



Helping Young Children Learn Mathematics

Ann S. Epstein, PhD

In October, during staff development, teachers worked on the Numbers Plus activities that are a part of our High/Scope curriculum. Just as learning to read takes more than chanting the ABCs, learning mathematics involves more than reciting the 1, 2, 3s. Over the next few newsletters, I plan to share some activities involving mathematics with you that can be done at home using everyday objects. This is from *Numbers Plus* by Ann Epstein, PhD

Number

Numbers are used to describe Quantity (amount), to count things (objects, people, actions and events), and to perform numerical operations (addition, subtraction, multiplication, division). Understanding numbers and how they work, sometimes called *number sense*, is essential in all areas of mathematics. You can use the following strategies to help your child develop number sense:

- Count things! Preschoolers love counting so count place settings at the table, socks in the laundry basket, mosquito bites on ankles. Point to and/or move each object as you count and say each number aloud. This not only helps your child keep track but also conveys the important idea that each number refers to one and only one object or action.
- Sing counting songs and read counting books.
Songs and chants such as “*One, Two Buckle my Shoe*” and “*Ten Little Monkeys Jumping on the Bed*” make learning to count, - forward and backward - fun for young children. There are many wonderful counting books that not only help children become familiar with written numerals but also convey the idea that numbers correspond to quantities.
- Find numbers (numerals) around your home and neighborhood
Go on a “number hunt”. Point out numbers on the television, microwave, telephone computer keyboard or screen. Look for and circle numbers in newspapers, magazines and catalogs. Search for numbers on street signs, buildings, houses and supermarket shelves. Keep a count to how many of each number you see. Share your child’s excitement when he or she finds a number in an unexpected place, like the size label in clothing.
- Ask your child to help solve simple number problems.
Three and four-year-old children can begin to add and subtract small numbers. For example, you might say, “I need 3 tomatoes for the sauce and I only have one. How many more should I buy?” “Or, Daddy is working late tonight. I usually set 5 plates at the table, how many should I take away?”
- Provide numerals in diverse materials and encourage your child to trace, copy and write numerals during pretend play and real events. Put magnet numbers on the refrigerator. Have your child help copy or write numbers – such as his or her age and house number on birthday invitations.

Geometry

Early geometry includes the ability to identify 2 and 3-D shapes and use position, direction and distance words to describe the location of objects and one's own movement in space. Becoming familiar with shapes and special relationships helps children grasp the principles of geometry in later grades. You can use the following strategies to help your child learn and use basic ideas in geometry:

- Label shapes and sizes. When you play with your child or carry out the day's routines, use words related to shape and size. *Can you please bring me the largest box of cereal?* Point out everyday objects that are common shapes; for example, a computer keyboard is a rectangle, cheerios are circles and Chex are squares.
- Find shapes in the environment. Play "I Spy", looking for shapes around the house, at the store and in the neighborhood. *I spy circles on the car, can you guess what they are?*
- Encourage your child to climb in, out under, over and around things to develop a sense of space. Visit the playground and encourage your child to use the climbing equipment and describe what h/she is doing using these words. Reading the book *Hop on Pop* also introduces these words relating to space.
- Build structures with blocks, boxes and other clean and empty containers. Allow your child to discover that putting the biggest blocks on the bottom makes a strong base. Let your child figure out that when there are no more big blocks, two or more smaller ones can substitute. Talk about how your child stacks and lines up the boxes. Encourage your child to work with different sizes and shapes and discover how they fit together. Use words that describe position (over under, next to, between, above, behind). Direction, (forward, backward, up and down). Distance, (near, far, close, way over there). For example, hide a toy and give your child clues to find it: *Look higher, check under the couch, it's behind me, or I hid it near the bookshelf.* Use position, direction and distance terms during everyday interactions, such as *Let's walk around the puddle so our feet stay dry; Do you want to wear the barrette in the back or on the side of your hair? Did you look inside the top drawer?*

Measurement

We measure to figure and compare height, length and width; area and volume; and other characteristics, such as monetary value, brightness and frequency. Measurement is expressed in conventional units such as inches and feet, ounces and pounds, minutes and hours, cents and dollars. But children and even adults sometimes use unconventional units of measuring (describing a stack of dishes as 5 bowls high). You can use the following strategies to help your child begin to understand and use measuring.

- Organize and compare household items. Encourage your child to help you sort things such as groceries and laundry. Your child can line them up in order and compare them by attributes such as length (longest and shortest socks) weight (lightest to heaviest cans or bottles) etc.
- Use conventional and unconventional units to measure things. For example, use a one-foot ruler and a shoe to measure the length of a carpet. Then introduce a standard measuring tape so your child becomes familiar with them. Count how many songs are played on a play list when you drive to the grocery store one block away versus the library across town. Compare how many small, medium and large containers of water it takes to fill a plastic tub of water. Use different sized measuring spoons and cups to fill a bucket with sand.

