Early Childhood Math Course Benchmarks, Tips, and Learning Activities

Coursework teaching activities guideline for Early Childhood Math at Lake Washington Technical College. Benchmarks based on National Council for Teachers of Mathematics and activities suggested and referenced by Illinois Early Learning publications.

William and Julia Bricken
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Benchmark Activities

1.A.ECa, Use concepts that include number recognition, counting and one-to-one correspondence

Use the language of numbers.

- **Make Room for Blocks!**

Countless toys talk or beep or flash. But don't forget to make time and room for blocks! Blocks are open-ended play materials that stimulate the imagination. They support learning in language, math, science, and art. Unlike toys that children quickly outgrow, blocks continue to be valuable learning tools for children as their play becomes more complex.

Children go through stages of block play.

* At first, children may carry blocks around and stack them randomly. Next come simple structures, such as towers and rows. Children move on to making bridges, enclosures, and buildings.
* Eventually, children use structures in dramatic play.

Block play encourages physical, social, emotional, and cognitive growth.

* Stacking and fitting blocks together builds hand strength and hand-eye coordination.
* Working in groups with blocks helps develop social skills.
* Creating designs allows self-expression and a feeling of control.
* Talking about shapes and structures builds a child's vocabulary.
* Working with blocks in sets helps develop number concepts and spatial sense.
* Planning and building help develop problem-solving skills.

Teachers or parents and children can plan for block play

* Look for unit blocks-those based on proportions such as 1:2:4.
* Make sure blocks are sturdy, well made, and plentiful. Include a variety of shapes.
* Include ramps, wheels, and pulleys to explore physics concepts.
* Create a block area away from other classroom traffic and large enough for several children.
* Work with children on simple rules: "Blocks should not be thrown." "Blocks should be put back in the appropriate containers."
* Store blocks on child-sized shelves to encourage independent use and clean up.

Teachers and parents can help children extend their block play.

* Introduce new words, such as arch. Discuss place words, such as over, under, right, and left.
* Place paper and drawing tools where children can make signs for their buildings. Help children record their block work in sketches, in photographs, or on graphs.
* Provide props for pretend play, such as empty food containers, costumes, a steering wheel, or a train whistle.
* Teach number concepts with blocks. Have children use sets of blocks, compare blocks, and divide blocks equally between them. Store blocks of similar shape together. Let children measure with rulers or string.
* Provide toy animals and plants so structures can become animal homes. Provide books on animal habitats for research.

* Use words like amount, enough, none, before/after, most, pair, take away.
* Help children ask and answer thought-provoking questions involving numbers: “How many of our caterpillars haven’t made cocoons?” “Do I have more silver keys or more gold keys? How can you tell?”

Make numbers part of the daily routine.

* Have children “sign in” by moving a nametag or other token from one basket to another. They can count leftover tokens to find out how many are absent.
* Ask children to set tables with one napkin and one cup per chair.
* Encourage voting on classroom issues. “Ten people want apples for snack Friday. Seven want crackers.”

Provide games that involve numbers and counting.

* Teach card games such as Go Fish, War (Top That), Animal Rummy.
* Provide games such as Tic Tac Toe, Mancala, Checkers.
* Use “choosing” games like One Potato Two Potato.
* Teach active games such as Farmer in the Dell, scavenger hunts, and variations on bowling.

Offer activities that promote working with numbers.

* Ask children to use tally marks to answer questions such as “How many cars in the lot?” or “Who has a pet at home?” They can tabulate the marks as a group.
* Help children construct graphs to compare amounts: “Did more people eat plain popcorn or cheese popcorn?”
* Provide blocks, integer rods, plastic animals, coins, etc., for making rows, pairs, and other groupings.
* Teach songs or fingerplays such as “Five Little Ducks” or “Ten Green Bottles.”
* Invite children to “hunt” for numbers around them.
* Post a number line and a 0-100 chart where the children can easily use them.
* Model using the principles of counting. Touch each object when counting aloud (“One bag, two bags, three bags. . .”).

Number Match Up
Counting

1.A.ECb, Count with understanding and recognize "how many" in sets of objects.

- **The Path to Math: More Word Problems for Preschoolers**

Do you know a preschooler who easily solves simple word problems that involve adding and taking away? That child may be ready to apply those math skills to part-to-whole relationship questions and problems that involve comparing sets of objects. (See Illinois Early Learning Benchmarks 6.A.ECb, 6.B.EC, 6.C.ECa, and 6.D.EC).

Older preschoolers may be ready for questions about parts and wholes.

* Keep in mind that you may need to explain words such as whole, part, and collection before introducing these word problems.
* You could ask the child to start with the parts of a set or group. For example, you might say, “There are two parts to Min-Yung’s coin collection—4 pennies and 2 dimes. How many coins do you think there are in his whole collection?”
* You can also ask questions that start with a whole set or group. For example, “Min-Yung’s whole coin collection has 6 coins. Four are pennies. The rest are dimes. How many dimes do you think he has?”
* You might ask children to think about splitting up whole items into equal parts. They seem to especially enjoy this activity when food is involved. “Here’s the pizza we made together. How many pieces do you think I should cut so everyone at the table gets a slice?”

Some preschoolers are ready for word problems that compare two sets of objects.

* Before asking children to solve these problems, you may need to explain words like quantity, compare, amount, more, most, fewer, and less.
* You could ask a child to compare quantities. For example, “Winona has 6 pennies and Yusuf has 4. Who do you think has more pennies?” “How many more pennies do you think that person has?”
* When a child can solve problems like this with ease, you can also try reversing the “known” and “unknown” amounts. “Winona has 6 pennies. She has 2 more pennies than Yusuf has. How many do you think Yusuf has?”
* You might want to try comparison problems that have more than one answer. For example, “Yusuf has 4 pennies. Winona has fewer pennies than that. How many pennies could she have?”

Children may enjoy word problems more if they do not feel they must compete to answer the question first.

* If you are working with several children, give them each a chance to reply. Ask each child, “How did you get your answer?” or “What makes you think so?” (The way a child thinks about a problem can be just as important as having a “right” answer.)
* Let children use objects to work out their answers.
* When each child has answered, ask the group to talk about which answer to the problem makes the most sense.

- **Number Guessing**

Let your child think of a number between a stated range of numbers while you try to guess the number by asking questions. Here is a sample conversation.
Guess If You Can

Child: I am thinking of a number between 1 and 100.
Parent: Is it more than 50?
Child: No.
Parent: Is it an even number?
Child: No.
Parent: Is it more than 20 but less than 40?
Child: Yes.
Parent: Can you reach it by starting at zero and counting by 3's?
Child: Yes.

(At this stage, your child could be thinking of 21, 27, 33, or 39.)

Figure out the answers to your own questions.
After you have guessed your child's number, let your child guess a number from you by asking similar questions.

- **Probability Game**

Explore mathematical chance

Materials

* cardboard square
* marker
* paper
* paper clip
* tack

Directions
Show your children how to use a "Lucky Guess" spinner and see if it "knows all."

1. Prep: Before you play with your children, make the spinner. Label one side of a cardboard square with the word YES, and the other side with the word NO. Use a paper clip as the spinner "needle," securing it to the center of the board with a tack. (Make sure the paper clip can spin easily.)

2. Ask: Have your children ask the spinner a few yes or no questions: Is my name Humpty-Dumpty? Do horses have wings? Does Jackson have brown eyes? When everyone has had a turn, ask your children: Does the spinner always know the right answer? Does it sometimes get the answer right? Do you know why that happens?

3. Play: Make a chart on paper with two columns, one labeled CORRECT and one labeled INCORRECT. Have your children guess whether they will spin a YES or a NO. Tally their correct and incorrect guesses on your chart. What does the outcome tell you about the Lucky Guess spinner?

Take It Further
Using graph paper, make a chart with six columns numbered 1-6. Show your kids how to roll a die, count the number of dots on top, and color in a square in the appropriate column. Which number comes up most often?

- **M & M Counting Chart**

Grade Level(s): Preschool, K
By: Debbie Haren, preschool teacher

Children graph the M&Ms by color, graph their favorite color M and M as a class.

Objectives:
To learn how to count and to help reinforce colors.

Materials:

* A small graph with the different colors of M and M's Try this printable M & M Chart from A to Z Teacher Stuff NOTE: You'll need a recent version of Adobe Acrobat to view & print. Having Problems?
* M&M's
* A large piece of paper to make another graph to display everyone's favorite color of M & M

Plan:

1. Pass out a handful of M & M's to every child in the class.
2. Have them put the colored M & M's on the correct spot on their graph.
3. Have them count how many green ones they have. Then how many brown ones and so on...
4. Let the children then eat the M & M's and then ask them what their favorite color of M & M is.
5. Then make a chart showing the children's favorite M & M colors.
6. Have them answer questions such as what is the most favorite color of the class? What is the least favorite color?
7. List the favorites in order from greatest to smallest.

Comments:
The kids love this counting activity!

1.B.EC, Solve simple mathematical problems

- **Counting With Marshmallows and Licorice**

Subjects:

Algebra, Arithmetic
Grades:

Pre-K, K-2

Note
Before preparing or distributing any food in the classroom, make sure you're aware of children's allergies or dietary restrictions and caution children about choking hazards.

Brief Description
This activity helps students count using tens and ones in a "yummy" way. The activity should work well with young students and in special education classes.

Objectives

Students

* use snack foods to count and add into the double digits.
* use plastic tens and ones blocks to count and add in the double digits.

Keywords
addition, education, math, nutrition, ones, place value, snack, special, tens

Materials Needed

* licorice sticks
* mini-marshmallows
* paper
* pencil
* plastic tens and ones blocks

Lesson Plan

Start the lesson by reviewing counting skills and basic addition to 10. Then provide each student with ten mini-marshmallows. Use the marshmallows for counting exercises: for example, students count out the number of marshmallows that equals their ages, their grade, or the number of siblings they have. Then introduce simple addition problems. Students use the marshmallows to perform simple addition up to a sum of 10: for example, 2 marshmallows+ 5 marshmallows = __ marshmallows.

Next, have students make a "math mat." The math mat is simply a piece of paper with nine squares or rectangles. Students will be able to use this math mat to add two two-digit numbers and, eventually, three-digit numbers that add up to 999 or less. The mat's columns will look like this (each X represents a square):

```
  XXX
+XXX
_____
=XXX
```

Teach students to use the math mat to solve simple addition problems that add to a sum of 10 or less (for example, 4 + 4 = __ marshmallows).

Now introduce a licorice stick for counting numbers or sums greater than 10. Introduce the idea that a licorice stick is the same value as ten marshmallows; ten marshmallows could be "traded" for one licorice stick. Practice counting and showing a licorice-marshmallow representation for numbers greater than 10. For example, a licorice stick and four marshmallows represents the number 14.

Next, challenge students to use their math mats to solve a simple addition problem that results in a sum of 10 or greater: for example, 6 marshmallows + 5 marshmallows = __ marshmallows. They will quickly discover they do not have enough marshmallows to work the problem. But they can "trade" ten marshmallows for a licorice stick. The licorice sticks will always appear in the second column (the tens column) on their math charts. Practice adding numbers that result in a sum greater than 10 but less than 99.

Eventually, as students learn to add to numbers greater than 99, introduce a pretzel or a carrot stick to represent ten licorice sticks.

End the lesson by enjoying a tasty, low-fat snack.

Assessment

Use tens and ones plastic math blocks to check transferability of students' place value skills from food to real math manipulatives.

- **How Many Bears on the Bed?**

Purpose/Skills

* To solve problems using 1, 2, and 3 objects. (Children should be able to identify quantities of 1, 2, and 3, and count to 3, before doing this activity.)

Materials
A construction paper rectangle for a bed; 3 bear counters for each child (Generic counters can represent bears.) Children's book that has three characters.
Vocabulary
How many
1
2
3

Literature Suggestion
Read Peace at Last by Jill Murphy, a version of The Three Bears, or another book that has three characters.

