provide a simple pattern, and invite children to make a pattern that looks the same as the model (e.g., make a row of small animals-one giraffe, one tiger, one giraffe, one tiger-and provide a container of animals).

Geist, 2003, p.4-6

Rhymes and songs are great ways to introduce math to infants and toddlers.

This Little Piggy

This little piggy want to market.
(Softly squeeze a thumb or big toe and say "That's one!")
This little piggy stayed home.
(Softly squeeze a second finger or toe and say "That's two!")
This little piggy had roast beef (or tofu or ice cream).
(Softly squeeze a third finger or toe and say "That's three!")
This little piggy had none.
(Softly squeeze a fourth finger or toe and say "That's four!")
This little piggy cried "Wee-wee-wee!" all the way home.
(Softly squeeze a fifth finger or toe and say "That's five!")

www.pbs.com

Hands and Feet

One hand (gently hold up one hand)
Two hands (gently hold up both hands)
I have two hands. (gently clap hands together).

One foot (gently wiggle foot)
Two feet (gently wiggle both feet)
I have two feet (gently wiggle both feet)

Hicks, 2006

NUMBERS AND OPERATIONS

"Number knowledge emerges surprisingly early in life and develops considerably during the first three years of life. Infants can discriminate among and match very small configurations (one to three) of objects" (Clements, 2004, p. 7).

"Numbers are familiar to children because they appear in telephone numbers, addresses, speedometers, speed limit signs, mileage distance signs, page numbers, clocks, calendars, and thermometers" (Eliason and Jenkins, 2003, p.393).

"The development of number concepts does not occur in one lesson, one unit, or even one year. It is a continuous process that provides the foundation for much of what is taught in mathematics" (Copley, 2000, p.48).

Characteristics of numbers and counting

› Oral Counting begins early life and often before a child is two-years-old. It is often a pattern of "sing-song" sounds. Children then move to stating number words in correct order. (Baroody & Wilkins, 1999, p.51-52)

› "Songs, fingerplays, nursery rhymes, and stories utilizing the fingers as counting objects should be heard often" (Eliason & Jenkins, 2003,p.394).

› "Verbalizing the number sequence, is one thing; but to count items correctly, one number per item, is more difficult" (Eliason & Jenkins, 2003,p.394).

❖ One-to-One Correspondence (Object Counting, "One Item Gets Only One Number 'Tag'") occurs when a number is assigned to each item in the set and the item only gets counted once.

❖ When a child hands out one napkin per child during snack, one crayon per child at the art table, or lines up one car for each tree in the block center, they demonstrate one-to-one correspondence.

❖ "By the time children are four or five years old, they understand the concept of one-to-one labeling but may have difficulty using it with sets of more than five items" (Baroody & Wilkins, 1999, p.52).

› Stable-Order Principle ("Numbers Occur in a Fixed Order") Children learn through observing other people that numbers occur in the same position each time.
Hirsh-Pasik& Golinkoff, 2003

› "Whether or not children have the number list correct yet, they seem to appreciate that the numbers they have learned occur in a stable order" (Hirsh-Pasik& Golinkoff, 2003, p. 49).

› "Ask a 2-year-old to count a set of objects...She might say 'one, two, three, four, seven.' Yet when you give her two different sets to count she may keep those numbers (her personal number list) in the same order" (Hirsh-Pasik& Golinkoff, 2003, p. 49).

› Cardinal Principle (Quantity, "The Number of Items in a Set is the Same as the Last Number Tag") occurs when children realize that the last number they have counted in the set is the number of items in the set.
Hirsh-Pasik& Golinkoff, 2003

› When a child counts out five napkins ("1, 2, 3, 4, 5, -I have five napkins") and realizes that there are five napkins they are showing an understanding of the cardinal rule/ quantity.

›"Between two and three years of age, children realize that remembering the count is important but may not realize the object-counting process can be summarized by simply stating the last number word used"
(Baroody & Wilkins, 1999, p.53).

❖ Abstraction Principle ("I Can Count Anything!") means I can count anything.
Hirsh-Pasik& Golinkoff, 2003

❖ I can count shells, buttons on the dolls clothing, crackers on a plate, cars in the parking lot, books on the shelf, or even how many steps I walk to get to the water fountain.

❖ "Numbers are universal that apply anywhere to anything. ...Even though the words change across language (un, deux, trios– or one, two, three)- these principles are the same around the world"
(Hirsh-Pasik& Golinkoff, 2003, p.50).

› Order-Irrelevance Principle ("It Doesn't Matter Where You Start Counting") means we can count anything we want, in any order, and starting with any item.
Hirsh-Pasik& Golinkoff, 2003

› I can place some cookies in a row and start counting from one end and get the answer "seven" and I can start counting again at a different cookie and still have an answer of "seven."

› "From their everyday experiences, children learn much about quantities and their behavior. By learning to count collections in different arrangements, they can discover that appearance can be deceiving that the number collect remains the same despite superficial changes in appearances"
(Baroody & Wilkins, 1999, 51).

"By the age of 3, most children seem to operate according to these five principles most of the time.

- The One-to-One Principle
- The Stable Order-Principle
- The Cardinal Principle
- The Abstraction Principle
- The Order-Irrelevance Principle"

Hirsh-Pasik& Golinkoff, 2003

ACTIVITIES and STRATEGIES : PRESCHOOL

Numbers and Operations

Playing Card Puzzles

1. Use a deck of playing cards.
2. Cut the cards in half, using different patterns. Make sure each card is cut differently so that only two correct halves will fit together.
3. The children match the two sides together.

