BOSTON CHILDREN'S MUSEUM

STEM sprouts

Science, Technology, Engineering & Math

Teaching Guide

Sponsored by nationalgrid

Welcome! Are you ready for some fun?

The STEM Sprouts Teaching Kit is the product of a collaboration between National Grid, Boston Children's Museum, and WGBH. The goal of this curriculum is to assist preschool educators in focusing and refining the naturally inquisitive behaviors of three to five-year-olds on science, technology, engineering, and math (STEM).

MEET THE PARTNERS

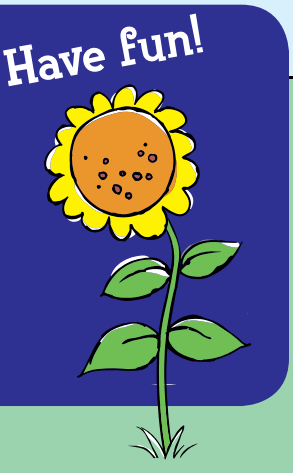
National Grid is committed to supporting deserving programs in the Northeast – focusing on STEM education and environmental stewardship and sustainability, areas critical to the company's core business. National Grid is passionate about encouraging children and students of all ages to be interested in STEM, inspiring future generations to pursue careers in engineering. The company's Corporate Citizenship program seeks to inspire students and teachers alike in conventional and unconventional ways, helping students increase their STEM literacy and see engineering as an exciting and creative career choice.

Boston Children's Museum is a welcoming, imaginative, child-centered learning environment that supports diverse families in nurturing their children's creativity and curiosity. BCM promotes the healthy development of all children so that they will fulfill their potential and contribute to our collective well-being and future prosperity. BCM builds brains every day! Come and visit our *Peep's World* exhibit where children develop basic science skills like observing, predicting and problem solving by playing with water, sand and shadows.

Peep and the Big Wide World is produced by WGBH Education Foundation and 9Story Entertainment. The award-winning animated series gives wings to the idea of teaching science and math to preschoolers. Wry and distinctive visual humor, lovable characters, charming plotlines, and live-action videos featuring real children combine with a preschool science and math curriculum to attract and engage three to five-year-olds, as well as their parents. Families and caregivers can watch *Peep and the Big Wide World* daily on public television and on the Web site, peepandthebigwideworld.org, where there are also fun games, family activities, and much more! Find *PEEP and the Big Wide World* on Facebook.

ALL THE COLLABORATORS WANT TO REMIND YOU THAT:

- Preschool is the perfect time to cultivate positive attitudes.
- Very young children are quite capable of doing science.
- Preschoolers are natural scientists.
- Preschool is the perfect time to develop science skills.



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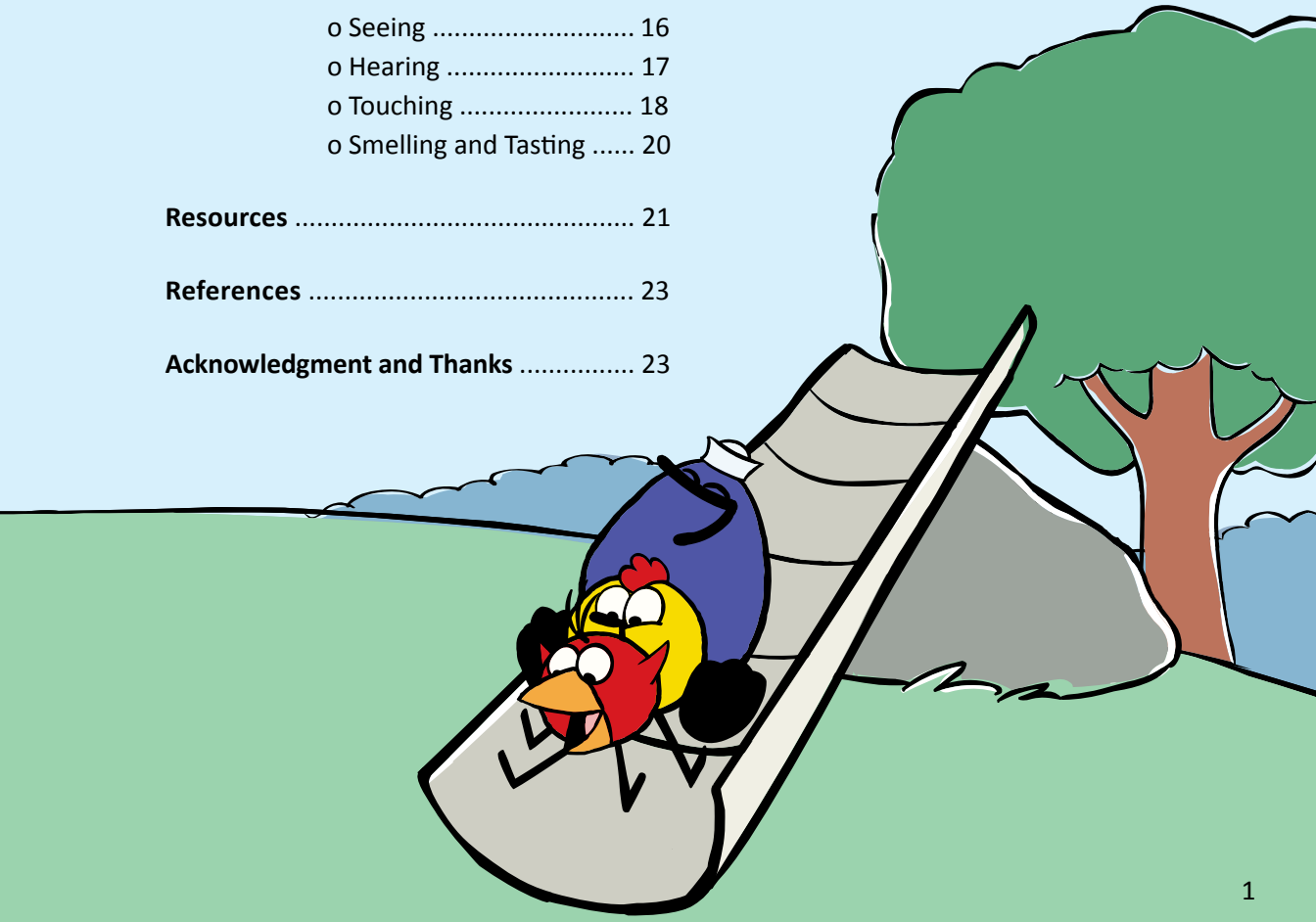
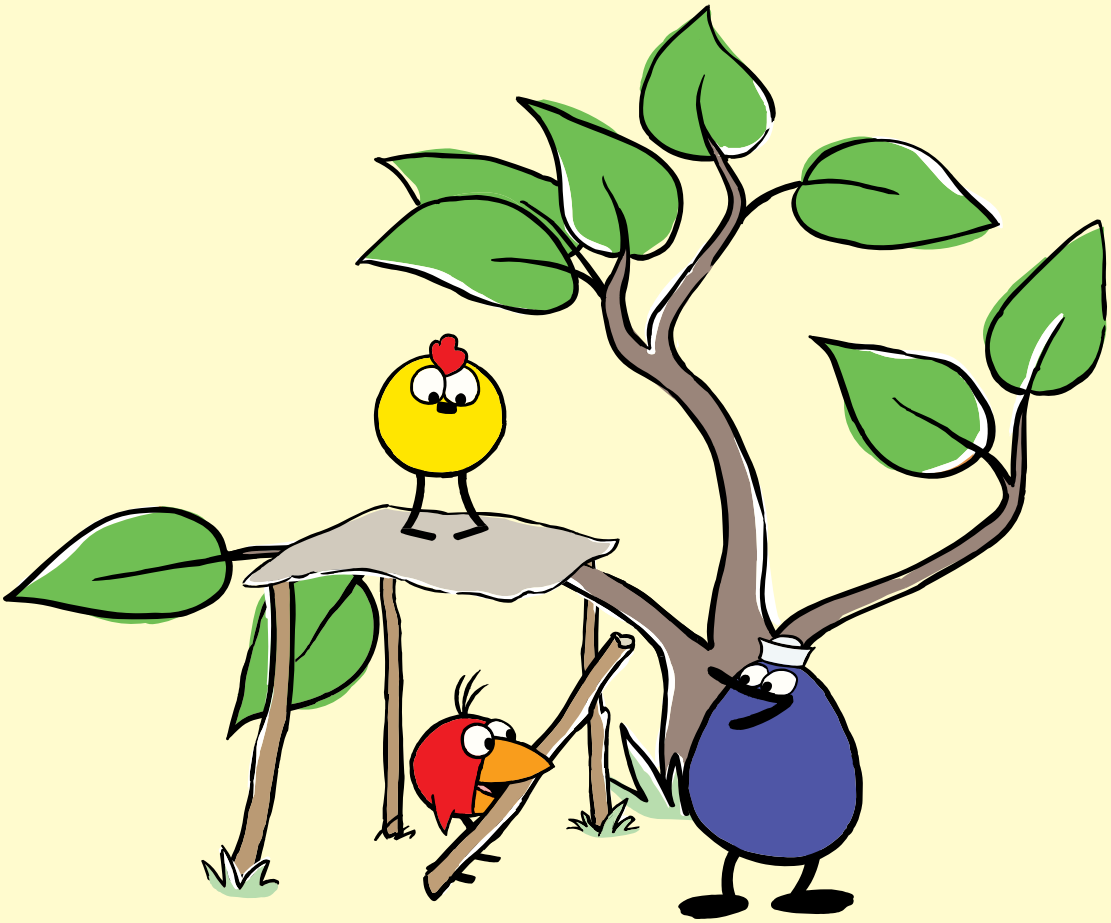