Warm-Up

* Invite children to play "Copy Cat" with you.
* Tell them that you are going to do things and count, and they must be copycats and do what you do.
* Clap 2 times and say, "This time I'll be the copycat." Then turn around and clap 2 times again. "Let's do it together. This time I'll slap my knees and count. Then you be copy cats and slap your knees and count."
* Continue, using 1, 2, and 3 actions, with the children mimicking your words and actions each time.

Procedure

* Teach children how to solve problems using objects. Use the bear counters and have children repeat your phrases and actions.
* Say, "One little bear went to bed," and put 1 bear on the bed. (Children duplicate.) "One more little bear went to bed. Add another bear. Let's count 1, 2. Now there are 2 little bears in bed. 1 more little bear went to bed. Add the third bear. Now there are 3 little bears in bed."

* "Show me 2 bears in the bed." Help children count out 2 and get them in the bed. Put 1 more bear in the bed. "How many bears are in the bed?" (3) "One little bear got out of bed. What do you do?" (Take 1 out.) "How many bears are still in bed?" (Children should count and say 2.) Continue with simple problems until children are comfortable moving the 3 bears.

Enrichment
Keep the number of bears at 3 and add a chair (a paper circle of a different color from the rectangular bed) to the setting. Have children use the counters and "chair" to solve problems like the following: "One little bear was in bed and 2 little bears were on the chair. 1 little bear got out of the bed and sat on the chair. How many bears were on the chair? On the bed?"

Observation Assessment

* Proficient - Child can follow directions and use up to 3 objects to solve simple problems.
* In Process - Child can count to 3, but experiences difficulty using objects to solve simple problems.
* Not Yet Ready - Child does not yet count to 3 or use objects to solve simple problems.

- **Blocks and Pattern Block Frames**

- **Regents' Center for Early Developmental Education Rheta DeVries, Ph.D. Director Pattern**

Materials Needed
Pattern Blocks (all blocks of the same shape are the same color)
Pattern Block Frames
Purpose of Activities
As they use the Pattern Blocks and Pattern Block Frames children are actively engaged in mathematics that is both fun and meaningful. When they discover that some combinations of pieces can replace others, that a frame can be filled in more than one way, or that a different number of blocks can fill the same frame, students gain confidence in their ability to solve problems and do mathematics.
Manipulating Pattern Blocks to fit the cutout design of each frame helps students to develop spatial reasoning. For example, in one arrangement the trapezoid may be used with the long side down, whereas in a different one, the short side may be down.
Over time, students can generalize from (A) to (B) below:
(A) The trapezoid hasn't changed; only its position in space has changed.
(B) All of the shapes remain the same no matter how they are positioned.
Combining pieces allows young children to begin to acquire an understanding of geometric spatial relationships in designs. By combining two or more shapes to create a new shape, students gain insight into the ways pieces fit together and how geometric shapes are related. While using Pattern Blocks and Pattern Block Frames, children can also begin to develop an intuitive sense about area, perimeter, shapes within shapes, fractions, geometric relationships, and number.
University of Northern Iowa * College of Education 107 Schindler

Puzzles in early childhood education:
Putting the pieces together

When children work on puzzles, they are actually "putting the pieces together" in more ways than one. Puzzles help children build the skills they need to read, write, solve problems, and coordinate their thoughts and actions—all of which they will use in school and beyond. Find a puzzle with a picture that has particular interest for your child, and you may help her begin to recognize colors and letters, and come to realize that the sum of parts make up a whole—a concept that will help her with math later on. By inserting pieces into the puzzle, children also develop the muscle group used for writing, or the "pincer" grasp.

Children can work on puzzles by themselves, without the help of adults or other children. They can also work together on large puzzles and practice compromising and getting along. Because each child must concentrate on the puzzle individually, he experiences a sense of satisfaction as he picks up a piece, rotates it, and discovers the spot in which it fits. Piece by piece, he begins to recognize the picture that the puzzle represents.

Good quality puzzles are a good investment because children can use them year after year. You may also look for puzzles at yard sales, thrift shops, and lending toy libraries. Children who are developing the ability to use scissors can cut pictures from magazines to create their own puzzles. Simply mount the pictures on cardboard and cut into large pieces. Homemade puzzles can make great gifts, too!

1. Make sure puzzles are suited for each child's age and abilities. Two year olds, for example, will enjoy putting in pieces and taking them back out just as much as they will enjoy fitting them into the right spot. Toddlers enjoy three or four-piece wooden puzzles. As they grow and learn to rotate pieces to match holes and find pieces that fit, they can handle increasingly complex puzzles.

Three-year-olds still enjoy puzzles with single knobs on each piece, but they can also work on puzzles with five to eight pieces. Four-year-olds will enjoy knobless puzzles with familiar scenes and characters. They can handle 12 to 18-piece puzzles. Five-year-olds can handle large or small piece 18 to 35 pieces puzzles. They move from the pleasure of the activity to mastering the task.

As children reach school age, they will enjoy more complex puzzles of 50–100 pieces or more. All family members may gather around the table top to help children put the pieces together.

2. Puzzles should be well-made and appealing to the child. The younger the child, the more she will benefit from large, recognizable pieces to help her complete a picture. Good puzzles may show pictures of food, cars and trucks, animals, boys and girls, nursery rhymes and scenes from story books. Young children better understand figures made of simple shapes like circles, triangles and squares.
3. Watch for missing pieces or damage to puzzles. Puzzles should offer a challenge to children, but they should also be solvable. Nothing is more frustrating to a child than trying to complete a puzzle with a missing piece.
4. Puzzles can provide formal learning experiences. Teachers may work closely with children to help them learn to solve problems through puzzles. Puzzles also help teachers observe children and assess their development. While children work alone or in groups, teachers can monitor the way they speak, move, and concentrate.

Additional resources:

Maldonado, N.S. 1996. Puzzles: A pathetically neglected, commonly available resource. Young Chidren 51 (4):4–10.

Diffily, D. & K. Morrison, Eds.1996. Family-friendly communications for early childhood programs. Washington, DC: NAEYC.

1.C.ECa, Explore quantity and number

- **How Many Letters in Your Name?**

Purpose/Skills

* To count letters in names
* To experience numbers to 9 or 10

Materials
Name cards for each child, with the number that represents the number of letters under the name
Prepare name cards ahead of time.
Literature Suggestion
Read The Tale of Peter Rabbit by Beatrix Potter. Have children look at the cover and help them say the letters in Peter's name.

Vocabulary
letters
how many?
count

Warm-Up
Show children Peter's name on a board or chart. Model "a see, touch, and say" approach: touch each letter of Peter's name as you count the letters 1, 2, 3, 4, 5. Invite children to take turns touching and counting the letters. Then write 5 under the name.

Procedure

* Help children understand that their names are made up of letters. Ask children to look at their name cards and touch the letters in their names. Help children count the letters in their names aloud and say the numbers that are written on the name cards. Invite volunteers to touch and count the letters in their names aloud.
* Have children use a finger to trace around the letters of their names and to trace around the numbers on their name cards. Encourage children's curiosity about the number of letters in the names of their friends.

Enrichment
To help children remember the number of letters in their names, play a game called "How Many Letters in Your Name?" Give 1-step and 2-step directions to do actions similar to the following:

* If you have 5 letters in your name, hop on one foot.
* If you have 9 letters in your name, stand up and snort like a pig.
* If you have 7 letters in your name, fly like a bird and go "tweet-tweet."

Observation Assessment

* Proficient - Child can easily count the letters and identify the numeral representing the number of letters in Peter's name and his or her name.
* In Process - Child touches the letters and counts some of the letters, but occasionally gets confused.
* Not Yet Ready - Child touches letters, but gets confused when counting and does not associate numeral names with the letters.

• **IMPROVE STUDENT PERFORMANCE**
Teaching Our Youngest
A Guide for Preschool Teachers and Child Care and Family Providers
Downloadable File PDF (162 KB)

Teaching about Numbers and Counting

Many children enter preschool with some knowledge of numbers and counting. They can count five to ten objects accurately and can also read some numbers. But many other children have not developed this knowledge. These children in particular need many opportunities to learn the words for numbers, to count things, and to learn to read and write numbers.

You can help your children to learn about numbers and counting in many ways, including these informal ways:

*

Make pointing to and counting objects part of your daily routines.
o

As you pass out the juice cups at snack time, point and count the cups; as you pass out pieces of paper for an art project, point to the paper and count the pieces; count the children's boots as you help take them off; count the stairs as the children walk down them.
*

As you point and count, get the children to count with you. Children need to hear and practice things a lot in order to learn them.

Teacher Talk

* Let's all count the pictures on the wall. (You and the children count 1,2,3, as you point to each picture.)

*

Help the children learn to answer the "how many?" question.

Teacher Talk

* Let's count the puzzles on this table. (You and the children count 1, 2, 3, 4, as you point to each puzzle.) Oh, there are four puzzles aren't there?

* Now let's count the games on the table. (The children count 1, 2, 3, as you point to each game.) There are three games on the table.

*

Children like to point to and count their fingers, their legs, and their ears. Help them do that.

Here are some other activities that you can use to help the children with numbers and counting:

*

Use different types of macaroni. Encourage them to sort the different types and then count them.

*

Have materials on a choice shelf such as rubber teddy bears and colored cotton balls.

*

Give children rulers and let them measure different things around the room.

*

Teach the children counting songs and rhymes. You can play counting games with many different actions such as jumping and clapping. As children learn number words, they can count more actions.

*

As you and the children sing counting and rhyming songs you can add and take off felt board pieces that represent objects in the song.

Teacher Talk

* We're going to clap three times. (The children clap three times, counting for each clap.) How many times did you clap? (The children say, "Three times.")
* We're going to jump five times. (The children jump five times counting each jump.)
* I am going to clap and I want you to listen for how many claps you here. OK, now you clap the same number I did.

Here are some ways that you can help your children learn to recognize and write numbers:

* When they play with number puzzles, encourage them to say the numbers as they put the pieces in the puzzles.
* Have them include numbers in the pictures that they draw and in the words and "stories" that they write. For example, "What's the street number for your house that you drew?" "Wow, you wrote a long story. Can you number all of those pages?"
* Read and discuss number and counting books, pointing and counting the objects on each page.
* Encourage the children to make their own counting picture books by cutting and pasting pictures of objects on pieces of paper or by using stickers. The children can count the objects and write the number of the total on each page.
* Keep pencils, crayons and paper around the room so that the children can make lists.

In addition to learning about counting and writing numbers, young children need experiences that will help them to learn words and ideas that are particularly important to their future success in arithmetic and mathematics. You can help children by

* Using words such as same, different, more than, less than, and one more as you compare groups of objects.
* Naming the first, second, third, fourth, and last items when you talk about things in a line or a series. For example, when cooking, ask the children, "What do you think the first ingrediant will be? Ok, what is the second thing we should add to the bowl?"
* Using location words: in back of, beside, next to, between.
* Teaching them to learn to recognize, name, and draw different shapes, and by combining some shapes to make new or bigger shapes.
* Making comparisons between objects: taller than, smaller than.
* Measuring things first with measures such as string or strips of paper and then with rulers, scales and measuring cups and discussing why we need to measure things.
* Arranging groups of objects according to size—from largest to smallest.
* Helping them learn to copy patterns and to predict what will come next.
* Matching objects that are alike.
* Describing similarities and differences among objects.
* Sorting objects into groups by a given feature (the same color, the same shape) or by class (animals, cars, buildings). Discuss why the groups of objects are the same.

- **Adding One More**

Purpose/Skills

* To add 1 more
* To count on 1

Materials
A real or paper soup pot
For each group or math station, 9 of each: paper carrots, onions, green beans, potatoes, rabbit or chef hats (optional, or make hats as an art project)
Literature Suggestion
Read The Tale of Peter Rabbit by Beatrix Potter. Ask children to notice what vegetables Peter ate (lettuce, French beans, radishes).