Eliason & Jenkins, 2003

Calendar Fun

1. Take two pages from a calendar.
2. Cut the numbers from one page and leave the other page whole.
3. Match the cut out numbers to the whole page of numbers.

Eliason & Jenkins, 2003

Seed Cards

1. Use seed packets to make matching and sorting cards.
2. The cards can be matched together and they can be sorted by color, type (flower or vegetable) and vegetables that grow above ground or vegetables that grow below ground

Eliason & Jenkins, 2003

Flannel Board

- Create felt numbers and felt shapes (trees, stars, hearts, flowers, etc).
- The children can organize the shapes into sets (1 heart, 2 trees, etc.)
- They can also sort the shapes by color and category.

Eliason & Jenkins, 2003

Sandpaper Numbers

- Cut out numbers from sandpaper.
- Children can feel the numbers as they are learning them.

Eliason & Jenkins, 2003

Classroom Directory

- Create a classroom directory that has each child's name, address and telephone number.
- Put the list in home living so the children can practice dialing numbers.

Eliason & Jenkins, 2003

Self- Correcting Number Lotto

1. Cut out two numbers from contraction paper (the same size) and glue them onto poster board.
2. Place the second number between a plastic sheet cover.
3. The children match the number on the poster board to the number in the plastic sheet.
4. As the children match the numbers, they can see through the plastic and correct themselves if the number is wrong or facing the wrong direction.

Eliason & Jenkins, 2003

Pair Game

- Place pairs of items into a bag (socks, shoes, earrings, dice, etc)
- Children remove the items from the bag and match them.

Eliason & Jenkins, 2003

Wallpaper Match

- Use a hand pattern and trace and cut out the left and right hand from various wall-paper patterns.
- Cut the hands out and mix them up.
- Children match the pairs of hands.

Eliason & Jenkins, 2003

Number Set Cards

1. Mark a number (2,3,4,5,...10) on a card.
2. Each child will create a set using paperclips, stickers, a hole puncher, etc. For example, the children would put five staples on the "5" card or three paperclips on the "3" card.

Eliason & Jenkins, 2003

Outdoor Walk

- Give children paper bags and have them collect various items during the walk.
- For example, children collect 2 rocks, 6 pinecones, etc.

Eliason & Jenkins, 2003

Number Collage

- You will need pre-cut numbers, glue and paper.
- Have the children randomly place numbers on the paper or have them match them to pre-drawn numbers.
- Children identify numbers with teacher and peer support in small groups.

Eliason & Jenkins, 2003

Number Line

1. Draw a line (you can use tape) with proper sequence of numbers on the floor.
2. Each child stands on a number.
3. Give directions, move ahead 2 and then back 1, etc.
4. After you have given the directions ask the children to tell you what number they are standing on now.

Eliason & Jenkins, 2003

Soup Can Sort

1. Cover 10 empty soup cans with solid color contact paper.
2. Line the edges with tape and fold over.
3. Place a small adhesive dots on the can.: one dot for can "1", two dots for can "2", etc.
4. Children sort straws or wooden sticks according to the number of dots on each can. The "4" can will need four straws, etc.

Eliason & Jenkins, 2003

Block Printing

1. Cut out foam numbers or use precut foam numbers.
2. Glue the numbers onto a block backwards.
3. Dip the block into paint and press the blocks onto paper.
4. The children can create number paintings using the blocks.

Eliason & Jenkins, 2003

Number Cookies

- Cut out numeral cookies from cookie dough.
- Cook them.

Eliason & Jenkins, 2003

Musical Footsteps

1. Place footsteps with numbers on them in a circle on the floor.
2. The children skip, hop and jump around in a circle until the music stops.
3. When the music stops the children have to say the number that they are standing on.

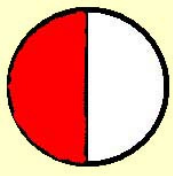
Eliason & Jenkins, 2003

Number Booklets

- Use pictures from magazines, photos, or the children's own drawings.
- Have the children dictate or write a sentence for each page.

Eliason & Jenkins, 2003

Fractions



1. Cut out a whole circle using color paper.
2. Cut out 3 other circles the same size using different color pieces of paper
3. Cut the circles into ½", 1/3" and ¼"
4. Children use the whole circle as a template on which they place circle pieces.

Eliason & Jenkins, 2003

Graphs

- You can use chart paper, poster board, blank paper, butcher paper, etc.
- You will want to pose a question to the class and discuss the answers.
- After you have discussed the answers, graph responses of the children.
- You can record their answers by using tally marks, coloring in boxes, writing children's or they write their names under the categories.
- For example, you can graph how many brothers and sisters the children have, the different hair and eye colors in the class, different kinds of pets, ages, favorite colors, foods, books and number of buttons on their clothes to name a few.

Eliason & Jenkins, 2003

"How many brothers and sisters do you have?"	
Brothers	Sisters
A.J. Kellie Drew	Meagan Paul Kerrion Sydney
There are fewer brothers than sisters.	There are more sisters than brothers.

ALGEBRA

"Algebra begins with a search for patterns. Identify patterns helps bring order, cohesion, and predictability to seemingly unorganized situations and allows one to make generalizations beyond the information directly available" (Clements, 2004, p. 52).

"Children watch the sun setting everyday; listen to stories, songs, and verses that follow patterns; notice how a puppy plays and sleeps on a schedule; jump rope to patterned chants; and skip over sidewalk bricks laid in patterns" (Copley, 2000, p. 83).