- Include your child in activities that involve measuring. Children can help measure ingredients in a recipe, the length of boards for a bookshelf or the distance between rows in a vegetable garden. They can also use timers for length of play in a bathtub or reading stories!
- Estimate! Estimating is a fun guessing game and also provides an opportunity to measure how close your estimate comes to the real number. Estimate how many cookies are in a package, how many steps from the house to the street, how many red lights are from home to school. Then compare the actual number. Is it higher or lower? By how many?
- Talk about time. Time is such a nebulous concept to a preschooler so one must be very concrete with time. When a child's birthday is approaching, count the days to the birthday. For some kids, counting how many nights of sleep before the birthday is helpful. For example, *in 5 days it is your birthday! That is 4 nights of sleep or 4 sleeps until the big day.* Pose simple challenges, *how many times can you jump in 1 minute? In 2 minutes?* Set a timer and count.

Algebra

Understanding algebra begins with the study of patterns, which lets us make predictions based on what has come before. Patterns are all around us. They exist in nature, (stripes on a zebra, leaves on a stalk) visual art (quilts, wallpaper, carved moldings) music (alternating chorus and verse, repeated melody) and literature (the rhyme scheme of a poem, the division of acts into scenes in a play). Patterns are also at the heart of many mathematical operations. For example, if we see a sequence of numbers that advances by 2's – 2,4,6,8 – we can predict that the next number is 10. You can use the following to help your child enjoy working and playing with patterns.

- Look for patterns in songs, chants and story books. Many stories and songs written for children repeat lines verses and rhyme patterns. This allows children to recognize and predict a pattern. As you read or recite these with your children, leave blanks and encourage your child to fill in the missing word.
- Create patterns using your hands and feet. For example, pay head, shoulders, head shoulders, head shoulders (repeat a pattern at least 3 times to help your child get the idea) or do clap, stomp, clap stomp, clap stomp. Encourage your child to make up his/her own pattern for you to copy.
- Hunt for patterns in your house or neighborhood. Your child can find patterns in clothing, furnishings, toys legos, plants, animals etc. For example, point to a flag and say red, white red white for the stripes. This helps to emphasize the idea of a pattern.
- Create patterns with household items. You may lay out a row of silverware (fork, spoon, fork spoon, fork spoon) and encourage your child to extend it. Leave a blank space and see if your child can fill in the missing item. Describe the pattern aloud. Use your voice to emphasize each repetition.
- Explore patterns in numbers. Older preschoolers may begin to count in the teens, 20s 30s and so on. As you count aloud or look at written numerals, call attention to number patterns and sequences. For example, 21, 22, 23...31, 32, 33.

Data analysis

Think of data as information presented in numerical terms. We deal with data all the time in our lives. For example, we compare how long it takes to go grocery shopping on Monday morning, Wednesday evening or Saturday afternoon and plan our schedules accordingly. We investigate how much we will save on heating costs by lowering the thermostat, adding attic insulation, or installing a high efficiency furnace, and then decide which steps are within our means. Knowing

how to collect, organize interpret data makes our lives manageable and helps us make decisions. Learning these basic mathematical skills can also help your child solve problems and make good use of his/her resources. You can use the following strategies to give your child experience working with simple data.

- **Make collections.** Children are natural collectors. Encourage your child to collect items around the house, such as paper clips, junk mail coupons or buttons from worn out clothing. Bring bags or baskets on nature walks to collect fallen leaves, rocks and shells. Provide containers, bowls, plastic trays or paper so your child can sort collections by size, shape, texture or function. Encourage your child to describe the basis for the sorting; why he or she put items in the same or different groups.
- **Sort household items.** Children love to do grown up things, so encourage your child to help you organize real objects and complete sorting tasks around the house. Common examples include sorting toys, sorting the laundry, separating knives spoons and forks in the flatware drawer. Expect your child to help with simple cleanup chores that involve sorting and organizing.
- **Make simple charts and graphs.** You might list the fruits and vegetables and other types of food your family eats. Ask each member of the family whether he/she likes each item on the list. Tally their preferences and order them from least to most favorite. Use the results to plan the next week's grocery shopping. Keep track of what people eat and ask your child whether to buy more, less or the same the following week.

There are countless ways for you to help your young child about mathematics. Remember to not just do the activities but also talk to your child about what he/she is observing and thinking. As children use their bodies – hands, and feet, eyes and ears – you can help get their minds actively working too!