Vocabulary
add 1 more
how many?
vegetable soup
chef

Warm-Up

* Introduce the children to the concept of 1 more.
* Show them a real or paper soup pot.
* Pretend to be Chef Peter Rabbit. Put 1 paper vegetable into the pot, and say, "There's 1 carrot in the soup." Ask, "Who can add 1 more?" Select a child to put in 1 more and say, "1 more makes _____." (Have children help you complete the sentences.)
* Complete the demonstration by saying, "Now there are 2 carrots in the soup." Start with 1, 2, or 3 vegetables and play "Add 1 More" with the children.

Procedure

* Help children play "Add 1 More." Children should take turns being Chef Peter. Peter puts some vegetables in the pot and says, "There are vegetables in the soup." Who can add 1 more?
* Peter chooses another child to add the vegetable and says, 1 more makes. Now there are vegetables in the soup.
* Encourage children to explore putting larger numbers in the pot and adding 1 more or 2 more.

Enrichment

Children work in pairs to play "Chef and Helper." The Chef puts some vegetables in the soup and says, "There are _____ vegetables in the soup. Who can add 1 more?" Helper puts a vegetable in the soup and says, "Now there are vegetables in the soup." Then they reverse roles.

Observation Assessment

* Proficient - Child can identify a small number of vegetables and can easily add 1 more.
* In Process - Child participates, but experiences difficulty adding 1 more.
* Not Yet Ready - Child does not yet identify a small number of items or add 1 more.

1.C.ECb, Connect numbers to quantities they represent using physical models and representations

- **5 Ways to Use Technology**

- **Writing Numerals**

- **Probability**

Explore mathematical chance

Materials

* cardboard square
* marker
* paper
* paper clip
* tack

Directions

Show your children how to use a "Lucky Guess" spinner and see if it "knows all."

1. Prep: Before you play with your children, make the spinner. Label one side of a cardboard square with the word YES, and the other side with the word NO. Use a paper clip as the spinner "needle," securing it to the center of the board with a tack. (Make sure the paper clip can spin easily.)

2. Ask: Have your children ask the spinner a few yes or no questions: Is my name Humpty-Dumpty? Do horses have wings? Does Jackson have brown eyes? When everyone has had a turn, ask your children: Does the spinner always know the right answer? Does it sometimes get the answer right? Do you know why that happens?

3. Play: Make a chart on paper with two columns, one labeled CORRECT and one labeled INCORRECT. Have your children guess whether they will spin a YES or a NO. Tally their correct and incorrect guesses on your chart. What does the outcome tell you about the Lucky Guess spinner?

Take It Further

Using graph paper, make a chart with six columns numbered 1-6. Show your kids how to roll a die, count the number of dots on top, and color in a square in the appropriate column. Which number comes up most often?

1.D.EC, Make comparisons of quantities

- **Counting Towers**

Let's Do Math!

Math is a very important part of life. We use math to set an alarm clock, buy groceries, keep score or time at a game, wallpaper a room, or wrap a present. We all need math in the world of computers and electronic communication. It is important to encourage children to think of themselves as mathematicians who can reason and solve problems.

Here are some things you can do:

* Show your children that you like numbers. Play number games and think of math problems as puzzles to be solved.

* From the time your child is very young, count everything. When you empty a grocery bag, count the number of apples. Count the number of stairs to your home.

* Put things into groups. When you do laundry, separate items of clothing: all the socks in one pile, shirts in another, and pants in another. Divide the socks by color and count the number of each. Draw pictures and graphs of clothes in the laundry: 4 red socks, 10 blue socks, 12 white socks.

* Tell your children that anyone can learn math. Point out numbers in your child's life: in terms of weight (pounds and ounces), measurements involving cooking, temperature, and time.

* Help your children do math in their heads with lots of small numbers. Ask questions: "If I have 4 cups and I need 7, how many more do I need?" or "If I need 12 drinks for the class, how many packages of 3 drinks will I need?"

- **Fruit Graph**

1. Empty your grocery bag onto the kitchen table or counter and have your child group the fruits by type: apples, bananas, oranges, etc.

2. Have your child count each type of fruit.

3. Have your child make a graph with the fruit by putting it in rows on the table:

- **Money Match**

for beginning mathematicians

1. The object of the game is to be the first player to earn a set amount (for example, 20 or 50 cents).

2. Each player rolls the dice and gets the number of pennies of the number shown on the dice.

3. As each player gets 5 pennies, the pennies are replaced by a nickel, and 10 pennies are replaced by a dime.

4. The first player to reach the set amount wins.

- **List It**

for more advanced mathematicians

1. Give your child the grocery section of the newspaper.

2. Have your child make up a grocery list that will feed the family for a day and cost a specific amount of budgeted money.

3. Have your child add up the prices of all the items.

4. If the total for the groceries is too great, talk about what items could be taken away.

5. Talk about the nutritional balance of the items selected. What is the ratio of sweets to vegetables?

Resources: Information was based on Helping Your Child Learn Math. For more information, please contact the National Library of Education, 555 New Jersey Avenue, NW, Washington, DC 20208, telephone 1-800-424-1616.

- **Commercial Games**
- **Commercial Games Part 2**

1D ECa, Solve problems using comparison of quantities, ratios, proportions, and percents

- **Commercial Games**
- **Commercial Games Part 2**

- **TIPS:**

Older preschoolers may be ready for questions about parts and wholes.

* Keep in mind that you may need to explain words such as whole, part, and collection before introducing these word problems.
* You could ask the child to start with the parts of a set or group. For example, you might say, “There are two parts to Min-Yung’s coin collection—4 pennies and 2 dimes. How many coins do you think there are in his whole collection?”
* You can also ask questions that start with a whole set or group. For example, “Min-Yung’s whole coin collection has 6 coins. Four are pennies. The rest are dimes. How many dimes do you think he has?”
* You might ask children to think about splitting up whole items into equal parts. They seem to especially enjoy this activity when food is involved. “Here’s the pizza we made together. How many pieces do you think I should cut so everyone at the table gets a slice?”

Some preschoolers are ready for word problems that compare two sets of objects.

* Before asking children to solve these problems, you may need to explain words like quantity, compare, amount, more, most, fewer, and less.
* You could ask a child to compare quantities. For example, “Winona has 6 pennies and Yusuf has 4. Who do you think has more pennies?” “How many more pennies do you think that person has?”
* When a child can solve problems like this with ease, you can also try reversing the “known” and “unknown” amounts. “Winona has 6 pennies. She has 2 more pennies than Yusuf has. How many do you think Yusuf has?”
* You might want to try comparison problems that have more than one answer. For example, “Yusuf has 4 pennies. Winona has fewer pennies than that. How many pennies could she have?”

Children may enjoy word problems more if they do not feel they must compete to answer the question first.

* If you are working with several children, give them each a chance to reply. Ask each child, “How did you get your answer?” or “What makes you think so?” (The way a child thinks about a problem can be just as important as having a “right” answer.)
* Let children use objects to work out their answers.
* When each child has answered, ask the group to talk about which answer to the problem makes the most sense.

2.A.ECa, Demonstrate a beginning understanding of measurement using non-standard units and measurement words

- **Fun at Home with Preschoolers: Let's Measure!**

Your preschool-age child hears you talk about miles, inches, pounds, liters, acres, and minutes. He sees you measuring things. He may wonder how tall he is or how long he can stand on one foot. Here are some home activities that can help your child learn basic measurement concepts.

Use the language of measurement.

* Introduce your child to words such as unit, full, load, balance, meter, area.
* Ask her to compare: “Which board is widest?” “Whose boots are heavier? Yours or Dad’s?”
* Help her ask questions about measurement: “You could ask Grandpa what he measures at work.” “It sounds like you want to know if your lunchbox holds more stuff than mine.”

Show your child how to use measurement in family routines.

* Your child can measure and refill food and water dishes for pets.
* He can use teaspoons and measuring cups when you cook together.
* He can learn to check a rain gauge or thermometer and tell you the results.
* She can help fill trash bags and recycle bins. You might help her use a calendar to keep track of how much your family recycles or throws out each week.
* He can have a daily schedule for giving garden plants a set amount of water.

Play games together that use measuring skills.

* Tag, beanbag toss, and hopscotch are active games that involve awareness of distances. “Pathway” games (for example, Candyland) also involve distances.
* Using a timer during games lets your child practice measuring time.

Offer other activities related to measuring.

* Let your child play with boxes, geoboards, nesting toys, clay, wood scraps, interlocking blocks, stacking toys, and fabric squares.
* Offer your child measuring tools (ruler, eye dropper, balance, clock) for study or play. Provide clear tubes and containers for sand and water play.
* Help your child use nonstandard items (hands, thick string, shoes, floor tiles) to describe the size of things around him. “This table is 5 tiles long.”
* Invite your child to guess the weight of pets, family members, or toys, checking them on a scale. You might help her make a chart of her results.
* Make a quilt with your child, or let him help you build a model, a birdhouse, or other small construction project.

- **Things to Do while You’re Waiting: Math**

Things to Do while You’re Waiting: Math

It’s happening again! You’re running errands with your children and suddenly you’re stuck—in traffic, at the clinic, in the checkout line. Many parents find that playful learning activities can help reduce children’s impatience when they have to wait.

You can use waiting time to show your child that Math = Part of Life.

Math is much more than just counting, adding, and subtracting! Playing with math concepts helps children become confident mathematical thinkers. Here are some quick math questions, games, and activities to engage a child who has to wait.

Counting Use objects to help your child learn that each item we count corresponds to a number. “Let’s put one can of beans on top of each cereal box.” Ask each other questions like “How many trucks do you see?” "How many people are ahead of us in line, and how many will there be once the front person leaves?" Children also like action rhymes that involve counting. See Finger Plays and Action Verses for Children for more about rhyming games.

Sequences and patterns Order is important in math. Notice sequences with your child: “Looks like we’re the second in line!” Find simple patterns together—the colors of floor tiles or the rhythms of people walking. Invite your child to make visual patterns using small objects around you.

Classifying This means sorting things according to different properties. Make a game of sorting objects with your child, such as coins or laundry. Or you might suggest, “Let’s find all the people with hats” or “I’ll spot red cars and you spot cars in your favorite color.”

Spatial relations This has to do with shapes and locations of objects. You can “hunt” for shapes together: squares, triangles, rectangles, and circles. Use words like “on,”“under,” and “inside” to describe where you see the shapes. Drawing shapes in the air can also be fun.

Estimation and predictions Children often like to make educated guesses. “Will our laundry fit in two washers?” “Which is higher, a stack of five pennies or five dimes?” "How can you tell?" Make a guess first, and then check to see how close your guess came.

Measurement and time Investigate measurement together. “How many hands tall is this jar?” “Which is heavier, your coat or your boot?” “How many steps to the car?” Your child may like timing games: “How many times can you count to 10 before we are first in line?” "How long can you stand on one leg?"

- **Geometry Activities**

Which Container Holds the Most? An Activity for Younger Children

Most children will come to this activity with memories of filling containers with water, sand, dirt, or objects. Although they may not hold a sophisticated understanding of volume and surface area, their experiences will provide a learning base.

Within each group the members should comment on the activity, observing each container and projecting the outcome of the bead count. Ask the students to discuss their observations among themselves before sharing with the class.

The containers' constant outer surface area allows comparison of their volumes. The children may need some direction to understand this idea.

Young children may need help accurately taping the strips. Constructing the containers will help them understand that the surface area is the same for each.

Moving the beads from one container to the next helps students see that the quantity needed to fill them increases or decreases as the shapes change.

Use this activity to introduce vocabulary words such as cylinder, volume, and surface. The children can hear the words and practice using them as they explore the activity. Remember, however, that success at this level does not depend on using correct vocabulary. Continued practice with the ideas and use of appropriate words will instill the vocabulary over time.

For each small group you will need:

* Six strips of card stock or light cardboard cut into the dimensions 5" (~18cm) X 1.5" (~4 cm).

* A cup of wooden or plastic beads about the size of small lima beans.

* Tape

* A shallow plastic tub or metal tray

To introduce this activity, link the students' experiences with the concept of volume. Who has filled buckets with water or dirt? What other containers have you used? What is in an empty container? What shape of container would you predict holds the most? How can you test your hypothesis? Here is a way to build containers of different shapes and find out how much each will hold.