"Patterns, sorting, sequencing, and measurement should be woven throughout children's early learning experiences, recognizing that problem solving and reasoning are at the heart of mathematics learning" (Neuman & Roskos, 2005, p. 131).

"Children are natural pattern detectors, and algebra is the science of patterns. We are not so much bringing algebra to the preschool/ primary classroom as we are bringing out patterning minds back from 'rituals' of rote memorization and joining our curious charges as they detect patterns, design models, and describe and represent their world" (Elliott, 2005, p.104).

"If early childhood educators are to enhance children's outcomes, encouraging algebraic thinking in the early years is essential. We can begin by offering many experiences with varied types of patterns, mathematical situations and structures, models of quantitative relationships, and change" (Taylor-Co, 2003, p. 7)

"If children see patterns in their world and connect them to mathematics, they are better able to remember what they have learned and transfer that knowledge to new situations or problems" (Copley, 2000, p. 89).

Algebra

Clapping Rhythms

- Have the children clap out favorite nursery rhythms, dots on the chalkboard, or a variety of rhythms.

Eliason & Jenkins, 2003

Sidewalk Patterns

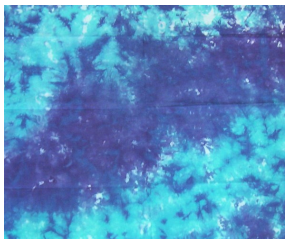
1. After studying repeating patterns of two parts, (red, blue, red, blue, etc.) children can create their own pattern on the sidewalk.
2. Children work with a partner to create their two part pattern.
3. Children copy their pattern onto blank paper.
4. Children share their pattern with the class.

Copley, 2000, p. 98

Dippy Patterns

1. Children fold white paper towels many times.
2. They dip the corners of the folded towel into water dyed with food coloring.
3. After dipping all the corners, they open the towels and set them out to dry.
4. The dried towels are posted on a bulletin board.
5. The children don't say which one is theirs.
6. They take turns describing their patterns from top corner to top corner and the other children guess which towel is being described.
7. The teacher can extend this activity by describing the towels from top to bottom, diagonal to bottom, etc. This give the children a different perspective.

Copley, 2000, p. 100



Pattern Dance

1. Children take turns creating a dance using three different motions in sequence (wiggle, spin, kick).
2. The steps are repeated over and over again (*abc* pattern).
3. The children that created the dance serves as the dance director and leads the class in the dance with music.

Copley, 2000, p.100

Rhyming songs and poems:

Five Little Ducks
Written By: Unknown
Copyright Unknown

Five little ducks
Went out one day
Over the hill and far away
Mother duck said
"Quack, quack, quack, quack."
But only four little ducks came back.

Four little ducks
Went out one day
Over the hill and far away
Mother duck said
"Quack, quack, quack, quack."
But only three little ducks came back.

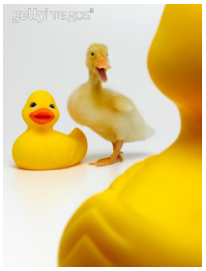
Three little ducks
Went out one day
Over the hill and far away
Mother duck said
"Quack, quack, quack, quack."
But only two little ducks came back.

Two little ducks
Went out one day
Over the hill and far away
Mother duck said
"Quack, quack, quack, quack."
But only one little duck came back.

One little duck
Went out one day
Over the hill and far away
Mother duck said
"Quack, quack, quack, quack."
But none of the five little ducks came back.

Sad mother duck
Went out one day
Over the hill and far away
The sad mother duck said
"Quack, quack, quack."
And all of the five little ducks came back.

www.kididdles.com



One Bat Hanging in the Steeple
Written By: Unknown
Copyright Unknown

One bat hanging in the steeple
One bat flies in through the door
That makes two bats in my belfry
Wonderful, but there's more!

Two bats hanging in the steeple
One bat flies in through the door
That makes three bats in my belfry
Wonderful, but there's more!

(Continue adding more verses and bats
until the kids -- or you -- are tired of singing it.)

www.kididdles.com

One, One, the Zoo is Lots of Fun
Written By: Unknown
Copyright Unknown

One, one,
The zoo is lots of fun

Two, two,
See a kangaroo

Three, three,
See a chimpanzee

Four, four,
Hear the lions roar

Five, five,
Watch the seals dive

Six, six,
There's a monkey doing tricks

Seven, seven,
Elephants eleven

Eight, eight,
A tiger and his mate

Nine, nine,
Penquins in a line

Ten, ten,
I want to come again!

www.kididdles.com

One, Two, Buckle My Shoe
Written By: Unknown
Copyright Unknown

One, two,
Buckle my shoe

Three, four,
Shut the door

Five, six,
Pick up sticks

Seven eight,
Lay them straight

Nine, ten,
Do it again!

www.kididdles.com

Three Little Monkeys
Written By: Unknown
Copyright Unknown

Three little monkeys
Swinging in a tree
Teasing Mister Alligator,
Can't catch me, can't catch me
Along comes Mister Alligator,
Quiet as can be
And SNAPS that monkey
Right out of that tree!

Two little monkeys
Swinging in a tree
Teasing Mister Alligator,
Can't catch me, can't catch me
Along comes Mister Alligator,
Quiet as can be
And SNAPS that monkey
Right out of that tree!