WHAT IS STEM ALL ABOUT?

STEM is an acronym. It was used originally by the US government to describe fields of study that helped immigrants get work visas: science, technology, engineering, and math. Today, educators are linking these areas together in what is called *STEM curriculum*. When we break down the acronym into its parts, we see that early childhood programs practice STEM activities every day. ***Science*** activities include exploring water and sand, comparing and contrasting natural materials like rocks and soil, rolling balls across the room, and looking through a magnifying glass to count how many legs are on the bug that was caught during outdoor play. ***Technology*** activities include computers, but also identifying simple machines like gears and wheels and pulleys. ***Engineering*** in preschool happens in the block area. There children are planning and designing structures every day with little teacher direction. ***Math*** activities include counting and matching shapes and making patterns. Measuring is easy too, especially with unit blocks where two of one size equal one of the next size up.

As a preschool educator, you can expand kids' science learning and lead them toward discovery by encouraging their natural curiosity; noticing what they are doing during play with water, shadow, or sand; and asking the right questions. You can get involved by asking children open-ended questions: "Tell me what you are working on now." "What do you notice about how it's moving?" "What else have you seen other kids try?" Writing down their thoughts and ideas is a good way to document their growth in STEM curriculum to share with their parents.



BRAIN BUILDING 101

An explosion of research in neuroscience and other developmental sciences shows us that the basic architecture of a child's brain is constructed through an ongoing process that begins before birth and continues through adulthood.

Like the construction of a home, the building process begins with laying the foundation, framing the rooms, and wiring the electrical system in a predictable sequence. Early experiences literally shape how the brain gets built. A strong foundation in the early years increases the probability of positive outcomes. A weak one will require remedial education, clinical treatment, or other interventions that are less effective and more costly than providing crucial brain-building interactions early in life.

In an environment intentionally designed to provide brain-building experiences for children, the educator is available to children when they need guidance and assistance with new ideas. The teacher's role is to be on the sidelines offering support when needed to help children develop new skills and facilitating interplay between children and the environment. The adult should never be the only source of input and exploration for children. A well-planned environment will provide children with an array of learning experiences. When such an environment is combined with intentional, brain-building learning activities, children have the best of all possible worlds.

BRAIN BUILDING FOR STEM

Science is a way of thinking. **Science is observing and experimenting, making predictions, sharing discoveries, asking questions, and wondering how things work.**

Technology is a way of doing. **Technology is using tools, being inventive, identifying problems, and making things work.**

Engineering is a way of doing. **Engineering is solving problems, using a variety of materials, designing and creating, and building things that work.**

Math is a way of measuring. **Math is sequencing (1, 2, 3, 4…), patterning (1, 2, 1, 2, 1, 2…), and exploring shapes (triangle, square, circle), volume (holds more or less), and size (bigger, less than).**

The Brain Building in Progress campaign is a public/private partnership of the Massachusetts Department of Early Education and Care, United Way of Massachusetts Bay and Merrimack Valley and a growing community of early education and child care providers, academic researchers, business leaders and individuals. Check the website for more information.

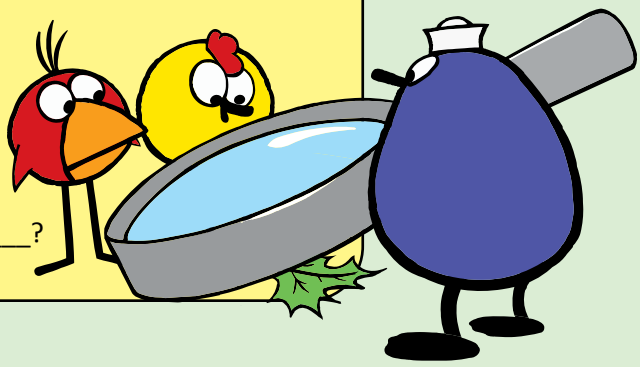
ASKING GOOD QUESTIONS: FOCUS ON "WHAT"

You've probably noticed that preschoolers ask lots of questions when they're exploring: "Where do clouds come from?" "Why is the ice melting?" "Why is the ball rolling over there?" Sometimes it feels like no one educator could have all the answers to their questions. But we have good news for you—you don't need to have the answers to create memorable STEM experiences. In fact, the key to effective STEM learning at the preschool level is asking great questions right along with the kids!

One strategy for asking great questions is focusing on "what" instead of "why." When you ask "why" questions, it implies there is a correct answer and the child is being tested. For example, if you ask, "Why is the magnet sticking to that kind of metal?" you may be just as unable to answer that question as the child is. But when you ask "what" questions, you're starting a conversation and exploring right along with your children. "What" questions focus on what is happening, what you are noticing, and what you are doing—and those answers are right in front of you and your kids. By focusing your questions on what kids have observed and noticed, not only are you helping them develop valuable communication and observation skills, but you are also building their confidence by giving them questions they can answer as experts.

"WHAT" QUESTIONS

- What happened there?
- What did you try?
- What have you changed about what you are making?
- What are some of the ideas you have talked about that you haven't tried yet?
- What have you seen other people trying?
- What do you notice about _____?
- What do you think will happen if we _____?

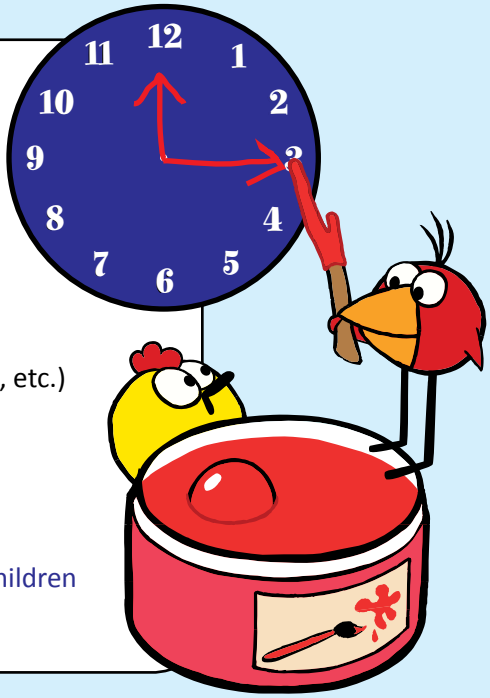


"What do you think will happen if we _____?" is a great question for helping kids who are struggling with something they are making or with an experiment. This question requires that you observe what the students are working on and that you determine why it is not working. In addition, rather than telling children how to fix a problem, you can ask them to focus on something that will lead them toward discovering the answer. For example, if a team is creating a roller coaster with blocks and ramps and the ball is falling off at a point where the track is twisted, ask them, "What do you notice about what is happening right at the part where the ball falls off?" By focusing their attention on the point of the problem, you will not only be helping children learn how to focus on details, but you will also lead them toward answering their own questions and solving their own problems—which is much more empowering than being told the answer!