Divide the students into groups of three. Each group receives three equal strips of card stock and a cupful of small beads in a shallow tray. Groups are to build three containers of different shapes. Each container is constructed by joining the 1.5" (~4 cm) ends of a 5" (~18 cm) long strip, taping the edges where they meet so there is no overlap.

The tray bottom serves as the container's bottom piece. For all shapes except a cylinder, creases in the strip help define the shape. The children will need to work together to tape the strips.

Ask the children to predict which shapes will hold the most material and record their responses on a class chart. Then the group fills one container with beads, counts the number it holds, and records its results for that shape. They then transfer the beads to another container, adding more or fewer beads if necessary. Then the same for the third container. Caution the groups to keep the container sides straight and not to let the walls bulge from the weight of the beads. A group member records the results of each container's capacity.

When the measuring is complete, the results can be compared across the groups and recorded on a class chart. What can be seen from the data? How does the number of container sides compare with the number of beads it can hold? Does it matter if the sides are of equal length? If we had to choose a shape that holds the most, which would it be?

An Extension: Give every student another strip. Ask them to construct another container with many sides. Have them predict, then count the number of beads the containers will hold, comparing their volumes to those of previous shapes.

- **Building Houses An Activity for Older Students**

The Scenario
Imagine that you live in a society in which people produce almost everything they need by their own efforts. Your family is planning to build a house and your family and neighbors must gather all the materials. Some of the materials are scarce and you want to be as efficient as possible. You have collected all of the materials you can for the walls, but you are concerned that you might not be able to build a house with enough space for your family. Design a floor plan that will give your house the largest amount of enclosed space.

Even though the teacher sets up the context of this activity, the students are in charge of the exploration. The drawings and data will present evidence that they can interpret within the small groups, compare across the groups, and discuss with the entire class.

Establish what ideas the students have about the relation of surface area and internal area. Placing the activity in the context of house construction takes mathematics out of the abstract and grounds it in the concrete world. If they were building a house, would the walls be vertical, as in a traditional Western house, or slanted, as are teepees or A-frame houses? What effect would a slanted wall have on the amount of interior space?

By designing the shapes and determining the internal areas, the students have produced raw data. They can examine and explain hypotheses about the figure that encompasses the largest area within a given perimeter.

As students plot the shapes of their houses, the spaces within the images will emerge as identifiable figures. The students will be able to see the areas change and enlarge as the number of sides increases and the figure nears the shape of a circle.

The groups may need encouragement to use many-sided figures as well as triangles and quadrilaterals. This is a good opportunity to reinforce use of mathematical terms and vocabulary.

This activity works well for student groups of three. The group should assure that every member understands what is being performed and discussed.

You will need:

* String cut in 32 cm (~13.5") lengths
* Graph paper
* Rulers, compasses, other drawing and measuring tools
* Pins
* Cork board squares

To begin thinking about this activity, the class might discuss the different styles and shapes of dwellings seen around the world. Examples of teepees, tents, one- and two-story houses, apartments, yurts, igloos, and other structures indicate the variety of the world's structures. Students might be interested in the work of Buckminster Fuller or homes designed for fuel efficiency or other environmental concerns. A discussion of different dwellings would probably touch on aesthetics, weather, and local terrain as well as availability of structural materials.

Each student group will work with a string 32 cm (~13.5") long, and try to determine what perimeter shape provides the greatest internal area. Encourage the groups to try a variety of shapes they think might be interesting.

Students may find it helpful to pin the string onto corkboard to fix the shape, then transfer the dimensions to a rendition on graph paper. A variety of ways can be used to determine area including use of formulas or counting the number of graph squares enclosed in the shape. Some measuring and drawing tools, such as compasses, protractors, rulers, and t-squares should be available, but they may not be needed.

When the groups are finished they can record their data on a class chart that allows comparison across the groups. Particular attention to the number of sides and the area dimensions for the various figures will allow a pattern to emerge. Discussion can focus on the comparison of data from the various figures. What can be inferred from the results? What predictions can be made about other kinds of figures?

This activity is adapted from C. Zaslacsky, "People Who Live in Round Houses," Arithmetic Teacher, 37 (September 1989): 18-21.

- **Who Measures What in Our Neighborhood?**
- **Experimenting with Balls video**

Experimenting with Balls
Length: Short Reading Level: Easy
http://illinoisearlylearning.org/videos/exper-balls.htm

2.A.ECb, Construct a sense of time through participation in daily activities

- **Tip Sheet: Remember When...**

History is the story and record of the past. Children begin to develop a concept of history as they develop the concept of time. Predictable routines and records of the past help them begin to see time as a continuum with the present as a point in time that follows the past and precedes the future. (See the Illinois Early Learning Standards, Benchmark 16.A.EC: Recall information about the immediate past.) Consider using these strategies to help children understand the concept of history.

Discuss daily routines. Predictable routines help children learn the concepts of past and present. “We had circle time already. Now it’s time to visit our different learning stations.” “We had story time already. Now it’s time to get ready to go home.” “Tomorrow we will have a visitor.”

Use vocabulary related to time. Young children may use abstract terms for time without really understanding them. They may not be able to distinguish between the immediate and the distant past. Connect the vocabulary of yesterday and today, before and after, and past and present to remembered or observable events. “Yesterday we played inside because it was raining. Today we are going outside to play.”

Work with the children on a class journal. Students can dictate entries about special classroom events for you to record. As the year progresses, read from this journal occasionally to recall the past. “Last week we planted the flower seeds. Remember the very first day of school when we talked about class rules?” “Let’s read what you said about the visitor we had who...”

Encourage your preschoolers to interview a parent or other grown-up. The school librarian or a class volunteer can share a story about the past. Discuss possible questions the children might ask: “What was your favorite toy or book when you were my age?” “Do you remember something fun your family did together?” Write the stories down as the children dictate them. Add pictures drawn by the children and make a history book to share.

Explore the history of the school or immediate neighborhood. What was at this location before the school was built? How has the neighborhood changed? Plan a walk to observe local historical markers, statues, or dates on buildings. Put dates into context: “This building was built when I was a child.” “This statue is of the person who started our town. That was even before your grandparents were your age.” Perhaps a teacher, administrator, or parent could help with this project.

Use a project time line. Add words and pictures to document the beginning, development, and conclusion of each project. Invite children to use the time line to tell the story of the project to other classes or to visiting parents.

- **Tip Sheet: Time for Preschoolers: Duration**

Most preschool-age children are not ready to fully grasp such abstract time concepts as duration (the amount of time an event lasts). But preschoolers already deal with duration in a variety of situations, such as when they have to wait for something they want. Here are some ideas for helping older

preschoolers use prediction and estimation to learn how time goes by. (See Illinois Early Learning Benchmarks
- 7.A.ECb,
- 7.C.EC, and
- 10.A.ECb.)

Invite older preschoolers to notice how long certain activities last.

* Ask questions such as, “Which do you think takes you a longer time: eating a cracker or drinking a glass of water?”
* Point out parts of a clock face and explain some ways that you use a clock. For example, have children compare the position of the hour and minute hands before and after the class goes outside. What do they notice? Explain that the changes represent seconds and minutes passing.

Talk with the class about how people keep track of time.

* Explain that many people use seconds and minutes to measure the amount of time it takes to do something.
* Try teaching the children to count seconds by chanting, “One-one-thousand, two-one-thousand…” or “One-a-penny, two-a-penny…” Let them try chanting in time with a digital timer or stopwatch that shows seconds. Keep in mind that counting to 10 or 20 may be challenging for preschoolers, whether using the chant or not.
* Show children how to use timers, stopwatches, and hourglasses.

Adapt physical activities to help children play with time concepts.

* Invite children to do things for a set amount of time. For example, you might ask a child to predict how many times she can jump in 10 seconds. Then assign other children to count her jumps. Say “GO” and then start the timer when the child begins jumping. Her classmates can count the jumps until the timer sounds. Help them compare predictions to the actual number of jumps.
* Pose new questions on other days: “How many seconds can you stand on one foot?” “How many hiders can the seeker find during 2 minutes of Hide and Seek?” “How many seconds can the class bounce a ball on the blanket before it falls off?”
* Ask children to estimate how many minutes it will take to walk to the bus stop or all around the school building. Use a stopwatch to time the walk. Help them compare the actual times to their estimates.

Let children investigate time while cooking.

* When you cook with children, ask them to predict how long certain processes will take. “How many minutes do you think it will take the water to start boiling?”
* Invite children to experiment: “Will noodles be done cooking after 1 minute? 5 minutes? 20 minutes?”

- **A Minute in Time: How much can you do in a minute?**

Materials

* clock or watch (with second hand)
* egg timer
* markers
* paper

Directions
Children may think a minute is a really brief amount of time. To help them develop a more accurate sense of time, ask them to find out much they can do in a minute. They may be surprised!

1. Discuss: Ask your children to rest quietly for one minute. Time them with a watch, clock, or egg timer. Ask: How did it feel? Longer or shorter than you thought?

2. Brainstorm: Help children create a list of things they can do in one minute. Encourage them to think up a wide variety of activities (e.g., How many fish can they draw in a minute? How many times can they write their names? How many jumping jacks can they do?).

3. Try it: Have your children try the activities on their list. Before starting each one, have them predict how much they think they can do in one minute.

4. Wrap up: When time is up, discuss the results. Ask: Did your "active" minute seem to pass faster or slower than your minute of rest?

With a Group
Let teams or partners choose tasks to estimate and test, taking turns being the timer and the experimenter. Then meet as a whole group

7.C.EC. Incorporate estimating and measuring activities into play

- **Tip Sheet: Fun at Home with Preschoolers: Let's Measure!**

Your preschool-age child hears you talk about miles, inches, pounds, liters, acres, and minutes. He sees you measuring things. He may wonder how tall he is or how long he can stand on one foot. Here are some home activities that can help your child learn basic measurement concepts.

Use the language of measurement.

* Introduce your child to words such as unit, full, load, balance, meter, area.
* Ask her to compare: “Which board is widest?” “Whose boots are heavier? Yours or Dad’s?”
* Help her ask questions about measurement: “You could ask Grandpa what he measures at work.” “It sounds like you want to know if your lunchbox holds more stuff than mine.”

Show your child how to use measurement in family routines.

* Your child can measure and refill food and water dishes for pets.
* He can use teaspoons and measuring cups when you cook together.
* He can learn to check a rain gauge or thermometer and tell you the results.
* She can help fill trash bags and recycle bins. You might help her use a calendar to keep track of how much your family recycles or throws out each week.
* He can have a daily schedule for giving garden plants a set amount of water.

Play games together that use measuring skills.

* Tag, beanbag toss, and hopscotch are active games that involve awareness of distances. “Pathway” games (for example, Candyland) also involve distances.
* Using a timer during games lets your child practice measuring time.

Offer other activities related to measuring.

* Let your child play with boxes, geoboards, nesting toys, clay, wood scraps, interlocking blocks, stacking toys, and fabric squares.
* Offer your child measuring tools (ruler, eye dropper, balance, clock) for study or play. Provide clear tubes and containers for sand and water play.
* Help your child use nonstandard items (hands, thick string, shoes, floor tiles) to describe the size of things around him. “This table is 5 tiles long.”
* Invite your child to guess the weight of pets, family members, or toys, checking them on a scale. You might help her make a chart of her results.
* Make a quilt with your child, or let him help you build a model, a birdhouse, or other small construction project.

* Measurement

- **Counting Towers**
- **Math in the Home**

8.A.EC. Sort and classify objects by a variety of properties

- **Tip Sheet: Classification**

The Path to Math: Classification
There's more to preschool math than counting! Classification skills are building blocks for learning important math concepts. Children classify objects, ideas, sounds, smells, or flavors into groups (categories) according to traits they have in common.