One little monkey
Swinging in a tree
Teasing Mister Alligator,
Can't catch me, can't catch me
Along comes Mister Alligator,
Quiet as can be
And SNAPS that monkey
Right out of that tree!

www.kididdles.com

Hickory Dickory Dock
(Traditional Tune)

Hickory dickory dock.
The mouse ran up the clock.
The clock struck one,
The mouse ran down.
Hickory dickory dock.
Two - "Yahoo!"
Three - "Whopee!"
Four - "Do more!"
Five - "Let's jive!"
Six - "Fiddlesticks!"
Seven - "Oh, heavens!"
Eight - "Life's great!"
Nine - "So fine!"
Ten - "We're near the end."
Eleven - "We're sizzlin'."
Twelve - "I'm proud of myself."

http://www.drjean.org/index.html

Junior Birdmen
(Make circles with index fingers and thumbs and hold around eyes like goggles.)

Up in the air, Junior Birdmen.
Up in the air, upside down.
Up in the air, Junior Birdmen.
Keep your noses off the ground.

And when you hear the grand announcement
That their wings are made of tin.
Then you will know the Junior Birdmen
Have sent their box tops in.

It takes five box tops,
Four labels,
Three coupons,
Two bottle caps,
And one thin dime.

Junior Birdmen!

http://www.drjean.org/index.html

Photo Patterns

1. Photographs of buildings, sidewalks, fences, and monuments around town are posted in the block center.
2. Children create their own version of the structures.
3. The children then draw their structure on blank paper.
4. They then hang their picture next to the photograph.

Copley, 2000, p. 100

Snake Patterns

1. Children look at pictures of snakes and study the pattern skin.
2. Children make their own snakes from play-dough or paper.
3. Snakeskin patterns can be made from using cookie cutters, plastic tools, color construction paper, and other art materials.
4. Snakes are displayed around the room.
5. Paper snakes can be cut first into a circle or oval and then hung from the ceiling, providing a different way to look at patterns.
6. Remind the children to create their pattern on both sides of their snake.

Copley, 2000, p. 100

Environmental Print Memory

1. Collect environmental print product labels or logos (2 per label/logo).
2. Glue them to an index card or if they are big enough use them as they are.
3. Turn them face down on the table.
4. Turn them over trying to make a match.
5. A variation is to hand out one card to each child and play class memory.
6. Children take turns calling on classmates, trying to make a match.

Hicks, 2004

Questions Specific to Patterns, Functions and Algebra

- How are these alike? How are they different?
- Do you see a pattern? Tell me about it.
- What comes next? How could we make this pattern with these different materials? Could you tell a friend about this pattern and see if they can pick out which one you mean?
- Can you dance your pattern? What would you do first? Second?
- What do you think will happen next? Why do you think so?
- Tell me about these two things: which one is bigger (heavier, smaller, lighter, more, less)?
- What would happen to the pattern if I changed_____?

Copley, 2000, p. 96

GEOMETRY and SPATIAL SENSE

"Geometry involves shape, size, position, direction, and movement and describes and classifies the physical world we live in" (Copley, 2000, p. 105).

"Children who are surrounded by interesting objects are naturally led to make relationships between those objects...The more frequently children make comparisons, the more complex their comparisons become" (Geist, 2001, p. 16).

"Spatial orientation is knowing where you are and how to get around in the world; that is understanding and operating on relationships between different positions in space, especially with respect to your own position" (Clements, 1999, p. 72).

"Experiences with simple maps, position words, and opportunities to manipulate shapes into various positions are important to children's development of spatial sense" (Copley, 2000, p. 113).

"For the most part, young children do not develop their concepts of shape from looking at pictures or merely hearing verbal definitions ('a triangle has three sides and three angles'). Rather they need to handle, manipulate, draw and represent shapes in a variety of ways" (Copley, 2000, p. 112).

"Infants and toddlers spend a great deal of time exploring space and learning about the proprieties and relations of objects in space" (Clements, 2004, p. 430.

"The geometric and spatial knowledge children bring to school should be expanded by explorations, investigations, and discussions of shapes and structures in the classroom" (NCTM, 2000, p.97)

GEOMETRY and SPATIAL SENSE

Shape Identification

1. Place objects in a container.
2. Circulate containers of objects to be identified by shape.
3. Have the child feel the shape within the containers and repeat what they feel.

Eliason & Jenkins, 2003

Silhouette Identification

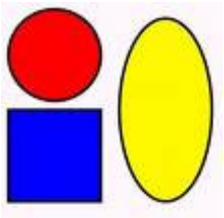
- Display outlines of various shapes (umbrella, shoe, chair, animals, etc)
- Have the children identify the shapes.

Eliason & Jenkins, 2003

Shape Collage

1. Paste various shaped pieces of paper on a background.
2. Give the children matching shapes that have been cut smaller than the background shape.
3. Children match their smaller shape to the background shape.

Eliason & Jenkins, 2003



Musical Shapes

1. Pass around various shapes.
2. When the music stops have the child tell the shape they are holding.

Eliason & Jenkins, 2003

String Shapes

1. Three to four children hold a large string loop.
2. They make various shapes by adding and taking away sides, changing the angles, etc.
3. The leader names the shape.

Copley, 2000, p. 117

Other shape ideas:

- Sandwiches cut into shapes
- Napkins folded into shapes
- Cookies baked into different shapes
- Gelatin molds
- Popcorn balls sculpted into different shapes
- Pancakes cooked in different shapes

Eliason & Jenkins, 2003

Sensory Exploration

1. Place objects of different shapes in a trough or similar container so children can see and feel the various shapes. For example, for a circle place a ball, marble, coin, magnifying glass, etc. in the container.
2. Children can then see and feel the various shapes.