A DAY IN THE LIFE OF A PRESCHOOLER

STEM activities are fun any time of the day. Choose a topic and greet the children by setting out open-ended materials. Introduce the topic at morning free play or circle time and plan ahead to create the main activity. Check out these activities for examples of incorporating STEM in a preschooler's day.

7:30 AM Children begin to arrive
8:00 AM Free play time
8:30 AM Circle time
9:30 AM Outdoor play time
10:30 AM Morning snack
11:00 AM Cooking activity
12:30 PM Lunch
1:00 PM Quiet activity and nap time (puzzles, books, etc.)
2:30 PM Story time
3:00 PM Afternoon snack
3:30 PM Music time or outdoor play
4:30 PM Free play time
5:00 PM Transition to home; parents pick up their children
6:00 PM Program closed; clean up



Here is an example of how preschool educators can incorporate STEM into the day:

8:00 AM Free play time: Put out some books about fruits and vegetables. Add a sorting game with plastic fruits. Create a market in the dramatic play corner featuring fruits and vegetables. Make sure the market worker has an apron and some recycle bags for his customers!

8:30 AM Circle time: Plan a field trip for apple picking or bring in a bag of apples to share. Read the book *Applesauce* by Shirley Kurtz, and let the kids feel and smell an apple from the bag. Talk about cooking applesauce as a special activity for the day.

9:30 AM Outdoor play time: Take children on a walk through the playground or around the block and find trees that have fruit or flowers growing on them. Have kids collect what is growing on the trees you see.

11:00 AM Cooking activity: Plan ahead to have a few volunteers come in and make applesauce with the group. It can start as a whole group activity (peeling and putting apple slices in a pan to be cooked), and then individual children who want to help with more of the cooking can work with the volunteers to finish the applesauce. For kids who aren't cooking, sing some songs, play some music or read a book about Johnny Appleseed.

5:00 PM Transition to home: Write a note for parents about applesauce making. Tell parents to ask their children, "How did the apple turn into applesauce?" Encourage families to try some applesauce with their dinner.

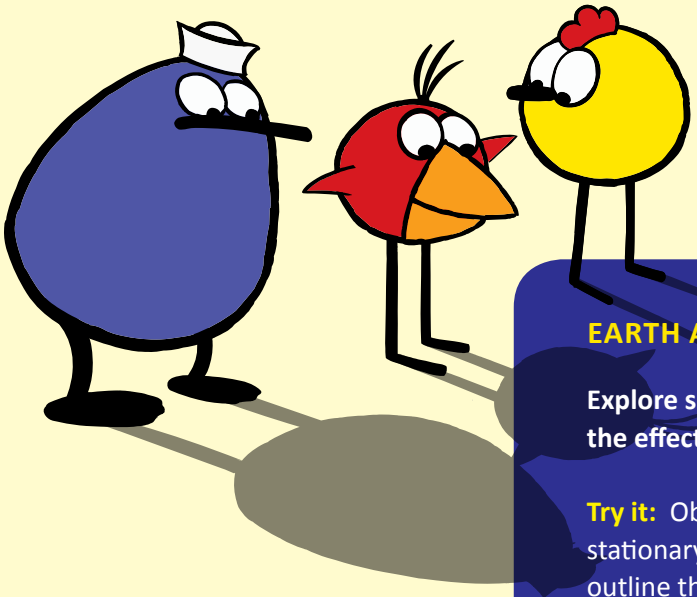
MASSACHUSETTS GUIDELINES FOR PRESCHOOL LEARNING EXPERIENCES

The Early Childhood Program Standards and the Guidelines for Preschool Learning Experiences excerpted here reflect the Massachusetts Department of Education's commitment to quality in early childhood education in order to ensure a solid foundation for later learning and school success. The role of the early years in a child's development has received a great deal of attention in recent years. Research on brain development supports the value of high-quality early childhood education programs for young children, and studies of such programs also provide evidence of their benefits.

GUIDING PRESCHOOL LEARNING IN SCIENCE AND TECHNOLOGY/ENGINEERING

Young children are naturally curious. They wonder what things are called, how they work, and why things happen. The foundations of scientific learning lie in inquiry and exploration—these are the tools of active learning. Fostering young children's sense of curiosity about the natural world around them can promote a lifelong interest in it. Scientific learning should not be limited to a particular "science time."

Early childhood teachers should look for opportunities to develop children's understanding of scientific concepts in all content areas. To do so, children need to observe things first-hand as much as possible. The younger the children, the simpler and more concrete the activities need to be. Classrooms need to have scientifically accurate books about animals and their environments such as field guides, as well as fictional stories. In all activities, teachers should make sure they use, and encourage children to use, the precise language of science.



EARTH AND SPACE SCIENCES ACTIVITY

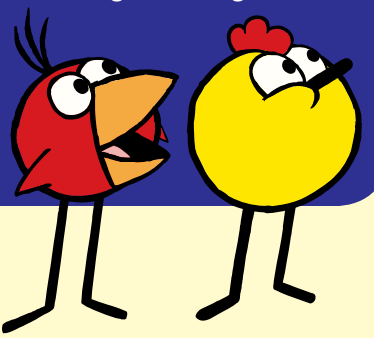
Explore sunlight and shadows and describe the effects of the sun or sunlight.

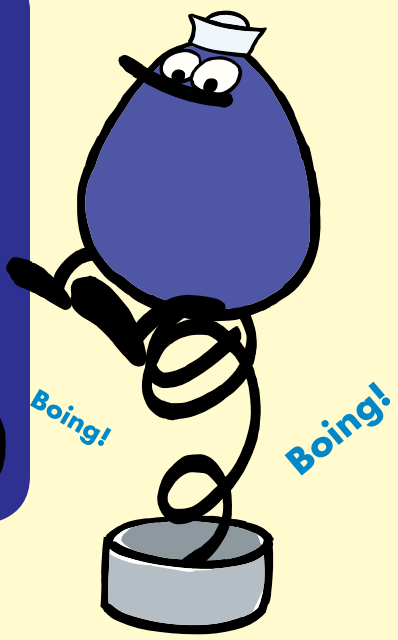
Try it: Observe shadows of trees and other stationary objects in the morning (or even outline them with sidewalk chalk) and return in the afternoon to see if the shadows have moved or are different in some way.

PHYSICAL SCIENCES ACTIVITY

Experiment with a variety of objects to determine when the objects can stand and ways that objects can be balanced.

Try it: Offer a wide variety of building materials for kids to build with, including small and large boxes, other "recyclables" – anything you might have around that is safe to build with. Present children with a design challenge like "make a bridge for the animals to get from the chair to the desk," or "Who can build a tower taller than their own body?"





The skills and processes of inquiry and exploration are fundamental to all the sciences. At the early childhood level the processes of experimentation may require preparation of the classroom environment, routines and materials as well as attention to how children operate and utilize materials.

The **Earth and Space Sciences** describe the properties of the earth, ocean, atmosphere, and universe (what things are called; what they do; how they look, act, and react to various stimuli). It includes geology and astronomy.

The **Physical Sciences** investigate natural forces and the basic elements in natural substances.

The **Life Sciences** include the study of living things (what they are, how they survive, their life cycles, how they change). Young children need concrete experiences that enable them to observe, categorize, compare, and contrast living things. The three major components of the life sciences are biology, physiology, and ecology.