What do preschool children know about classifying? Children ages 3-5 are learning to recognize colors, shapes, sizes, and materials. They are learning about parts and wholes. They can compare: biggest/smallest, more/less. They can sort by one trait at a time—separating blue buttons from red ones, for example. But sorting by both color and size might be difficult. Here are some ways to help children gain experience with classifying.

Make sorting a part of daily routines.

* Children can sort as they clean up (label shelves with pictures of the items they hold).
* Children can separate items to recycle.
* Children can "sort themselves" as a way to vote on classroom issues. "If you want to play outside, stand here. If you want to play in the gym, stand there."

Play games that involve matching traits.

* Engage children in active games: "Mother May I" (involves categories of movement).
* Provide table games: Concentration, Go Fish, Bingo, Dominoes.
* Teach guessing games: "I hear something loud and rumbly. What is it?"
* Show children shoe search: Children take turns finding their own shoes in a pile.
* Introduce onomatopoeia (good for trips): Match sounds to things you see: "When you see a cow, say 'Moo.'"

Offer other activities that involve classifying.

* Collections: Children can gather, display, and study related items.
* Object sorting: Children can use egg cartons or sheets of paper with two or more sections for grouping similar things—coins, tools, keys, shells, fabric pieces, plastic figures, pictures from catalogs. Explain, "For this activity, you can put things that are alike together." When the child finishes, ask, "How are the ones in this group alike?"
* Parts and wholes: Children can cut clay shapes into pieces, match lids to containers, or put bolts and washers together.

Encourage children to observe and compare.

* Show children a familiar item and ask them to describe it. List the traits on an easel or chalkboard. Repeat with a similar item. Compare the lists. What is alike? Different? Introduce unfamiliar items. "Malik guesses this thing is made of wood. What makes you think so, Malik?"
* Describe things clearly. "Do you want a shiny pillow or a fuzzy pillow?" Use classification vocabulary: some, all, part, pair, set, category, observe, rule, different. Words for materials, sounds, smells, and flavors are useful, too.

Show and Tell socks

- **Fold the Socks**

Do you ever help fold the socks for people in your family?

Any time the family laundry is done is a chance for a sorting and matching game. You can help sort the clothes when your someone in your family is getting ready to do the wash--into whites or colors, or things that are delicate or sturdier. After the wash is done, you can help sort things for putting them away--for example some shirts are big and others are little. Whose rooms do they go in? Which socks go together?

Parent Tips Play and learning go hand in hand, and giving your child these experiences doesn't take extra time or involve extra materials. It can happen naturally in everyday family life, especially when you make something fun out of a chore, like setting the table, putting away silverware, or helping to make the bed. As children take in information about the world, they are often fascinated by sorting and categorizing things.

With the laundry game, you can help your child understand that the same things are likely to get re-sorted differently for putting them away: while the pre-wash sorting may have been by color, the post-wash tends to be by size. That can help your child learn that things (and people) are alike in some ways and different in other ways. Just working at something "grown up" alongside you can make any such activity a treat for your child.

- **Money Math**

Learn math using spare change

Materials

* empty container with lid
* pennies, nickels, dimes, and quarters

Directions
Use these fun math activities to introduce your children to different coins. (Coins can be a choking hazard, so supervise your children carefully.)

1. Sort: Have your children sort a pile of change into pennies, nickels, dimes, and quarters (by color or size), and then count the number of coins in each category.

2. Make patterns: Create a pattern by placing coins in a certain order. See if your children can figure out the rule, and ask them to add to the pattern.

3. Call heads or tails: Explain the terms "heads" and "tails," showing your children examples. Place some coins in an empty container and put on the lid. Shake the container, and then scatter the coins on the table. Help your children count the number of "heads" and "tails" they see.

Take It Further
Prepare four bowls, each containing one of the following:

* 2 tbsp. vinegar
* 1 tsp. salt
* 1 tsp. salt plus 2 tbsp. water
* 1 tsp. salt plus 2 tbsp. vinegar

Add a tarnished penny to each bowl. Ask your children to predict which penny will become shiny. Observe at five-minute intervals.

8.B.ECa, Recognize, duplicate and extend simple patterns, such as sequences of sounds, shapes and colors

Teaching about Numbers and Counting

Many children enter preschool with some knowledge of numbers and counting. They can count five to ten objects accurately and can also read some numbers. But many other children have not developed this knowledge. These children in particular need many opportunities to learn the words for numbers, to count things, and to learn to read and write numbers.

You can help your children to learn about numbers and counting in many ways, including these informal ways:

*

Make pointing to and counting objects part of your daily routines.

o

As you pass out the juice cups at snack time, point and count the cups; as you pass out pieces of paper for an art project, point to the paper and count the pieces; count the children's boots as you help take them off; count the stairs as the children walk down them.

*

As you point and count, get the children to count with you. Children need to hear and practice things a lot in order to learn them.

Teacher Talk

* Let's all count the pictures on the wall. (You and the children count 1,2,3, as you point to each picture.)

*

Help the children learn to answer the "how many?" question.

Teacher Talk

* Let's count the puzzles on this table. (You and the children count 1, 2, 3, 4, as you point to each puzzle.) Oh, there are four puzzles aren't there?
* Now let's count the games on the table. (The children count 1, 2, 3, as you point to each game.) There are three games on the table.

*

Children like to point to and count their fingers, their legs, and their ears. Help them do that.

Here are some other activities that you can use to help the children with numbers and counting:

*

Use different types of macaroni. Encourage them to sort the different types and then count them.

*

Have materials on a choice shelf such as rubber teddy bears and colored cotton balls.

*

Give children rulers and let them measure different things around the room.

*

Teach the children counting songs and rhymes. You can play counting games with many different actions such as jumping and clapping. As children learn number words, they can count more actions.

*

As you and the children sing counting and rhyming songs you can add and take off felt board pieces that represent objects in the song.

Teacher Talk

* We're going to clap three times. (The children clap three times, counting for each clap.) How many times did you clap? (The children say, "Three times.")
* We're going to jump five times. (The children jump five times counting each jump.)
* I am going to clap and I want you to listen for how many claps you here. OK, now you clap the same number I did.

Here are some ways that you can help your children learn to recognize and write numbers:

* When they play with number puzzles, encourage them to say the numbers as they put the pieces in the puzzles.
* Have them include numbers in the pictures that they draw and in the words and "stories" that they write. For example, "What's the street number for your house that you drew?" "Wow, you wrote a long story. Can you number all of those pages?"
* Read and discuss number and counting books, pointing and counting the objects on each page.
* Encourage the children to make their own counting picture books by cutting and pasting pictures of objects on pieces of paper or by using stickers. The children can count the objects and write the number of the total on each page.
* Keep pencils, crayons and paper around the room so that the children can make lists.

In addition to learning about counting and writing numbers, young children need experiences that will help them to learn words and ideas that are particularly important to their future success in arithmetic and mathematics. You can help children by

* Using words such as same, different, more than, less than, and one more as you compare groups of objects.

* Naming the first, second, third, fourth, and last items when you talk about things in a line or a series. For example, when cooking, ask the children, "What do you think the first ingrediant will be? Ok, what is the second thing we should add to the bowl?"

* Using location words: in back of, beside, next to, between.

* Teaching them to learn to recognize, name, and draw different shapes, and by combining some shapes to make new or bigger shapes.

* Making comparisons between objects: taller than, smaller than.

* Measuring things first with measures such as string or strips of paper and then with rulers, scales and measuring cups and discussing why we need to measure things.

* Arranging groups of objects according to size—from largest to smallest.

* Helping them learn to copy patterns and to predict what will come next.

* Matching objects that are alike.

* Describing similarities and differences among objects.

* Sorting objects into groups by a given feature (the same color, the same shape) or by class (animals, cars, buildings). Discuss why the groups of objects are the same.

- **Teaching Our Youngest: A Guide**

3.B.ECb, Begin to order objects in series or rows

- **Grandma's Button Box**

In this lesson, students have opportunities to identify properties and to sort, classify, organize, and display data. They solve problems and make, explain, and defend conjectures. They extend their knowledge by making generalizations and consolidating their thinking.
[javascript: doToggle('_ctl0__ctl7_ObjectivesSection_','1') null]
Learning Objectives

Students will:

* sort items by color, size, type, and shape
* use the vocabulary of sorting
* classify, organize, and display data

Materials

The Button Box, by Margarette Reid
Special Things about Buttons in Grandma's Button Box Activity Sheet
Buttons
Key Ideas and Words Recording Sheet
Instructional Plan

Gather students so they can see the book and hear you read aloud the story The Button Box by Margarette Reid. The child in this story examines the different buttons in Grandma's button box. As you read the story, ask questions that focus the students' attention on the properties, similarities and differences, and multiple ways to sort the buttons. (See the Questions for Students below.)

After reading the story, discuss the properties, similarities and differences, and multiple ways to sort the buttons in Grandma's button box. List properties that students identify on a chart and post for future reference. Give students the Special Things about Buttons in Grandma's Button Box activity sheet for recording the various properties.

Grandma's Button Box Activity Sheet
You will use this to document students prior knowledge so that you will know how to plan instruction and to monitor each student's progress.

For the next part of the lesson, arrange the students in a circle. Introduce the game "Button, Button, Describe the Button" by explaining how the game is played:

* a button will be passed around the circle until the leader says stop;
* the student holding the button gives one descriptive feature (property) that has not been contributed previously; and
* play continues until students develop fluency in describing the button.

- **Alike and Different**

This lesson focuses on the observation of properties and the classification of objects to build ideas about variables. Students compare objects to identify similarities and differences. In addition, students are introduced to Venn Diagrams.

Learning Objectives

Students will:

* use the terms "alike" and "different" to make comparisons
* identify multiple variables when sorting
* use Venn Diagrams to compare properties

Materials

Transparent button box
Tub of buttons (various colors, shapes, sizes)
Alike and Different Activity Sheet
My Button Has and Hasn't Activity Sheet
Hula-hoops (2)
Chart paper and markers
Copy of the story "The Elves and the Shoemaker"
Elves and Shoemaker Activity Sheet
Instructional Plan

Provide a class button box. Using a transparent container enables students to readily observe some properties and begin to consider classification strategies. Pass the container and have each student select two buttons. (Asking students to close their eyes when choosing might expedite the process of selecting buttons.) Ask each student to consider how his or her two buttons are alike and how they are different. Invite students to exchange one button and repeat the activity. In the prekindergarten and kindergarten classes, the teacher will record similarities on a chart such as the one shown below.

Alike

Different

First- and second-grade students may do this as a class activity or individually on the Alike and Different activity sheet.

Alike and Different Activity Sheet

Post the list of likenesses and differences in the classroom and amend or extend it as needed. This discussion helps students identify multiple variables and helps them become more flexible in their thinking.

The following activity is based on the story The Elves and the Shoemaker and allows students to sort shoes. In it students have the opportunity to experience another method of displaying data using a Venn Diagram, which causes them to relate data in a different way.

The teacher reads the story as students sit around in a circle. Students take off their shoes and discuss ways to group the shoes. Two non-overlapping hula-hoops are placed where all can see them. One file card is placed in each hoop. The identified properties are recorded on a chart for future reference. These labels should be chosen so they do not overlap such as brown and large or brown and not brown. The shoes are organized within the hula-hoops according to their properties listed on the file cards. Labels for the sorts are determined by a discussion among the students and teacher. Have students tell how the shows in each hoop are alike. Count the number of shoes in each group.

Some questions that would help promote an understanding of the mathematics would be the following:

What kinds of shoes do our class members wear?
How are they alike?
How are they different?
How did we decide to place shoes within the groups?
Is there another way that we could sort our shoes?

Students can next discuss attributes (such as color, style, or material) that could be used to classify the shoes worn by members of the class, sort the shoes, and then represent the results in a Venn diagram, in a table, and in a graph. A blank floor graph made from butcher paper or a shower curtain makes it easy for young children to place their shoes in a column, see the number in each, and discuss the information that can be derived from the graph. The columns should be labeled and a title should be chosen. In addition, the students should predict the types of shoes worn by the students in other classes in the school.

Use the Elves and Shoemaker Activity Sheet to record the results of the class discussion.