Eliason & Jenkins, 2003

Same Shape Collection

1. Put a large shape (for example, a circle) on a table or bulletin board.
2. Then have the children and their families find photographs, pictures or objects that are the same shape as the example (a button, ball, coin, or plate).

Eliason & Jenkins, 2003

Shape Classification

1. Cut out various shapes (geometric or objects) in different colors and sizes from felt.
2. Have the children classify and sort according to shapes (all squares, all stars, etc.).

Eliason & Jenkins, 2003

Shape Book

1. Provide magazines for the children to go through and find objects with obvious geometric shapes.
2. The children cut out the pictures and glue to blank paper.
3. Put the pages together as a shape book.

Eliason & Jenkins, 2003

Pasta

1. Mix various types of uncooked pasta (shell, elbow, twist) in a bowl.
2. Children sort the different shapes into separate bowls.
3. After the sort, cook the pasta and compare the size and shapes to the uncooked pasta.

Eliason & Jenkins, 2003

Environmental Print Puzzles

1. Collected various types of product boxes (cereal, crackers, toothpaste, etc.)
2. Try to get two of each type of box.
3. Cut the front of the box out.
4. Cut one front into puzzle pieces and keep the matching front to be used as a template for the children as they put the puzzle back together.

Hicks, 2004

Sponge Paint

Use different shapes of sponges and paint with them.

Spatial Vocabulary

Location/position words: on, off, on top of, over, under, in , out, into, out of, top, bottom, above, below, in front of, in back of, behind, beside, by, next to, next to, between, same/ different side, upside down

Movement words: up, down, forward, backward, around, through, to, from, toward, away from, sideways, across, back and forth, straight/curved path

Distance words: near, far, close to, far from, shortest/ longest path

Transformation words: turn, flip, slide

Copley, 2000, p. 114

"Mathematical thinking begins in the infant-toddler room with learning to observe, compare, and measure. Mathematical literacy means being able to recognize, visualize, and think about patterns. Saying the words 'one, two, three' is vocabulary development. Understanding that two is more than one; that big and little are opposites; that numbers can be used to compare, count, and measure-that's math" (Lutton, 2002, p. 49).

MEASUREMENT

"Even during the preschool years, children begin to encounter many situations in which they want to compare things or judge how big, how long, or how deep they are...Young children construct measurement ideas over an extended period of time and the process can be quite complex" (Copley, 2000, p.125-126)

"As with pattern, measurement provides a natural context for the integration and application of number, shape, and space and location concepts. When children compare lengths, weights, and capacities, they use numbers to tell how long or tall, how heavy, or how much" (Greenes, 1999, p. 44).

"Children should be given opportunities to explore with balances, weights, scales, clocks, rulers, meter sticks, grid paper, measuring tapes, thermometers, gallon containers, cups, teaspoons, tablespoons, and graduated cylinders...year, ribbon, blocks, cubes, timers, ice cubes, and a wide variety of containers to compare and measure to make sense of their world" (Copley, 2000, p. 140).

"Measurement activities in the early years should focus primarily on enabling children to identify and compare attributes of length, area, weight, volume, temperature, and time. As children learn measurement vocabulary and explore a variety of measurement tools and, materials, they begin to develop a more formal understanding of measurement and the components of conservation, transitivity, and unit" (Copley, 2000, p. 132).

Time concepts and measurements are difficult for young children and not emphasized in the early years. Young children do "learn about time in everyday routines and conversation with adults and other children" (Copley, 2000, p. 134).

Temperature should be taught using words like *hot*, *warm*, *cold*, and *freezing*.
Copley, 2000

The primary focus of weight for the young child should be the comparison objects to see which one is heavier or lighter.
Copley, 2000

Seriation is ordering objects from smallest to largest and can be based on height, weight, shades of color, etc. "Comparison is the core activity and concept that starts children on the path to fully developed understanding and use of measurement" (Copley, 2000, p.132).

Capacity refers to the maximum liquid measurement that a container can hold. Volume refers to the space of a three-dimensional object. "Young children often explore capacity and volume in the block center, at the sand or water table, and even in pouring juice for snacks" (Copley, 2000. p. 133)

Measurement

Year Calendar

- Create a calendar for the year and place dates that are important to the children on the calendar (birthdays, holidays, and the closing of school).

Eliason & Jenkins, 2003

Calendar

1. Cut 31 sheets to 5 ½" x 4" to represent each day of the month.
2. Label each sheet from 1 to 30 or 31 and put in order.
3. Every day have a different child write and draw a picture for that day. For example, David's dog had puppies the night before on May 1. On May 2 he is invited to draw the picture for that day. The teacher of David can write a sentence relating to the picture.
4. At the end of the month the pages are attached to a name of the month sheet and the book is kept in the room to be used over and over.
5. At the end of the year a school year book can be made

Eliason & Jenkins, 2003

Measure Each Child

- Use register tape, yarn or string to measure each child.

Eliason & Jenkins, 2003

How Much Does It Take

1. Use cups, pints, 2-liter bottles and other containers
2. Have children measure how much sand, water or other media to fill a pint, cup, quart or 2-liter bottle.

Eliason & Jenkins, 2003

Kitchen Timer

- Have children guess how many times they can hop in a minute, or bounce a ball, etc.
- Set the timer and count out.

Eliason & Jenkins, 2003

Pictures

- Take a picture of the children under the same tree at various times during the year to show the changes in the children and the tree.

Eliason & Jenkins, 2003

Plant Seeds

1. Plant seeds (lima bean, sunflower) and observe them over time.
2. Compare growth to original size of the seed.

Eliason & Jenkins, 2003

Potato left on a table

1. Cut a potato and leave it on the table.
2. Observe the changes that occur as the potato sits.
3. Record changes on a chart or in a growth journal.