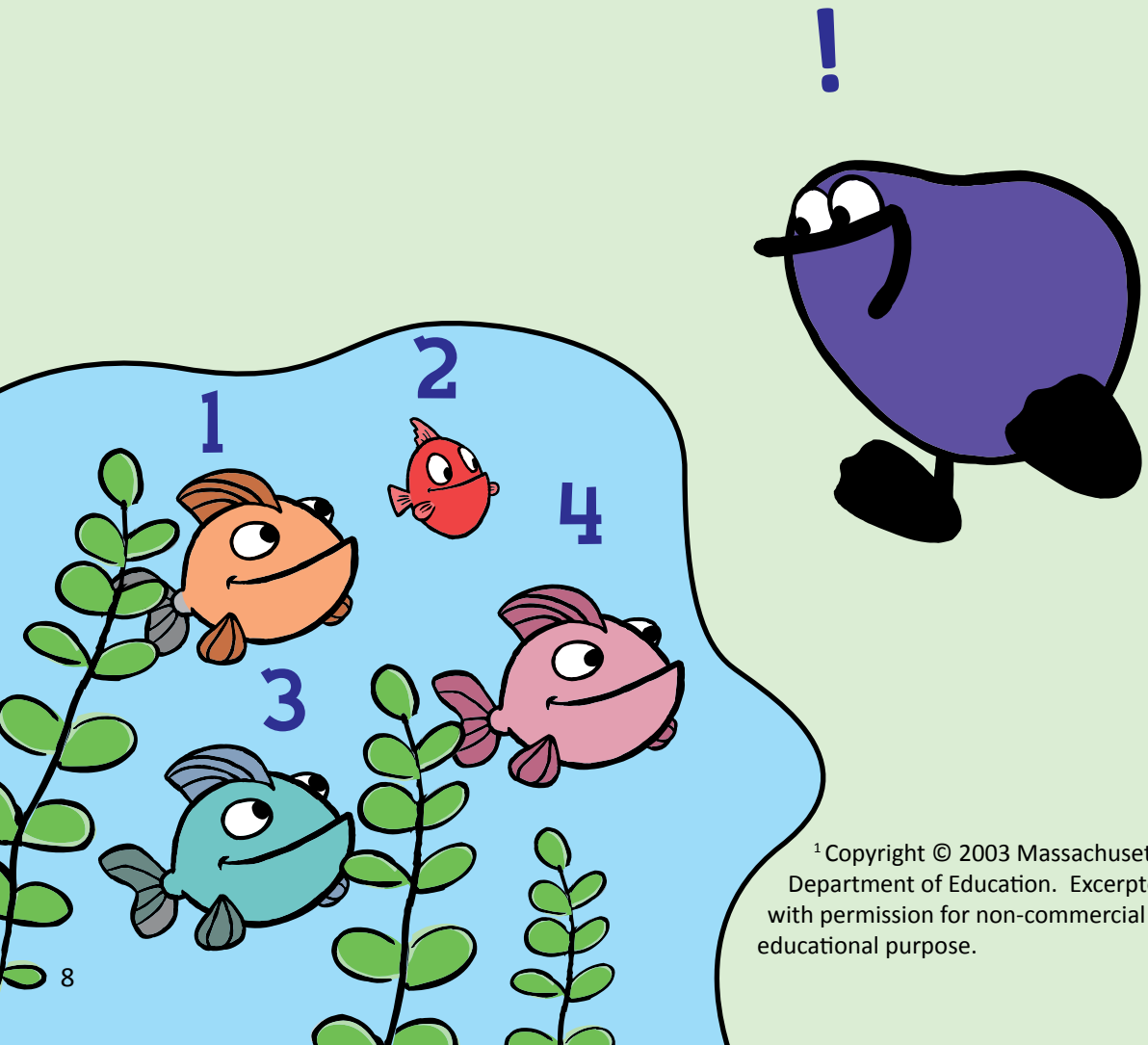
Technology/Engineering involves finding out how things are constructed and work, and thinking about what can make them work differently/better. Science tries to understand the natural world; the goal of engineering is to solve practical problems through the development of technologies. Technologies developed through engineering include the systems that provide our houses with water and heat; roads, bridges, tunnels, and the cars that we drive; airplanes and spacecraft; cellular telephones; televisions and computers; many of today's children's toys, and systems that create special effects in movies.

Preschool children can begin to develop concepts in engineering as they design, build, and test solutions through their play—as they construct sand castles and build cities out of blocks. They can also begin to understand that tools help people do things better or more easily, or do some things that could otherwise not be done at all.

GUIDING PRESCHOOL LEARNING IN MATHEMATICS

Mathematics relates to ideas and concepts about quantity and addresses logical and spatial relationships. At the preschool level, the foundations of mathematical understanding are formed out of children's concrete experiences. Mathematical experiences should not be limited to "math time." They can be embedded in almost all daily classroom activities, challenging teachers to be alert to opportunities for facilitating mathematical understanding. Mathematical thinking can be incorporated into block play, dramatic play, sand and water play, and outdoor play. Children can also make connections between mathematics and musical experiences or art when they explore rhythmic or visual patterns or symmetry.

Preschool children can learn to recite numbers in order, compare quantity, comprehend position, and match objects in one-to-one correspondence. Number concepts become significant to children when they develop out of experiences that are functional in their world. Preschool activities can build their understanding of number concepts, and also build foundations for understanding characteristics and properties of two- and three-dimensional geometric shapes.[1]



MATHEMATICS ACTIVITY

Recognize, describe, reproduce, extend, create, and compare repeating patterns of concrete materials.

Try it: Repeat patterns in songs with clapping, hand motions, and word sequences. Have children lead the song and make up their own unique patterns! Remember to start simple and work up to more challenging patterns.

STEM LEARNING GUIDELINES

The Guidelines for Preschool Learning Experiences are based on the standards for prekindergarten and kindergarten (or prekindergarten through grade 4) in the approved revisions of the Massachusetts Curriculum Frameworks. Reprinted here are excerpts from the guidelines for science, technology, engineering, and math. Following selected STEM-related Learning Guidelines are ideas for learning experiences that you can incorporate into your work with young children.

MATHEMATICS

Explore and describe a wide variety of concrete objects by their attributes.

Try it: Sort everyday materials—like toys, rocks, leaves, seashells, shoes, or snacks—according to different features, such as size, texture, color, pattern, and weight. Introduce descriptive words like *big*, *round*, *rough*, *small*, *shallow*, *flat*, *crooked*, and *heavy*.

INQUIRY SKILLS

Record observations and share ideas through simple forms of representation such as drawings.

Try it: Have each child select one item on a nature walk—like a leaf, rock, or other small object—and draw the item when back indoors. Encourage students to notice the shape, texture, colors, and weight of the object, noting fine detail if possible. Keep a journal throughout the year to save these observations.

EARTH AND SPACE SCIENCES

Observe and describe or represent scientific phenomena meaningful to children's lives that have a repeating pattern.

Try it: Use a familiar book, like Goodnight Moon, to start a conversation about how day differs from night. Make a list of things you can see at night that you can't see during the day. Ask children if they have noticed the different shapes the moon can take and how often it changes shape.

LIFE SCIENCES

Observe and describe seasonal changes in plants, animals and their personal lives.

Try it: Pick an area outside that your group visits regularly (playground or neighborhood park) and make a point of observing it during the different seasons of the year. Invite children to draw a picture of something (a tree, bush, sidewalk, or playing field) on the first of the month, for example, and talk about how the appearance changes during a cycle of seasons.

PHYSICAL SCIENCES

Investigate and describe or demonstrate various ways the objects can move.

Try it: Have children move their bodies to imitate moving objects from favorite books; for example, float from the sky like a snowflake, pop out of an egg like a hungry caterpillar, or roll on a beach like a coconut.