3.C.EC, Participate in situations that involve addition and subtraction using manipulatives

- **Naming Rows and Columns**

In this lesson, the teacher models how to organize data and use the vocabulary associated with collecting, organizing, and displaying data. Students learn the difference between rows and columns, how to label and select a title for graphs, and what comparative terms to use to describe relationships between and among the various sets of buttons.

Learning Objectives

Students will:

* identify the difference between rows and columns
* label and select a title for graphs
* use comparative terms to describe relationships between and among the various sets of buttons

Materials

Set of buttons from previous lessons
Overhead projector
Transparency of Grid Paper
Plain paper
Zip-top plastic bags
Key Ideas and Words Recording Sheet
Instructional Plan

Select one set of buttons saved from previous lessons. Organize buttons so that each row and each column has a unique property. Using an overhead projector and a grid allows all students the opportunity to see the display of the button data. To ensure one-to-one correspondence between and among columns, be certain that no more than one button is in each space. Discuss with students what name would be appropriate for each column. When all the buttons are placed, ask students to identify and describe observations about relationships between and among the buttons, such as which set has the most buttons, which has fewest, how many more are in the various columns, and what is the total number of buttons. Model the use of an appropriate title for the graph and labels for the columns. Record and post the demonstration models for students to reference.

Have students record on plain paper the demonstration graph you created. Make certain to reiterate the need to align the columns in rows to ensure one-to-one correspondence as you would when using a grid. Discuss how the student's graphs compare with the demonstration graph. Probe those areas that are not clear to the students. Keep the recordings made by students to monitor their growth in understanding and application of sorting, classifying, organizing, and displaying data.

Store each student's buttons in a labeled, zip-top plastic bag so that students can use the same set of buttons for the next lesson.

See fig. 4.23, page 112 of Principles and Standards for School Mathematics for an example of such a data display.

Older students at this grade band may relate the number of buttons in each column with the number of buttons in each set they sorted. Younger students may need help in recognizing this relationship. Older students should be able to organize the buttons with little or no assistance.

- **Show and Tell**

This lesson allows students to describe their graphs using appropriate vocabulary and to develop skills in posing and responding to questions about their graphs. Students also demonstrate an understanding of how to organize and interpret data. In addition, this lesson helps students move from the concrete through pictorial to abstract representations of displays of data, namely a graph.

Learning Objectives

Students will:

* sort buttons
* create pictorial graphs of their button data

Materials

Button collections from previous lesson
Blank Graphing Grid Paper
Paper Buttons Activity Sheet
Status of the Class Recording Sheet
Instructional Plan

Distribute blank Blank Graphing Grid Paper and the button collections from the previous lesson.
Graphing Grid Activity Sheet
Have students re-sort their buttons and place them on the grid. Have students share with a partner their sorting rule. Ask students draw pictures of what their grids look like and explain what the graphs tell about the buttons. You might also choose to adapt the Paper Buttons activity sheet for students to create a pictorial graph of the button data.
Paper Buttons Activity Sheet
Remind first- and second-grade students to add labels and a title. Reconvene the class as a whole group. Ask students to show and explain their graphs. If appropriate, students can write descriptions and explanations. These graphs and written descriptions may be used to create a classroom bulletin board or display for the hall.

Encourage students to use appropriate vocabulary such as row, column, titles, labels, sets, sort, and properties. Encourage students to ask questions about each other's graphs, allowing the student who organized the graph to respond to the questions.

Next, give students another piece of grid paper, and have them use the recording of the graph they created in the first half of this lesson. Model for students how to color a grid to match the pictorial representation of the "real button" graph. Have students color their grid paper to match the concrete graph from the previous lesson. Remind students who are capable to provide a title for the graph and labels for the columns. For young students at this grade band, the teacher might prepare class titles and labels.

Sharing recordings and discussing the graphs allows students to formulate their thoughts, use appropriate vocabulary, and clarify and extend their understanding. It enables you to observe what students know and can apply, what they are in the process of learning, and what they still need to learn.

3.D.EC, Describe qualitative change, such as measuring to see who is growing taller

- **From Big to Little, From Little to Big**

Art Activity

Children will increase their awareness of how things in their environment change in size and what causes these changes.

WHAT YOU NEED

* Crayons, colored pencils, or markers
* Large, light-colored construction paper
* Pencils
* Paper for taking notes

WHAT TO DO

1. Briefly discuss with children different things that are big and little. Have them suggest some things that are big and some things that are little. After children have made a few suggestions, point out that not all big things stay big and some little things may become big. Give them some examples, such as a little acorn becomes a big oak tree, and a big balloon can become little when it loses air.

2. Divide the class into groups of four or five and give each group time to brainstorm a list of big things that become little or little things that become big. You may want to assign one or two people in each group to record the group's ideas. As children are working, remind them that the change in size can occur slowly over time or suddenly as the result of some event, such as a balloon popping.

3. After each group has recorded several ideas, tell children that they are each going to choose one idea to illustrate. Pass out a large piece of construction paper to each child. Have children fold their paper twice to create four sections. Then tell children to illustrate the idea they have chosen. Explain that they should show the change from big to little or little to big by using the sections of the paper. For instance, if they are drawing something that is big and becomes little, they should use the first section to show the object when it is big and the last section to show when it is little. The sections in between should show the gradual change in size.

4. Have children label their drawings with the words big and little in the appropriate sections. Then encourage children to share their drawings with the class. As children show their pictures, encourage them to explain why the object they drew changes size.

TEACHING OPTIONS

* To help children focus, you may want to assign each group a topic. For example, you may want to have two groups that think of and illustrate big things that become little and two other groups that think of and illustrate little things that become big.

* You may want to suggest charades as a way for children to share their finished drawings. When everyone is done, children can take turns acting out how the object they drew changes size. Children can then show their pictures.

* If children are having trouble thinking of things that change size, you may want to make some suggestions such as, a little snowball rolling down a snowy hill becomes a big snowball, an umbrella can be little when closed and big when opened, a new pencil is big but becomes little with use, and the moon looks big when it's full and little as it wanes.

- **Tips: Get Growing**
- **Home Measurement**

4.A.EC, Recognize geometric shapes and structures in the environment

- **Tips: Make Room for Blocks**
- **The Outline of Things**

The physical world around us is filled with many geometric shapes or figures and children begin to notice the various shapes around them long before they enroll in school. When we ask them questions about sizes, shapes and positions, we're encouraging them to inquire about shapes in space. If you let your children handle objects and ask them to look for differences and similarities between them, you're helping them acquire knowledge and appreciation of the world around them. One of the earliest activities you can do with your children is to have them match common household items to outlines which you have traced.

several shopping bags or newsprint
markers
geometrically shaped
household items

OVAL
SQUARE
CIRCLE
RECTANGLE
HEXAGON

In this activity... your children will match common household items to outlines which you have traced on the back of a shopping bag. Start by finding a variety of household items that are easily recognized as geometric shapes like—squares, rectangles, triangles, and circles. Look closely at many items. Some jars will have a circle at the top, and a square on the bottom. Trace items on shopping bags or other available paper. Have your children match and name the items.

Did you know...

* That it isn't necessary for children to name more complicated shapes. It's more important that children become aware of shapes as they find them in their environment. If they have experienced them in that way, the names will soon follow.

* That during outings with your children you can ask questions about windows and dooors of houses and buildings, the tiles on the floor and all the different combinations of shapes that are around us everywhere.

* That some shapes are used more often than others? What might be the reason? Why don't you see more circular shapes on floors? Why don't we have square or triangular wheels? Why are most windows square or rectangular?

* That there is a wealth of questions you can ask your children when you take them for an outing—and I bet it won't occur to them or you that you're talking mathematics.

- **My Manipulative Story: How I Introduced the Geoboard in My ClassroomBy Marilyn Burns**

I remember the first time I introduced a manipulative to my class. At a workshop, I had learned how students could use geoboards to explore the areas of shapes, a standard textbook topic. I was excited and ready, but nervous.

I gave a geoboard to each student, distributed a cup of rubber bands to each pair, and gave time for exploration. Within a minute, chaos reigned. The cups were empty; every geoboard was full. Some students slouched in their chairs waiting for instructions. A few strummed the rubber bands as if the geoboard were a guitar. Several students, attempting to remove rubber bands from the geoboards, instead sent them flying. Others disappeared under their desks to retrieve lost rubber bands. This wasn't what I had envisioned.

Since then, I've changed how I set the stage for learning with materials. Here are some ways I've learned to introduce geoboards.

* For Intermediate and Upper Grades
* For Younger Children

For Intermediate and Upper Grades
Step 1: I drew a model on the chalkboard of a geoboard's 5-by-5 array and distributed one board to each student (no rubber bands yet). I asked, "How many pegs are there?" When I did this recently with fifth graders, I gave students time to think and then called on Sarah. "Twenty-five," she answered.

I responded, "You're right. How did you figure that out?"
She replied, "I counted five in a row and there are five rows, so I did 5, 10, 15, 20, 25."
"Did anyone figure it out a different way?" I asked.
Kyle answered, "I did 5 times 5."
I continued until all students had a chance to report their methods.

Step 2: I made a shape on my geoboard using one rubber band and drew it on the chalkboard geoboard. (This helped introduce students to the geoboard dot paper.) "Does anyone know this shape's name?" I asked. Several hands shot up, and Mike said, "Quadrilateral."
I then said, "Listen to my question and raise your hand when you figure out the answer: How many pegs does my rubber band touch? Count not only the corner pegs, but any peg that touches the rubber band." I waited until practically everyone's hand was raised.
"Let's answer together," I said.
"Five," students responded.
"And how many pegs are inside my shape, not touching any side?" Again they said the answer in unison. I repeated this for several shapes.

Step 3: I gave students directions to come up with nine shapes with rubber bands touching different numbers of pegs and with different numbers of pegs inside. I also gave pairs of students geoboards, rubber bands, and geoboard dot paper. I said, "First make any shapes on the geoboard. Then construct shapes to match my descriptions. On the dot paper, record one shape that matches each description."

The atmosphere was much different than my first experience. Some children still strummed the rubber bands, but the overall feeling was one of productivity.

Step 4: The next day, I asked pairs to create as many shapes as they could that touch four pegs with two pegs inside. Students recorded their shapes on the geoboard dot paper. Later, they exchanged papers and checked each other's shapes. Finally, I asked students to write the names of the shapes.

For Younger Children
Step 1: I give children time to explore with the geoboard. (They enjoy this, and some need the practice putting the rubber bands around pegs.) Then I say, "Remove the rubber bands on your geoboard and start again, this time making a shape of something that can fly."

Step 2: When everyone has made at least one shape that flies, I show them how to transfer their shape to geoboard dot paper. I use dot paper with only two geoboards to a page so their drawings are large enough for display.

Step 3: Finally, I have students post their recorded shapes — kites, rockets, butterflies — on a huge graph with a different column for each object. We discuss how many of each shape we have, how many more of one shape we have than another, and how shapes are alike and different.

For more from Marilyn Burns, please choose one of the following:

* 7 Musts for Using Manipulatives
* A Letter to Parents: How to Educate them on the Use of Manipulatives
* Answers to Your Questions about Manipulatives
* Pattern Block Activities (Plus Homework Assignments)
* The Solution to Marilyn Burns' Pattern Block Puzzler

About the Author

Marilyn Burns is the creator of Math Solutions, inservice workshops offered nationwide, and the author of numerous books and articles. She is author of the book 50 Problem-Solving Lessons, Grades 1-6, distributed by Cuisenaire.

4.B.EC, Find and name locations with simple words, such as 'near'

- **Location: Position on the Earth's Surface**

Look at a map or globe. Where are places located? Every place has a "global address" that tells exactly where in the world it's located, just as your home has a street address. There are two numbers in a global address--a number for latitude and one for longitude. If you know these numbers and how to use them, you can find any place in the world and give its absolute location. (For definitions, see the glossary at the end of this booklet.)