Eliason & Jenkins, 2003

"What will happen?"

1. Place grapes in a lid and place the lid in the windowsill.
2. Observe the changes that occur as the grapes sit in the sun.
3. Record changes on a chart or in a growth journal.

Hixson, 2006

Creative Movements

1. Act out various types of movement.
2. Being in a hurry, going slowly.
3. Pretend to be the hour, minute or second hand of a clock.
4. Dramatize a day from the time waking up to going to bed.

Eliason & Jenkins, 2003

Musical Chairs

- Play musical chairs for varying length of time.

Rhythm Sticks

- Play along with metronome with various beats per minute.

Eliason & Jenkins, 2003

Clock

1. Make a clock with moveable hands.
2. Have the clock show appropriate times of the day: the beginning of school, lunch, nap, snack, etc.

Eliason & Jenkins, 2003

Experience Stories

"The Times I Like" and "The Time I Do Not Like"

Eliason & Jenkins, 2003

Time Vocabulary

General words: time, age

Specific words: morning, afternoon, evening, night, day, noon

Relational words: soon, tomorrow, yesterday, early , late, a long time ago, once upon a time, new, old, now, when, sometimes, then, before, present, while, never, once, next, always, fast, slow, speed, first, second, third, and so on

Specific duration words: clock and watch

Special Days: birthday, Passover, Juneteenth, Cinco de Mayo, Easter, Christmas, Thanksgiving, vacation, holiday, school day, weekend

Copley, 2000, p. 134

Teach size

- Have children arrange (seriate: place in order by size, weight height, etc) Styrofoam balls from smallest to largest.
- Use materials such as buttons, gummed stars, lids, feathers, foam balls, fluffy balls, pipe cleaners, foam shapes, cotton balls, etc. as sensory materials and for seriating.
- Seriate cans and boxes and place the boxes inside one another.
- Cut geometric shapes in different sizes from felt, wood, or cardboard for seriating. Cut two for each size for matching.
- Put lima beans between a damp cloth and a clear plastic cup. As the seed grows the children can watch it change in size.
- Give children clay or playdough and have them roll balls of various sizes and then arrange them according to size.
- Fill a shopping bag with pairs of objects that are similar except for size. Empty the bag and have the children sort and match pairs, big and little.
- Have different sized greeting cards and envelopes or boxes with lids. Mix them up and have the children find the envelope that fits the card or the lid that fits the box.
- Cut an compare various lengths of paper tubes (from paper towels, toilet paper, etc.) for size matching.
- Place a hoola hoop on the floor and have children put smaller items inside the hoola hoop and leave the larger one outside the hoola hoop.
- Place a vegetable or fruit in the table. Every few days compare it to a fresh vegetable.
- Observe balls of different sizes.
- Compare the size of can foods.
- Compare different sizes of clothing.

Eliason & Jenkins, 2003

DATA ANALYSIS and PROBABILITY

"Classification is a beginning math concept that can be taught in many ways, in different areas of the room, and in various curriculum areas. To classify means to sort or group by some common characteristic, such as size, shape, number, color, or other category" (Eliason & Jenkins, 2003, p. 393).

"Materials in the early childhood classroom provide children with many opportunities for practicing the basic concepts and processes that underlie data analysis, especially sorting and organizing" (Copley, 2000, p. 151).

Three Levels of Sorting

- separate objects from a pile/collection by a common attribute
- separate the pile/collection objects by a consistent attribute
- separate the pile/collection by more than one attribute (color *and* size or shape *and* texture)

Copley, 2000

"Classification—grouping things according to common traits– is one way children organize their lives. They develop rules for treating things the same or differently, based on their attributes" (Epstein, 2003, p. 43).

The most basic concepts of probability; certainty, impossibility, and probability, and the vocabulary used to express these ideas are the focus in the early childhood classroom. "Teachers can discuss situations where an event is certain, impossible, more likely, or less likely to occur using those words in the context of experiences in everyday life as well as mathematical events" (Copley, 2000, p.159).

"Skills and concepts relating to collecting and analyzing data and considering probability have wide applicability across the curriculum. Among these skills and concepts are posing questions and gathering data to answer them; sorting and classifying; organizing data; representing data; describing and comparing data; and beginning to grasp concepts and language of probability" (Copley, 2000, p.153).

"Children can begin to understand data gathering by conducting simple surveys of attributes of children in their class or other classes" (Copley, 2000, p. 154).

Data Analysis and Probability

"In working with children on classification, data collection and analysis, and probability, teachers find a variety of materials useful: Animal counters, attribute blocks, buttons, plastic tees, cloth swatches, attribute people, sorting tings, large plastic tarps for real graphs, predawn graph paper, and prelabeled posters for graphs...objects from dollar stores, old wallpaper books, buttons, tops to milk containers, rocks, pebbles, old keys, garbage ties, straws, and so on provide opportunities for sorting and classifying" (Copley, 2000, p. 160).

Color Sort

1. Red, yellow, green, and blue boxes are placed in the activity center.
2. Children cut out pictures of different colors from magazines and place them in the matching box.

Copley, 2000, p.161

Marching Band

1. Children make homemade instruments such as rubber band guitars, percussion shakers, and kazoos.
2. The musicians are grouped by instrument type, such as sound blowers, string instruments, and percussion instruments.
3. They march in the band playing the homemade instruments.