TECHNOLOGY AND ENGINEERING

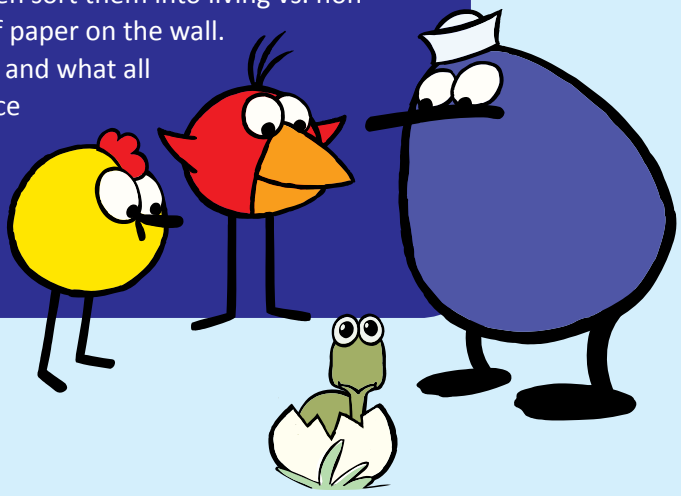
Demonstrate and explain the safe and proper use of tools and materials.

Try it: Offer opportunities for children to cut out different shapes, starting simple and working up to more complex shapes. Remember that very young children may need many months to master scissor technology!

LIFE SCIENCES ACTIVITY

Investigate, describe, and compare the characteristics that differentiate living things from non-living things.

Try it: Cut out pictures (from magazines, catalogs, etc.) of both living and non-living things. Have children sort them into living vs. non-living on a large board or sheets of paper on the wall. After sorting, discuss their choices and what all living things have in common. Once you all agree on your "rules", be sure to refer to them again the next time you go for a walk or look out the window!



STEM ACTIVITIES FOR PRESCHOOLERS

Don't panic! It's only science . . . and technology and engineering and math. You can do it, and so can young children! It's all about noticing behaviors, asking good questions, encouraging children to repeat their actions and observe, and cheering them on.

This section of the teaching kit includes STEM activities ready to use in your program. They include a short description of a topic, three or four different activities to try, questions to ask children, what to tell parents about the activity, and how the activity helps build a child's brain. The materials for these activities are inexpensive and easily bought or found in your kitchen.

SCIENCE

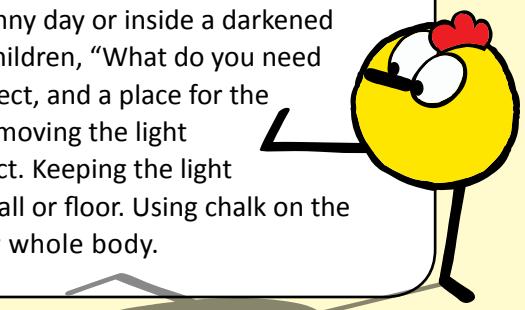
Experiments help children develop basic science skills like observing what is happening, using words to describe what they notice, and repeating the action to compare results. Questioning and posing answers are skills used every day in the classroom.

TRY THESE ACTIVITIES!

- **Air can move things.** Ask your children to blow air on their hands and to wave their hands in the air. Ask them, "What do you feel?" and "Can you hold air?" Line up floating toys in water. Use a straw to blow a toy across the water. Repeat the activity. Ask, "What happened when you blew on the toy?"

- **Bubbles have one shape.** In a bucket or tub, make a bubble solution with dish soap. Using a variety of oddly shaped objects—such as cookie cutters, a loop of string, and a straw—teach your children how to dip their object in the water and blow through it to make a bubble. Experiment with blowing *fast* and *slow*. Ask, "Which method works better?" Have students look at the shape of the bubble maker before they use it. Ask, "What shape do you think the bubble will be?" No matter what shape the object, the bubble will always be round due to liquid surface tension.

- **Shadows have changing shapes.** Outside on a sunny day or inside a darkened room with a flashlight, create a shadow and ask children, "What do you need to create a shadow?" The answer is a light, an object, and a place for the shadow to fall. Explore the shape of a shadow by moving the light *closer* to the object or *farther* away from the object. Keeping the light steady, move the object closer or further to the wall or floor. Using chalk on the sidewalk, outline the shadow of a hand, arm, or whole body.



Tell Children

"What happened when you blew on the toy?" "What happened when you made a bubble?" Encourage kids to use descriptive words like *faster* and *slower*.

"What will the shadow look like with your hand close to the ground? Will it have sharp edges or fuzzy edges?" Ask "what" questions so kids can predict what will happen.

"Do it again. What was different the second time?" Open-ended questions like this will help kids compare results.

Tell Parents

Today we explored air, bubbles, and shadows. Find a flashlight at home and ask your child to tell you about shadows.

Brain-Building Connection

By providing guidance and assistance and letting kids figure out what happened, you help them understand cause and effect and helped build their observation and prediction skills.

Read All about It

I Wonder Why the Wind Blows by Anita Ganeri
Fun with Water and Bubbles by Heidi Gold-Dworkin and Robert K. Ullman
Nothing Sticks Like a Shadow by Ann Tompert

TECHNOLOGY

When you hear the word *technology*, you might think of computers and smartphones, but in the preschool curriculum, *technology* refers to using tools and developing fine and gross motor skills. Tools can help children develop eye-hand coordination and strengthen their hand and finger muscles for writing, typing, and drawing.

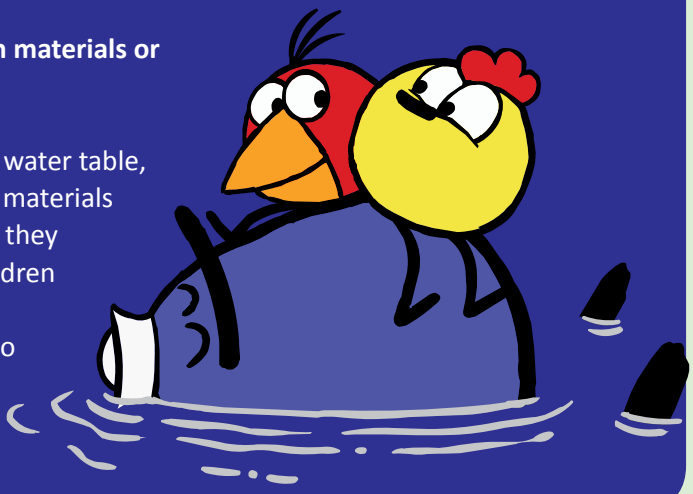
TRY THESE ACTIVITIES!

- **Scissor skills.** Show your children how to hold scissors. The thumb goes in the top hole and the pointer (index) finger should be placed in the lower hole. The middle finger should rest just below the rim of the lower hole to support the scissors. The ring and little finger are not used in cutting.
- **Follow the line.** Draw a simple wide line from the top to bottom of a sheet of paper. Direct the children to cut right above the line. Remind them that the thumb should always be up (in the top hole of the scissors).
- **Basic shape cutouts.** Draw three basic shapes on paper (square, circle, and triangle), and let your children cut them out. Save the cutouts (and scraps) for use in other projects.
- **Practice pouring.** Let your children learn how to pour using a small plastic pitcher and a few plastic cups. Tell them that the cups are empty and that they should pour the liquid into the cups until they are full. Try emptying the pitcher to fill the cups, and then try emptying the cups to fill the pitcher. Experiment with different size cups.
- **Scooping.** Using scoops for the beach, have your children practice moving dry material like sand or dirt from one container to fill another. Try not to spill any of the sand between the containers.
- **Observe closely.** Using a simple magnifier, have children look at something up close. What do they see with the magnifier? What do they see without it?

INQUIRY SKILLS ACTIVITY

Make predictions about changes in materials or objects based on past experience.

Try it: Before spending time at the water table, gather an assortment of classroom materials and have students predict whether they will sink or float in water. Have children describe their prior sink and float experiences and use those stories to make predictions as a group.



Tell Children

"Take your time. Scissors are tricky." Cutting with scissors takes practice! It's hard work for a child, so stay positive and encouraging.

"Try cutting out these shapes." Give some choices of what to cut, or just provide some recycled paper and let your children cut in any way they want.

"Wow! You are a good cutter." Applaud every effort, even if the shapes are raggedy.

"Will the cup hold more water?" Ask the child to make a prediction.

"It's OK. Let's clean it up." Spills and messes are part of learning to do it yourself.