Why are things located in particular places and how do these places influence our lives? Location can describe how one place relates to another. For example, the Panama Canal was cut across an extremely narrow strip of land in Central America. It provides a shipping lane between the Atlantic and Pacific Oceans, eliminating the need for long, dangerous journeys around South America.

Activities

Learning Direction

* To help young children learn location, make sure they know the name of their town and their street address, and that they can describe the building and neighborhood in which they live. Then, when you talk about other places, they have something of their own with which to compare.

* Children need to understand positional words. Teach children words like "above" and "below" in a natural way when you talk with them or give them directions. When picking up toys to put away, say, "Please put your toy into the basket on the "right," or "Put the green washcloth into the drawer." Right and left are as much directional terms as north, south, east, and west. Other words that describe such features as color, size, and shape are also important.

* Show your children north, south, east, and west by using your home as a reference point. Perhaps you can see the sun rising in the morning through a bedroom window that faces east and setting at night through a kitchen window on the west.

* Playing games can reinforce their knowledge. For example, once children have their directional bearings, you can hide an object, then give them directions to its location: "Two steps to the north, three steps west. . ."

Get the Map Habit

Put your child's natural curiosity to work. Even small children can learn to read simple maps of their school, neighborhood, and community. Here are some simple map activities you can do with your children.

* Go on a walk and collect natural materials such as acorns and leaves to use for an art project. Map the location where you found those items.

* Create a treasure map for children to find hidden treats in the yard or inside your home (a fun idea for birthday parties). Also, encourage children to play this game with one another--hiding the "treasure" and drawing the map. Or, some rainy day, suggest they draw imaginary treasure maps just for fun.

* See if you can find your street on a town or city map. Point out where your relatives or your children's best friends live.

* Find the nearest park, lake, mountain, or other cultural or physical feature on a map. Then, talk about how these features affect your child's life. Living near the ocean may make your climate moderate and bring tourists to the area. Mountains may block some weather fronts and offer recreational opportunities, such as camping and hiking.

* Point out different kinds of maps to your children--such as a state highway map, a city or town map, a bus route map or shopping mall map--and discuss their different uses. Also, check the back of this booklet for samples of three different types of maps of the same place--Salt Lake City, Utah. Shown are a shaded relief map, a road map, and a topographic map.

* Before taking a trip, show your children a map of where you are going and how you plan to get there. Look for other routes you could take and talk about why you chose the one you did. Maybe they can follow the map as you travel; for example, when you get to one town, ask them to tell you the next.

* Encourage your children to make their own maps using legends (keys to what the pictures or symbols in a map mean). They can draw fanciful maps of places or journeys they have read about. Older children might draw a layout of their neighborhood.

* Keep a globe or a world map near the television and use it to locate places talked about on television programs, or use a U.S. map to follow the travels of your favorite sports team.

* Look at a map of your state, such as this one of New Hampshire. Look at the numbers at the bottom and the letters at the right and imagine lines extended that divide the map into a grid. Locate Manchester in grid F-3. Use the scale to measure the straight-line distance between Manchester and Mount Washington.

* On a globe or world map, ask your child to point with a finger to the North Pole, South Pole, and the Equator. Ask which is the Western Hemisphere, the Eastern Hemisphere, and in which one do we live. Find the lines running from the North Pole to the South Pole and identify them as lines of longitude. Find the lines that run parallel to the Equator--lines of latitude. Are the lines numbered? Talk about what these lines mean. Try to figure out roughly the degrees of longitude and latitude for where you live--your global address.

- **Location Is Everything!**

Children use all of their senses to learn about the world. Objects that they can touch, see, smell, taste, and hear help them understand the link between a model (such as a map) and the real thing.

* Put together puzzles of the United States or the world. By touching and looking at the puzzle pieces, they can better understand where one place is located in relation to others.

* Use pictures from books and magazines to help your children associate geographic terms with visual images. A picture of a desert can stimulate conversation about the features of a desert--dry and barren. Talk about many different places and imagine what it would be like to visit them.

* Make a three-dimensional map of your home or neighborhood using milk cartons for buildings. Draw a map of the block on a piece of cardboard, then cut up the cartons (or any other three-dimensional item) and use them to represent buildings. Use bottle tops or smaller boxes to add interest to the map, but try to keep the scale relationships fairly accurate (e.g., 2 feet on the map equals 1 city block).

* Use popular board games like "Game of the States" or "Trip Around the World" to teach your children about location, commerce, transportation, and the relationships among different countries and areas of the world. Some of these games may be available at public libraries.

* Make a globe out of papier-maché using strips of old newspaper and a paste made from flour and water. In doing this, children will better understand the differences between a flat map and a globe.

Directions

Make the paste by mixing 1 part flour with 2 parts water. Tear Newspaper strips about 1 inch wide and 3 inches long. Blow up a balloon and tie it. Dip the strips into the paste and wrap the balloon as smoothly as possible with one layer of the papier-maché strips. Then wrap it again with three more layers; at this stage, try using the papier-maché to make models of mountains and valleys. Let the wrapped balloon dry for at least 24 hours. Then using poster or tempera paints, paint the continents and oceans.

- **There's No Place Like Home**

* Walk around your neighborhood and look at what makes it unique. Point out how it is similar to other places you have been and how it is different. Talk about what animals and plants live in your neighborhood. Look at the buildings and discuss their uses. Are there features designed to meet weather conditions, such as window shutters or sun rooms? Do the shapes of some buildings tell us how they were used in the past or how they are used now?

* If you live near a park, a lake, a river, a stream or a creek, take your children there and spend time talking about its uses. If you live near an historical site, visit it and talk about what happened there and why it's important. Look for other points of interest in your town and learn more about them.
*

- **Faraway Places**

*
* * Read stories and books about distant places with your children. Many children's books provide vivid images of different places and a sense of what it would be like to live in them. A Country Far Away, Heidi, and Going for Oysters are examples of books about other parts of the world that have inspired many young readers. There is a list of resources at the end of this booklet, and your librarian will have additional suggestions.
*
* * Use songs to teach geography. ``Home on the Range," "California, Here I Come," and "This Land Is Your Land" are all songs about place. Teach your children folk songs of different countries like ``La Cucaracha," ``London Bridge," and ``Dreidel, Dreidel, Dreidel."
*

* * With your children, see a movie or video which is set in a different land such as "The Lion King," "Treasure Island," or "A Little Princess."
*
* * Talk with your children about the places these books, songs, and movies celebrate, find them on a map or globe, and discuss their mental picture of these places.

- **Name/Title: Over, Under, Around, and Through**

Purpose of Event: To explore a variety of traveling skills while helping children to understand the concepts of moving over, under, around, and through objects.

Activity cues: Move body slowly, under control.

Suggested Grade Level: Pre-K

Materials Needed: A variety of different objects including cones, boxes, tunnels, chairs, empty 2-liter plastic soda bottles.

Description of Idea

Scatter obstacles throughout the movement space and ask children to find and explore as many ways possible to travel around, over, under, or through the obstacles. Ask that they think about which objects are better for traveling over, under, around and through and place an emphasis on children traveling under control. Also, ask children to think of a variety of ways to travel when they are moving from one obstacle to the next(gallop, sliding, crawling, hopping, etc.)

Variations:

For those teachers who do not have tunnels, a tunnel can be made by draping a sheet or blanket over several chairs.

Assessment Ideas:

As children move through space and around obstacles ask them to point out which objects are best to go under, around, over, and through. Use a checklist to record children's understanding of the concepts.

5.A.ECa, Represent data using concrete objects, pictures, and graphs

Get Growing: Learning about Seeds

Seeds are basic to any gardening project. Preschoolers can find out many things about seeds before planting them. Here are some teacher-tested activities to help children investigate seeds. (See Illinois Early Learning Benchmarks 3.C.EC, 5.A.EC,
6.C.ECa,
8.A.EC,
10.A.ECa,
10.B.EC,
11.A.ECa, 11.B.ECa, and 12.A.ECa.)

Collect a wide variety of seeds to share.

* Bring in seeds from plants the children are likely to see around them. Include seeds from local trees, prairie flowers and grasses, and cultivated plants like corn, squash, and marigolds. (Always use food-grade seeds or seeds taken directly from plants. Commercially packaged seeds may be treated with chemicals that children should not handle. Keep in mind that some children are allergic to nuts, peanuts, or soybeans.)
* Invite children and their families to bring in seeds they find around them. Help the children keep track of where they found the seeds.
* In the fall, take the class on a seed-collecting walk. Give each child large socks to pull over their shoes, then walk through a safe weedy area. Then pull seeds off the socks and add them to the class seed collection.

Offer children a look inside!

* Provide parts of plants that children can break or cut apart to find seeds. Examples could include pinecones, locust pods, sunflower seed heads, and edible fruits such as apples and melons. (Use safe cutting utensils, and supervise closely—or do the cutting yourself.)
* Cut apart some larger seeds such as pumpkinseeds, beans, and large grains for the children to examine. Offer magnifiers for a closer look, and ask children to describe what they notice through the magnifiers.
* Suggest that children make sketches of the items you have cut open.

Learn and use seed-related vocabulary.

* Ask a librarian to help you find picture books that illustrate terms such as pod, seed head, seed coat, cotyledon, embryo, and kernel. Help the children use those words to label their sketches.
* Facilitate class discussion about what makes something a seed. “Are peas seeds? How can you tell?”

Invite children to find out more about seeds.

* Encourage children to find answers to questions about seeds. “Which holds the most seeds—a locust pod, a peach, or a pumpkin?” “How do seeds change after they have been cooked?”
* Let children weigh and measure seeds, or classify seeds according to size, color, shape, texture, etc.
* Invite botanists or gardeners to talk with the children about seeds.
* Keep track of children’s comments and questions as they study the seeds. Make a chart of their questions, predictions, and findings.

- **Properties Everywhere**

This lesson captures students’ interest, provides a review of the primary unit objectives, and assesses students’ prior knowledge. This experience focuses students’ attention on the attributes of objects and rules for sorting them while building vocabulary for describing attributes and for classifying objects. In addition, this lesson allows students to apply knowledge of properties for sorting the buttons while working in a small group. This grouping arrangement offers students support and challenge through discussion of various options.

Learning Objectives
Students will:

* identify how items are sorted by color, size, type and shape
* formulate questions based upon these data

Materials

Chart paper
Bowls of crayons or sets of pencils to sort
Small containers with buttons for each working group
Felt squares
Objects to Sort Activity Sheet

I*nstructional Plan*

While students are at their desks or tables, ask them to identify things within the classroom that can be sorted and to name specific attributes to guide the sorting. Some examples students might suggest are the following:

* Things to sort by color: crayons, markers, papers, hair color, eye color, backpacks, and clothes
* Things to sort by shape: tables, books, blocks
* Things to sort by size: books, students, pencils, and shoes

Record and post this information on a chart for future reference. The format provided on the Objects to Sort activity sheet will familiarize students with the recording format.

Objects to Sort Activity Sheet

Give small groups of students bowls of crayons or sets of pencils to sort. Students may sort them by such categories such as color, length, with or without a paper covering, and with or without an eraser.

- **Namecards**

- **Surveys and Graphs**

Back to index

What's your favorite sport?
Materials

* Index cards
* Tape
* Drawing supplies

Directions

Encourage your child to survey family and friends, asking, "What's your favorite sport or outdoor activity?" Each person can draw and/or write their answer on an index card. When your child has collected eight to twelve cards, help him or her tape all the cards with the same or similar activities end-to-end in a row. Tape the rows of cards on a large piece of paper, one below the other, aligning the rows on the left. You will have created a picture bar graph. Talk about the graph together. "What sport did most people like best?" "How many people had the same favorite activity you did?" "What sports or activities did just one person think of?" Encourage visitors to the house to add an index card with their favorite sport or activity to the graph.
Talk About It

Staying active keeps grownups and kids healthy and alert. As a family, what active pastimes do you enjoy together? Playing basketball? Going for walks? Dancing in the house? Playing tag? Make a list with your child. Try to do several things on your list together each week.
Related Books

* Ice Skating School by Naia Bray-Moffatt
* Imagine Me on a Sit-Ski! by George Moran
* It's Snowing! It's Snowing! by Jack Prelutsky
* The Snowman by Raymond Briggs

5.A.ECb. Make predictions about what will happen next

- **Tips: Predicting:**

Helping Preschoolers Look Ahead
When we make predictions, we form ideas about the future based on what we've already seen or done. Preschool children are beginning to notice patterns, sequences, and connections that help them guess what to expect from the world around them. Prediction skills are important in literacy, math, science, and social development. Here are ways to encourage a child's disposition to make predictions.