Copley, 2000, p.161

Sorting Collages

1. Each child divides a piece of paper in half and picks a category for each side.
2. For example, the left side of the page might be for round items and the right side of the square items.
3. From a variety of materials, the children select items that fit categories and paste these items onto paper.

Copley, 2000, p.162

Veggie Robots

1. Children bring in a variety of vegetables to class, such as broccoli, carrots, celery, cauliflower, and sweet peppers.
2. After the teacher has cut the vegetables, the class discusses which type of vegetables come from flower, seeds, stem, leaves and root.
3. The children then make a veggie robot using toothpicks and pieces of vegetables.
4. After they make their veggie robots they describe and classify the vegetable parts they used.
5. The teacher ask questions like, "Whose robot has a round head?" or "Does anyone have a robot with a body made from a triangle-shaped root?"
6. If a child has that characteristic he or she stands up.

Copley, 2000, p.162

Ice Cube Tray Graphing

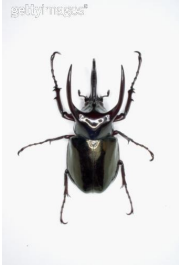
1. Children use ice cube trays to sort two different types of small objects; one is placed in each compartment, with one type of object placed in each side of the tray (example, ladybug magnets and marbles).
2. Draw a line down the center of the ice cube tray to help children interpret the tray as a graph.

Copley, 2000, p.163

Buried Treasure

1. Plastic bugs, fake jewels, shapes, and other items are buried in a large storage container filled with sand.
2. Children use plastic spoons as shovels to dig out their treasure.
3. After cleaning the item off, they classify their items into different categories and draw a pictures to show how they were sorted.

Copley, 2000, p.163



Minibeasts

1. Children go outside with magnify glasses and discover minibeasts (creatures smaller than the pinky nail).
2. After observing them in their natural environment the children return to the classroom and draw pictures of the creatures they saw.
3. After the children's minibeasts have been drawn and named they are classified into different categories such as eight-legged spiders, six-legged ants, four-winged moth, and worms with no legs.
4. The children also create their own minibeasts from play-dough, classify them, and describe them in their own words.

Copley, 2000, p.163

Question Box

Children learn a great deal in thinking about and discussing how to collect data on a variety of questions that are important to them.

1. Create a box for children's to put their questions. They can draw a picture or dictate their question to you.
2. Some questions may lead to data collection.

Copley, 2000, p.151

Ask questions that lead the children to classify and sort information. "How many people are wearing red?" "How many of you have dogs?" " How many of you like red apples?" All kinds of questions can be asked of the class and represented in a graph to show everyone's preferences and answers.

Integrating math into the rest of the classroom

"Children are mathematicians from the day they are born. They are constructing knowledge constantly as they interact mentally, physically, and socially with their environments and with other people" (Geist, 2001, p. 12).

Here are some ways to integrate math into the rest of the classroom:

General

- Post a child-made number line with pictures and numbers on the wall at the child's eye level.
- Post children's birthdays where they can be seen.
- Photographs of children taken at different times of the year (to show growth) are posted.
- Calendar is posted and used on a daily basis by the teacher and the students.
- Display graphing activities by the children.

Reading Center

- Provide books about counting, money, shapes, patterns, numbers, etc.
- Provide paper and pencils so children can record anything they want to remember.

Art Center

- Sponge numbers can be used to paint with.
- Magazines and newspapers can used as children search for shapes to cut out and use in their art.
- Pipe cleaners can be bent into shape.
- Clay can be modeled into shapes, etc.
- Foam shapes and numbers are a fun addition to art projects.

Writing Center

- Provide number and shape stencils.
- Provide graph paper.
- Provide paper in various shapes.
- Provide number and shape stamps.

Computer Center

- Have developmentally appropriate math software available.
- Have a timer available so the children know when their turn is over for that session.
- Have a sign up sheet so the children can sign up for the computer.

Music and Movement

- Have child created instruments available, rubber band guitar, kazoo, etc.
- Post songs or chants on chart paper and underline the number words.
- Provide music that the children can dance a pattern to, or clap a pattern.
- Sing songs that use numbers, an in"Five Little Ducks", etc.

Dramatic Play

- Have a telephone and telephone book
- Day planner to make appointments
- Paper to take orders
- Cash register, play money, check book, and credit cards
- Play clock/ timer
- Catalogues/ads with prices
- Recipe cards and cookbooks
- Maps
- Receipt books

Sand and Water

- Measuring items (e.g., cups, spoons, etc.)
- Cups of different sizes
- Molds of different shapes
- Tools to draw numbers in the sand
- Straws, plastic bottles, spoons, sieves, etc.

Blocks

- Construction and building blocks
- Writing paper and writing tools to draw maps, blue prints, etc.
- Props: animals, people, road signs, small vehicles, etc.
- Blocks organized on shelves by size and shape with outlines to show where the shapes go.