Tell Parents

Today we used scissors to cut shapes. Do you have a pair of child scissors at home?
Today the children started pouring their own snack and lunch drink. Do you practice pouring at home?

Brain-Building Connection

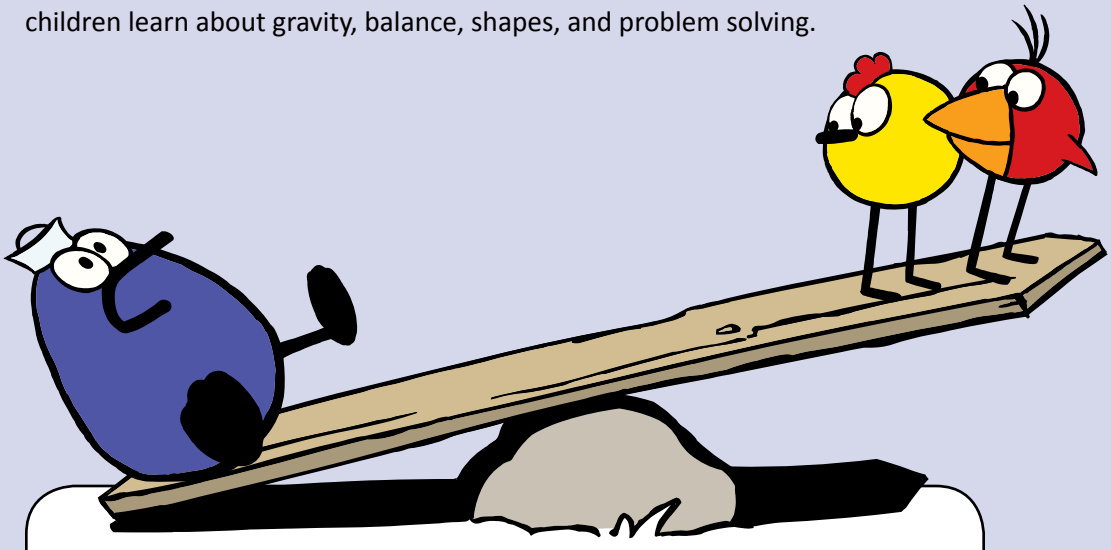
These activities will help children improve their visual discrimination and sensory motor skills. Always allow children to discover opportunities on their own. Allow some children more time with the materials if they want, even after other children have moved on. Even the most skilled educators have no way of knowing when a child has had his fill of discovery.

Read All about It

My First Book of Cutting (Kumon Workbooks)
I Can Do It Myself by Emily Perl Kingsley and Richard Brown
What I Like about Me! by Allia Zobel Nolan

ENGINEERING

Playing with blocks and other building materials develops math and science skills, helping children learn about gravity, balance, shapes, and problem solving.



TRY THESE ACTIVITIES!

- **Mix it up.** Use mixed sets of building materials. Try mixing building blocks with legos, or foam bricks with cans.
- **Recycle it.** Use card board boxes, plastic bottles, nesting cups, left over containers as building materials.
- **Challenge it.** Create a set of challenges for children using a variety of building materials.
  - o How tall can you make it?
  - o Build a tunnel you can crawl through.
  - o Build something as a team.
  - o Build something in five minutes.
  - o Unbuild. Slowly take apart a tower until it tumbles down.

Tell Children

"What do you think will happen?" "Will the structure stay by itself? Is it balanced?" Ask leading questions.

"Here, you try." Share successful ideas among the group. Encourage children to learn from one another.

"Can you take turns building with the blocks?" Encourage cooperative behavior.

Tell Parents

Unit blocks make it easy to measure. Use blocks at home to build a tower the same height as your child or you! Your child may be four blocks tall and you may be eight blocks tall.

Brain-Building Connection

Engineering activities encourage brain development as children solve problems, use a variety of materials, design and create, and build things that work.

Read All about It

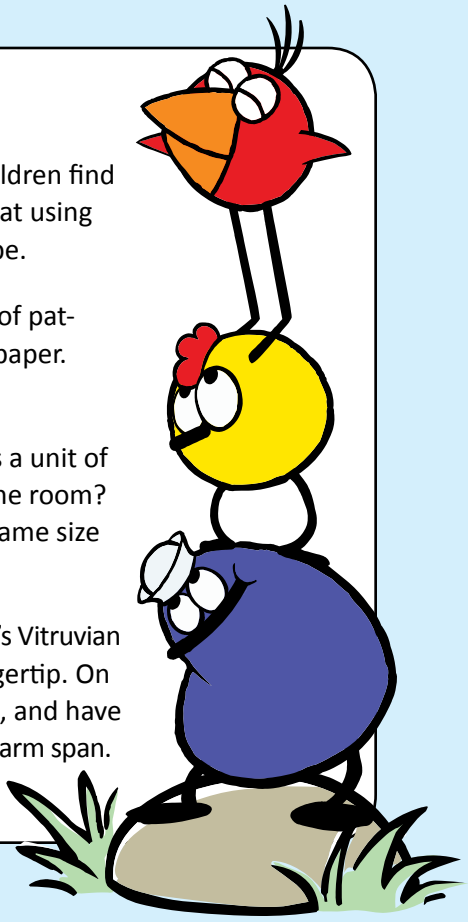
Block Building for Children: Making Buildings of the World with the Ultimate Construction Toy by Lester R. Walker
Block City by Robert Louis Stevenson and Daniel Kirk
Changes, Changes by Pat Hutchins

MATH

Sorting and counting are great ways to develop logic and learn basic math skills. Through play with blocks, colors, and shapes children begin to learn concepts such as classification and ordering.

TRY THESE ACTIVITIES!

- **Likes go together.** Assemble a set of toys and have children find matching toys: cars with cars, blocks with blocks. Repeat using different criteria: match colors, match size, match shape.
- **Design a quilt.** You can use fabric squares in a variety of patterns or triangles and squares cut out of construction paper. Create patterns in a design to mimic a quilt.
- **Body measurements.** Children can use their bodies as a unit of measurement. How many Janes does it take to cross the room? How many hands high is that tower? Is one hand the same size as another?
- **Da Vinci dimension.** The height, head to toe, of Da Vinci's Vitruvian man equals the width of his arms from fingertip to fingertip. On the floor with a piece of tape, mark each child's height, and have students rotate their bodies to compare their height and arm span.



Tell Children

"What color is this? Great! Let's put it with the other (green) objects." Children begin to notice things that are the same and different and learn how to sort them based on color, shape, or size.

"That's OK; let's count again. One, two, three . . ." It's okay to practice over and over.

Tell Parents

We are sorting and counting, so try a home challenge! Ask your child to assemble a collection of toys based on a particular criterion. For example: "Find all of your toys that are red" or "Find all of your toys that fit in this box."

Brain-Building Connection

Math is about counting, classifying, matching, patterning, comparing, and divergent thinking. These mathematical thinking skills build strong brain connections through music, organization, predicting, and problem solving.

Read All about It

Count on Math: Activities for Small Hands and Lively Minds by Pam Schiller and Lynne Peterson
Math Play! (Williamson Little Hands Series) by Diane McGowan, Mark Schrooten, and Loretta Trezzo Braren
Caps for Sale by Esphyr Slobodkina

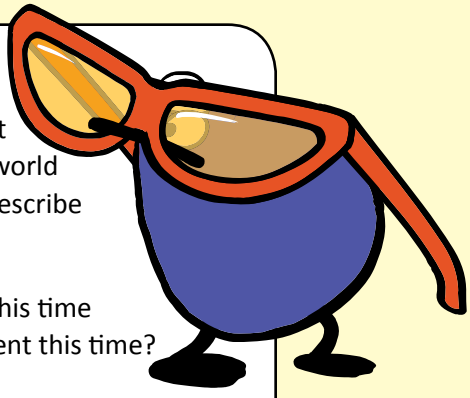
THE FIVE SENSES

Sensory exploration helps children build the basic science skills of observing what is happening and using words to describe what they sense. When children learn with all of the senses, their brain connections are stronger and their memories last longer. The five senses are the most basic way children explore, process, and come to understand new information.