Model different ways to make predictions. Use words such as predict, guess, expect: "Today you voted to have muffins for snack. So you're expecting to eat muffins. But we have only one tablespoon of sugar. I predict that won't be enough sugar for the muffin recipe."

Help children make connections to earlier experiences. Try asking them questions with phrases such as "remember when" or "think back": "Can you think back to what the muffins were like the time we forgot to use sugar? Do you remember if you thought they looked good and tasted good?"

Help children imagine possibilities. Ask "what if" questions: "What might happen if we don't put enough sugar in the muffins today?" "What do you think they might be like if we used something instead of sugar?"

Invite children to explain their predictions. Ask a follow-up question when a child makes a prediction: "Mike, you predict that the muffins will taste too salty without sugar. What makes you think so?" "What makes you think the cooks could use honey instead of sugar, Winona?"

Encourage children to comment on each other's ideas. Summarize and restate their ideas as needed: "Winona is guessing that using honey will make the batter sweet enough to taste good. Jaya, what do you think about that?"

Help children to decide what to try and to make a plan. Help them vote or reach a consensus: "The cooks voted to experiment with using honey in the muffin batter today. Rashad says we should have a taste-test!"

Emphasize "testing" and "checking" instead of being right. When children revisit their predictions, use words such as surprise and expected: "Was anyone surprised when they tasted the muffins?" "Joo-Yun says she expected flat, sticky muffins. But she checked them out, and they look and taste like regular muffins."

- **Tips: The Project Approach: Phase 2-Doing Fieldwork**

Most of the Illinois Early Learning Benchmarks can be met when young children are involved in project work. Projects are like good stories. They have a beginning, middle, and end. The middle phase is for fieldwork and finding answers to children's questions. It can last from three weeks to several months. Here are some ways to help children do fieldwork. (See also The Project Approach: Phase 2-Getting Ready for Fieldwork.)

Visit sites where children can do fieldwork.

* Before a site visit, help children plan what they might draw, photograph, collect, or record. Invite them to decide who will ask specific questions. Ask for volunteers for each task. ("Who will draw the dashboard? Who will record the bus starting up?")
* Give children clipboards, paper, and pencils to make observational drawings during site visits. They can also take bags for collecting things.
* On the site visit, take along a list of who agreed to do which tasks. Gently remind children of their responsibilities as needed.

Encourage children to collect information outside of class.

* Children can gather information on some topics from their families. For example, they can take questionnaires to family members to find out how many have had broken bones. They might also draw or photograph family items related to the project.
* Children can also bring in objects from their families related to the topic. Help them make labels, and display the objects together on a countertop or table.

Invite guest experts.

* Let the children practice asking their questions before the expert comes to visit. If necessary, gently remind them to ask their questions during the visit.
* After the visit, invite the children to talk about what the visitor told them and showed them. Write their main points down on chart paper, and post the list in the classroom.

Help children discuss each other's work.

* If a small group of children is going on a site visit, encourage them to ask those who are not going, "What do you want us to find out for you?"
* When children return from fieldwork, let them report what they found to the whole class. They can share their drawings, digital photos, or things they have collected. Encourage the children who did not go on the trip to ask questions of those who did.

Monitor progress.

* As a project proceeds, help the children check their original topic web and their original list of questions and predictions (See The Project Approach: Phase 1-Getting Started). Keep track of questions the class has answered and list new ideas or questions that have come up.

- **Boards & Rollers**

5.B.EC, Gather data about themselves and their surroundings

- **Tips: The Project Approach: Children Taking Surveys**

Surveys are popular sources of information for adults. Young children can also use simple surveys. They can ask others for predictions related to a project or ask about others' opinions, experiences, and work. When they do so, they can meet a number of Illinois Early Learning Benchmarks (including 1.A.ECb, 2.A.EC, 6.C.ECb, 18.A.EC, and 31.A.ECd). Here are some teacher-tested suggestions for helping preschoolers conduct surveys.

Demonstrate ways to construct and take surveys.

* Let the children watch you making a survey form with a question that has two possible answers ("Yes/No"; "Agree/Disagree"). During a project on a dentist's office, for example, you might pose the question, "Have you been to a dentist?" Attach your survey to a clipboard and go to the children one by one to ask the question. Show how to choose a column and make the check mark for a response.
* When you have surveyed all the children, report the findings to the class. Show them how to compare the two response columns. "You counted 8 checks in the 'Yes' column and 4 in the 'No' column. That means 8 people said they have been to a dentist and 4 said they have not."

Help children to take their own surveys.

* Encourage them to work in pairs, or groups of 3 or 4.
* Talk with them about what they want to find out, and help them decide how to phrase the survey question. With experience, they may be able to create surveys with more than two possible responses.
* Help them decide whom to survey. Will the survey be for classmates, families, or someone else?

Let children take surveys during any phase of project work.

* In Phase 1, help children focus surveys on people's opinions and experiences. Their questions might include, "Do you like to go to the dentist?" "Did you ever lose a tooth?"
* Encourage children to use surveys in Phase 2 to gather predictions related to the investigation, or to enhance field work. They might ask questions such as, "Do you think we will see toothbrushes when we visit the dentist?" On the site visit, they might get permission to ask patients, "Are you scared of going to the dentist?"
* In Phase 3, let children survey classmates to choose ways the class might represent project findings. "Do you think we should make a model of the dentist's chair or a mural of the office?" Phase 3 questions might also be reflective. "Do you think you might want to be a dentist someday?"

Make surveys a regular part of classroom life.

* Create survey templates to keep on hand, and have clipboards and pencils available. (Make inexpensive clipboards using stiff cardboard and paper clips.)
* Set aside time during class meetings for children to report on their surveys.

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- **Tips: Encouraging Scientific Thinking: Rain or Shine**

Everyone talks about the weather—including curious preschool children. Young children are keen observers of their surroundings. Describing, collecting, and recording information are important skills they can develop as they think about the weather (see Illinois Early Learning Benchmarks 12.E.ECa and 11.A.ECb).

Talk about the weather. Introduce weather-related words as you encourage children to observe and describe the weather each day. Ask questions such as, “Do you think it is sunny or cloudy, hot or cold, windy or calm?” If it’s raining, “Is the rain pouring or sprinkling? Is it just misty or really heavy?” If it’s snowing, “How could you describe snow to someone who’s never seen it?” “How can you tell when the wind is blowing? Can you see it?” “What sound does the rain make?” Ask the children if they have other questions.

Think about the effects of different kinds of weather. Discuss ways people are affected by the weather. Ask questions such as, “Why did you wear a sweater today?” “Did you need an umbrella on the way to school?” “Why do we need to know if a storm is coming?” “Why do farmers care about the weather?” “How do we stay warm in winter and cool in summer?”

Try some weather activities.

* Set up a rain gauge on rainy days using a clear plastic tumbler or wide-mouth bottle. Let a child mark the level of the rain one day, empty it, and then set it back outside. Check it again the next day. Is there more or less rainwater in it? Help make a simple bar graph to record daily observations.
* Look up on a cloudy day. Are the clouds moving or still? Talk about the color and shapes of the clouds. Provide chalk or crayons and blue or black paper for drawing.
* Create rainbows on a sunny day by using safe prisms inside or a sprinkler outside. Talk about the colors.
* Go outside on a windy day. Ask questions such as, “What can you see being moved by the wind?” “Does the wind make you feel colder or warmer?” Let children blow bubbles to see which way the wind is blowing.
* Let your young scientists fill a plastic or paper cup with snow on a snowy day. Mark the level of the snow on the cup and bring it inside. Measure the level of the water when the snow melts. Is it higher or lower than the mark made showing the level of the snow?

Help preschoolers record their observations. Preschool children can chart their daily weather observations for several days. Children can draw the sun, rain, or snow and dictate a brief description. Use the chart to answer questions such as, “How many days in a row did the sun shine?” “Did it rain yesterday?” Weather observations can also be included in a class journal.

- **Eye to Eye**

Students learn to pose mathematical questions about themselves and their surroundings through class. They gather data about eye color from their classmates and another class within their school. They organize this data to answer questions.

Learning Objectives

Students will:

* formulate questions that can be addressed with data
* collect, organize, and display relevant data to answer questions
* analyze data to answer questions
* develop an understanding of the purpose of data collection and the use of data

Materials

- Several face shots from magazines (focusing on eyes)
- Chart paper
- Class-sized Eye Color Graph
- 3 glue sticks
- Blue, brown, and green crayons or markers
- Scissors (1 per child)
- Eye Color Activity Sheet
- Compact mirror
- A "buddy" classroom with cooperating teacher
- Instructional Plan

The lesson consists of four segments: Launching the Lesson, Conducting the Lesson, Assessing Student Understanding of the Lesson, and Extending the Lesson. This is a two-day lesson. Activities each day should take approximately 45 minutes.

Launching the Lesson

This segment of the lesson can be used to capture students' interest and provide a preview of the main lesson. It is best conducted in a community area, such as the class rug. Start the lesson by displaying magazine photographs of people's eyes. Ask students to share ways that eyes are different from person to person. Be prepared for students to share disabilities, such as blindness or a glass eye. Accept all appropriate responses. Emphasize that no two people's eyes are the same and that eye color is one way eyes can differ. Ask if anyone knows what the colored part of the eye is called iris. Next, have the students brainstorm the different eye colors. Students may give answers other than blue, brown, and green, such as black or red. Explain that all eyes are a variant of blue, brown, or green although they may reflect other colors (i.e. redeye in photographs). List the three colors on chart paper for student reference.

Tell the students that they will be collecting data on eye color. Encourage students to pose questions they might answer with this data. Record all the questions students generate. For example, questions may include:

* What color is the most common among the class?
* What is the most common color for boys?
* What is the most common color for girls?

Conducting the Lesson

Place the Eye Color Graph in the front of the classroom with glue sticks. Inform students that they will use this graph to organize information about their eye color. Distribute the Eye Color activity sheet.

Instruct students to color in their eye color, cut out the eye, and paste it in the correct row on the Eye Color Graph when they are finished. Circulate around the classroom with the mirror so that students can determine their eye color.

Share data with the class. Discuss which of the student-generated questions can be answered with the data. Ask students if they could reorganize the data to answer other questions. For example, to answer the questions a)What is the most common color for boys? b)What is the most common color for girls? the class could have made one graph for boys and one graph for girls. Ask students if there are any other questions they could answer with the data. How many more students have brown eyes than green eyes?

Day 2

Explain that each student will be matched up with another student from a participating class of the same grade. They will be collecting data on the eye color of that student. They will repeat the data collection process used previously. Using the list of all the questions formulated the day before, the class should decide on one question that will be used to guide the collection of data. Solicit student input to create a graph that organizes the data to answer the selected question.

You will have made prior arrangements with another class from your grade to conduct this inquiry. Students will gather data on the eye color of their partner and return to the classroom to color in the eye color of the student they surveyed using the Eye Color activity sheet. After students color and cut out the eye representing their partner, they organize their data on the appropriate graph.

Assessing Student Understanding

After everyone has had time to display the data collected, have the students join together in a circle and discuss the data gathered from the other class. Use the data to answer the question posed. Now you can compare the two data sets and ask additional questions. Which class had more blue eyes? How many more did they have? Is the same eye color most common in both classes? Ask students to summarize their findings to present, along with the graphs from each class, to the “buddy” classroom. Use chart paper to record the students’ summary in a class letter.

http://nccic.acf.hhs.gov/index.cfm

National Library of Virtual Manipulatives
http://nlvm.usu.edu/