Science

- Measuring tools
- Magnify glasses
- Rulers
- Balance scales, ramps, pulleys, small balls, etc.
- Paper and pencil to record ob-

Project REEL Children's Literature for Numeracy

- 🕮 Actual Size, Steve Jenkins
- 🕮 Architecture Count, Michael J. Crosbie
- 🕮 Architecture Shapes, Michael J. Crosbie
- 🕮 Big Little, Leslie Patricelli
- 🕮 Big and Little, Steve Jenkins
- 🕮 Bread, Bread, Bread, Ann Morris
- 🕮 Brown Sugar Babies, Charles R. Smith, Jr.
- 🕮 City Signs, Zoran Milich
- 🕮 Color Zoo!, Lois Ehlert
- 🕮 Count!, Denise Fleming
- 🕮 Cubes, Cones, Cylinders, and Spheres, Tana Hoban
- 🕮 Each Orange Has 8 Slices– A Counting Book, Paul Giganti, Jr.
- 🕮 Everybody Cooks Rice, Nora Dooley
- 🕮 Fish Eyes: A Book You Can Count on, Lois Ehlert
- 🕮 How Do Dinosaurs Count to Ten?, Jane Yolen
- 🕮 I'm Growing!, Aliki
- 🕮 I Read Signs, Tana Hoban
- 🕮 I Spy Little Numbers, Jean Marzollo
- 🕮 I Spy Shapes in Art, Lucy Micklethwait
- 🕮 Is It Larger? Is It Smaller?, Tana Hoban
- 🕮 It Looked Like Spilt Milk, Charles G. Shaw
- 🕮 The Line-Up Book, Russo Marisabina
- 🕮 The Magic Hat, Mem Fox
- 🕮 Max's Toys: A Counting Book, Ropsemary Wells
- 🕮 Mouse Paint, Ellen Walsh
- 🕮 One, Two, Three!, Sandra Boyton
- 🕮 Opposites, Sandra Boyton
- 🕮 Piggies, Audrey Woods
- 🕮 Round Trip, Ann Jonas
- 🕮 Shades of Black, Sandra J. Pinkney
- 🕮 Somewhere in the Ocean, Jennifer Ward
- 🕮 10 Minutes Till Bedtime, Peggy Rathmann
- 🕮 Ten Black Dots, Donald Crews
- 🕮 There Was An Old Lady Who Swallowed A Fly, Simm Taback
- 🕮 Tommie's Little Mother Goose, Tomie dePaola
- 🕮 The Very Hungary Caterpillar, Eric Carle
- 🕮 What Do You Do With a Tail Like This?, Steve Jenkins

Suggestions for evaluation

- "Assessment includes the process of gathering evidence about the mathematics that children know, their ability to use it, and their attitudes toward math. Multiple sources of evidence-samples of children's mathematical work, audiotaped descriptions of their problem-solving discussions, anecdotal records describing children's work at centers and on mathematical tasks-should be collected and used on systematic basis" (Copley, 2000, p. 25).

- Assessment should take place everywhere in the classroom: small group, centers, one-on-one interviews, on the playground, and in large groups.

Copley, 2000

Strategies for ESL

- Integrate the child's native language and culture into mathematics
- Use child's prior knowledge
- Create opportunities for cooperative learning
- Provide opportunities for students to work in small groups
- Provide a variety of manipulatives
- Provide opportunities for students to engage in real life scenierios

Strategies for Children with Special Needs

- Give children opportunities to be engaged in authentic math activities (we look at the clock/schedule to determine what we are doing next, we look for patterns in our environment).
- Construct math lessons so that everyone is able to be successful.
- Encourage children to work together.

Promoting family involvement in numeracy development

- Tell stories, play games, go shopping, and cook together.
- Encourage children to question the world around them and help them find answers to their questions.
- Play games together to help develop basic math concepts.
- Allow children to solve problems on their own even if they do not get the "right" answer immediately. Children will try and self-correct as they work to solve problems.
- Follow your child's lead to decide what activities and materials to use.
- Encourage children to interact with other children.
- Allow children the opportunity to use their fingers or other objects to count.
- Find opportunities to search for patterns.

Baroody & Wilkins, 1999

Activities for home

- Help develop your child's geometric skills by encouraging your child to incorporate the shapes and geometric figures that they see in the environment in their artwork.
- Set aside some time to cook together while developing your child's measurement skills. Children as young as two-years old can help measure out the ingredients. The following websites have child friendly recipes:
  Pillsbury Baking Company, www.pillsburybaking.com/everydaytimeWithKidsMore.aspx
  The Vegetarian Kitchen, www.vegkitchen.com/kids.html
  Kraft Foods, www.kraftfoods.com/kf/ff/kids
  Betty Crocker, www.bettycrocker.com
- Bath time is a great place for your children to work on their measurement and volume skills as they play with empty shampoo bottles, plastic cups, and measuring cups.
- As your children play with blocks they are increasing their math knowledge. Block play contributes to the understanding of geometry, measurement, number height, area and volume.
- Count with your children throughout the day and you will help them increase their understanding of numbers. Count the number of cereal O's they will eat for snack, count the number of cups of water you put in the pan to boil, count the number of shoes you have to put away, etc.
- Games, games, games! Games are a great way to spend time with your child while helping them develop number sense. Some favorites are Hi-Ho Cherry-O, Chutes and Ladders, Bingo, etc.
- Help your children create patterns by providing them with math manipulatives that you gather from around the house (buttons, rocks and seashells) or purchase from the store (pattern blocks, wooden beads, bear counters, and unit cubes).
- Take a walk outside together and search for patterns.
- Puzzles are a great way for children to learn how to solve problems. You can make you own puzzles or purchase them.
- Offer your children opportunities to play in the sand. Scooping, shoveling, pouring and molding the sand helps children learn about volume and weight.
- Read, read, read! There are many children's books available that involve math concepts. (*One Fish Two Fish Red Fish Blue Fish, Caps for Sale*, etc.)
- Sing out loud together ("Five Little Monkeys", etc.) and teach your children about counting.
- Water play with plastic cups, funnels, straws, sieves, measuring cups, measuring spoons, sponges, and plastic spoons.
- Visit the U.S. Department of Education website for more activities that you can do at home with your child. www.ed.gov

Hansen, 2005

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