SEEING

In mammals, sight is one of the strongest senses, allowing us to notice color, texture, shape, and movement.

TRY THESE ACTIVITIES!



- **Focused observing.** Using simple materials like a toilet paper tube or roll of paper, have students look at the world through the tube. Stop on one thing and have them describe what they see. Use this activity on a nature walk.
- **Rose-colored world.** Use the same viewing tube but this time cover the end with colored cellophane. What is different this time?
- **Sorting colors.** Have students wear colored glasses like 3-D glasses (not sunglasses) and sort through M&M's or jelly beans. Remove the glasses and see the results.
- **Magnifying views.** Like focused observing, use magnifying lenses to observe an object closely or explore the outdoors, such as a tree trunk, the grass, or under a fallen log.
- **Aim true.** In circle time, roll a ball to another child in the circle, while holding a hand over one eye. "How is your aim?"

Tell Children

"What do you see through the tube?" Encourage children to take their time observing and to use lots of words to describe what they see.

"What else do you see?" This time take the tube away. Looking a second time at the same place will yield new answers.

Tell Parents

Today we explored our sense of sight. Try playing "I Spy" on the way home. Say, "I spy with my little eye," and then give some description of the object, such as "something red," "something square," or "something small." Let your child guess what you are "spying."

Brain-Building Connection

The brain looks for patterns to make meaning and is constantly looking for similarities in our environment. We are more likely to remember it if we've seen it before. Ask children, "Remember last week at the park when we saw a black and white dog?"

Read All about It

Scholastic Reader I Spy Series by Jean Marzollo and Walter Wick
Knots on a Counting Rope by Bill Martin Jr., John Archambault, and Ted Rand
The Eye Book by Theo. LeSieg and Joe Mathieu

HEARING

Hearing helps us gain a sense of our surroundings. It also facilitates communication.

TRY THESE ACTIVITIES!

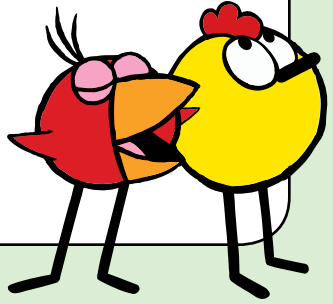
- **Deer Ears.** Deer and other animals are able to move their ears to better judge their environment for dangers. Have children cup their hands behind their ears facing forward and then move their cupped hands in front of their ears facing back. Can they hear a difference?

- **Twist 'n' Shout.** Compare loud and quiet sounds by having children stand and sing a song at normal volume. Have them "twist" down in a crouch and sing the song in a whisper, as they "twist" back to standing they increase the volume.

- **Clap Clap.** In circle time, start a short sequence of clapping and pass it along to each child one at a time so that everyone in the circle has a chance to clap. Try it again with a different pattern and notice if the group finds it easier the second time around. Try the same pattern again only this time make it faster or slower.

- **Match the sound.** Using several matching jars or cans covered so no one can see what's inside, place a few noise making items in each jar. Such as beans in jar one, cotton in jar two, toothpicks in jar three, etc. Put a sample of each item in a line and have children shake each jar to see if the can match the sound to the object.

- **What do you hear?** On a nature walk point out many of the sounds the children are hearing. Bird calls, squirrel chirps, wind in the leaves, car horns, dog barking, train whistle, etc.



Tell Children

"What did you hear?" Encourage the children to use words to distinguish sounds.

"Would you like me to repeat it for you?" Help children remember the clapping rhythm by repeating it.

Tell Parents

Today we explored our sense of hearing. Play a listening game by identifying some special sounds you hear at home.

Brain-Building Connection

Both listening to music and making music build the brain. These activities have a positive impact on expressive and receptive language, speech patterns, and gross motor skills.

Read All about It

I Make Music by Eloise Greenfield
Follow the Drinking Gourd by Jeanette Winter
Come On, Rain by Karen Hesse

TOUCHING

Touching allows us to distinguish fine details our other senses miss. We use our sense of touch to manipulate tools to help us communicate and create.

TRY THESE ACTIVITIES!

- **Mystery objects.** Place a variety of objects in a pillow or similar bag. Invite the children to feel each object and try to figure out what the item is without looking. Pass the bag around so everyone has a chance to feel inside. Use a variety of objects familiar and new.

- **Take the plunge.** Assemble bags of a variety of small items such as beans, sand, mulch, leaves, top soil, (yogurt or similar for the brave); etc. Have children plunge their hands into the bags of stuff. Ask them a variety of questions to stimulate creative thinking: What would you build with this? Who lives in that stuff? Where did it come from?

- **Eye sense.** Using a piece of string, a feather, a tissue or similar; have children hold one hand over their eyes so they can't see and slowly drag one of the items across the back of their other hand. They have to guess which of the three items was used.

Tell Children

"Does it feel like a shoe or an apple?" Give them hints to focus their attention.

"Tell me about it." Ask open-ended questions. You may be surprised by the response.

Tell Parents

Today we explored our sense of touch. Ask your child to name something that is soft, hard, prickly, goopy, squishy, bumpy, silky, or pointy.

Brain-Building Connection

The sense of touch never takes a break. Exploring touch encourages predicting, divergent thinking, memory, and creative thinking by allowing children to learn about their immediate environment.

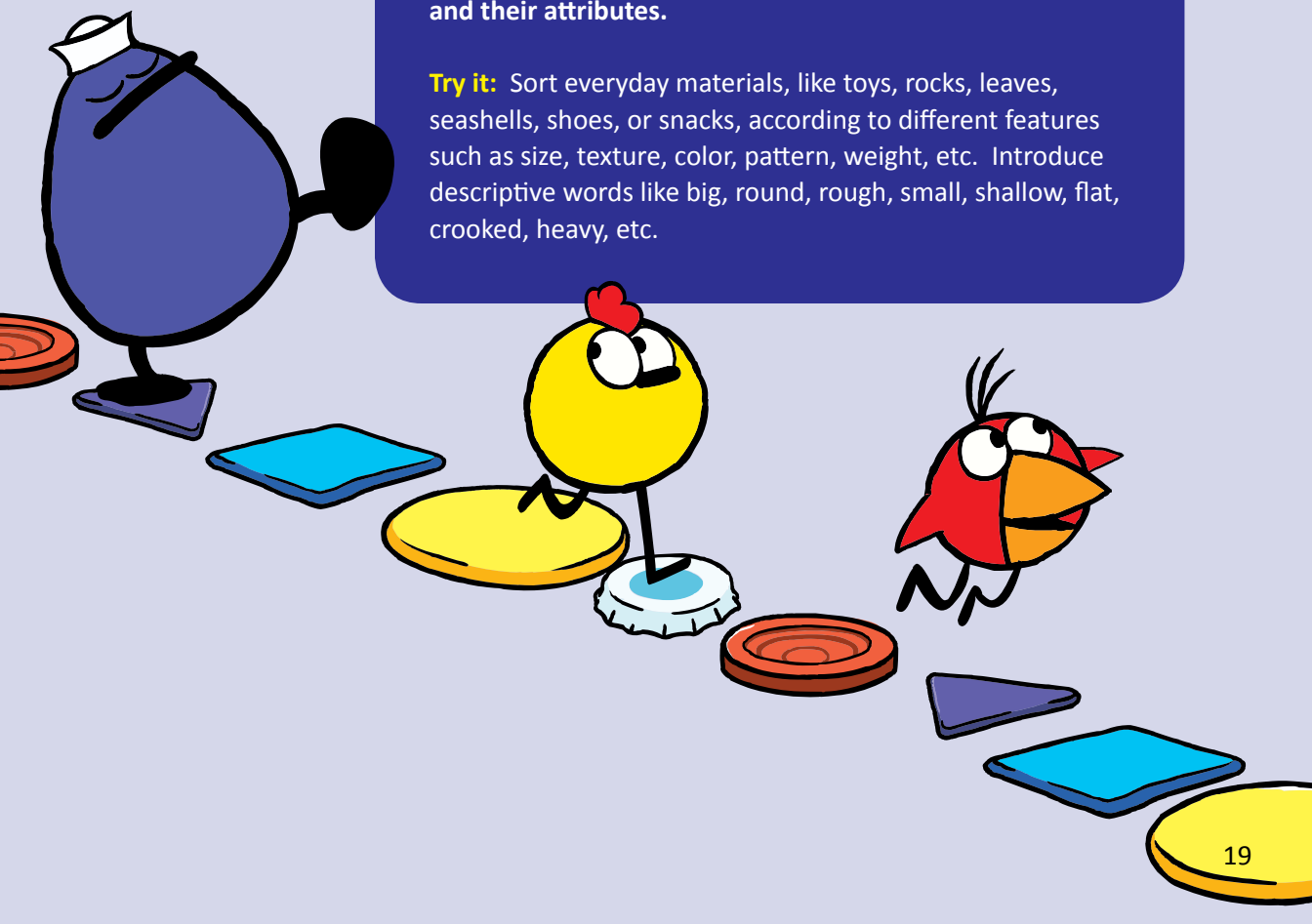
Read All about It

Who Sank the Boat? by Pamela Allen
Boy, Were We Wrong about Dinosaurs by Kathleen V. Kudlinski
The Ocean Alphabet Book by Jerry Pallotta

SENSES ACTIVITY

Explore and describe a wide variety of concrete objects and their attributes.

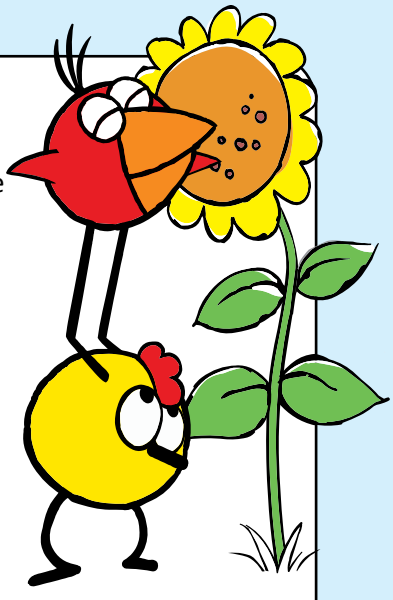
Try it: Sort everyday materials, like toys, rocks, leaves, seashells, shoes, or snacks, according to different features such as size, texture, color, pattern, weight, etc. Introduce descriptive words like big, round, rough, small, shallow, flat, crooked, heavy, etc.



SMELLING AND TASTING

The senses of taste and smell are so tied together that it is almost impossible to explore one without the other. Scent memory is among the most evocative of the senses.

TRY THESE ACTIVITIES!



- **Tasting with your nose.** Hold your nose and put an orange slice in your mouth, chew it a moment. Can you taste anything? Let go of your nose and take a breath. Can you taste anything now?
- **Match the scent.** Using small jars, cotton balls and food flavorings, assemble a series of jars with a few drops of flavoring on a cotton ball to capture the scent in the jar. Place pictures of the various flavors (peppermint, lemon, almond, chocolate, etc.) in a line. Let each child sniff each jar and match the scent with the picture.
- **Create a mood.** Different scents can invoke different moods or feelings. Try placing different spices and foods in your center every day. Ask the students each day, how the scent made them feel: sunny like lemons, warm and cozy like cinnamon, breezy like lavender. What are your best scent memories? What other scents can you create?
- **What is that flavor/texture?** During snack time, arrange a variety of foods in pairs for a taste test. Apple slice vs. orange slice: which one is sweeter or more tart? Cheese vs. cracker: which one is crispier or smoother?
- **"I can taste the roast beef!"** Willy Wonka created a chewing gum that tasted like a three course meal. Have children create an imaginary gum with their favorite meal. What does their gum taste like?

Tell Children

"What do you notice?" When children talk about what they sense, it helps them understand what is going on.

"This is fun, isn't it?" Have fun playing and exploring taste and smell with your children!

Tell Parents

Today we explored the senses of smell and taste. Encourage parents to ask their child about their favorite smells and foods. Teach parents the Willie Wonka game, and encourage them to try it at home during dinner.

Brain-Building Connection

Color and scents work hand in hand to create visual and smell stimulation that generates a positive connection to the nervous system. Scents can improve mental alertness. Lavender can promote calm and relaxation; peppermint can wake you up.

Read All about It

Sid the Science Kid: What's that Smell? by Jennifer Frantz
Sniff, Sniff: A Book about Smell by Dana Meachen Rau and Rick Peterson
Blueberries for Sal by Robert McCloskey

RESOURCES

BUILDING

A Day in the Life of a Builder **by Linda Hayward (Dorling Kindersley, 2001)**
Follow construction worker Jack through a busy workday—from making early-morning phone calls, to keeping dogs from ruining the wet cement, to presenting a finished house to a family.

The Three Little Javelinas **by Susan Lowell (Rising Moon Books, 1992)**
Everyone knows the story of the three little pigs, but now you're going to meet the three little javelinas (pronounced ha-ve-LEE-nas)—lovable, wild, southwestern cousins of pigs.

Paper Tower: **A family science activity (www.pbskids.org/zoom/printables)**
Click on **Activity Pages**. Under **Structures**, click on **Paper Tower**. What's the tallest tower you can build with just two sheets of newspaper? This is an interesting challenge to try with children.

LIGHT AND SHADOW

Guess Whose Shadow? **by Stephen R. Swinburne (Boyds Mills Press, 1999)**
Shadows come in all shapes and sizes. This book invites the reader to guess the objects that make the mysterious shadow shapes.

Nothing Sticks Like a Shadow **by Ann Tompert (Houghton Mifflin, 1988)**
Can Rabbit escape his shadow? "I can if I want to," says Rabbit. "Oh no, you can't," says Woodchuck. The bet is on. Who will win?

Shadowcasting: **An online activity (www.pbs.org/parents/creativity)**
Click on **Creativity Challenge**, then choose **Shadowcasting**. Move the hands into the spotlight. What kinds of hand shadows can you make?

SOUND

Clang! Clang! Clang! Beep! Beep! Listen to the City ***by Robert Burleigh (*****Simon and Schuster, 2009)**
From morning to night, a little boy experiences all the exciting sounds of the city.

The Listening Walk **by Paul Showers (Harper Collins, 1993)**
A father and child go for a walk and listen to the sounds they hear along the way.

Sounds Like Fun!: **An online game (www.peepandthebigwideworld.com/games/soundslikefun.html)**
Click on **Games**, then choose the picture of the beaver on the top row. Click on each animal to turn its sound on or off. Mix sounds and rhythms together.

WATER

A Cool Drink of Water **by Barbara Kerley (National Geographic, 2006)**
Color photographs show people around the world gathering, drinking, and sharing water.

What Is Water? **by Rebecca Olien (Capstone Press, 2005)**
Water is all around—but what is it? Find out the basic facts about this important resource.

WEATHER

Mirandy and Brother Wind **by Patricia McKissack and Jerry Pickney (Dragonfly Books, 1988)**
With the junior cakewalk fast approaching, Mirandy is determined to capture the best partner for the dance. And who is the best partner? The wind, of course!

I Wonder Why the Wind Blows **by Anita Ganeri (Kingfisher, 2011)**
This book is the perfect introduction to our planet, featuring Earth's insides, mountains, stormy rainforests, and much, much more.

Storm Boy **by Paul Owen Lewis (Tricycle Press, 1998)**
After a violent sea storm, a Haida prince washes ashore in an unfamiliar village inhabited by strange, colossal beings. There begins his spiritual adventure.

Science Suppliers

- Carolina Biological Supply Company: www.carolina.com
- Discount School Supply: www.discountschoolsupply.com
- Steve Spangler Science: www.stevespangler.com
- Ward's Natural Science: www.wardsci.com

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Early Childhood Advisory Council to the Massachusetts Board of Education; *Guidelines for Preschool Learning Experiences; April 2003.* Available on the web at: http://fcsn.org/pti/topics/earlychildhood/preschool_learning_eec.pdf

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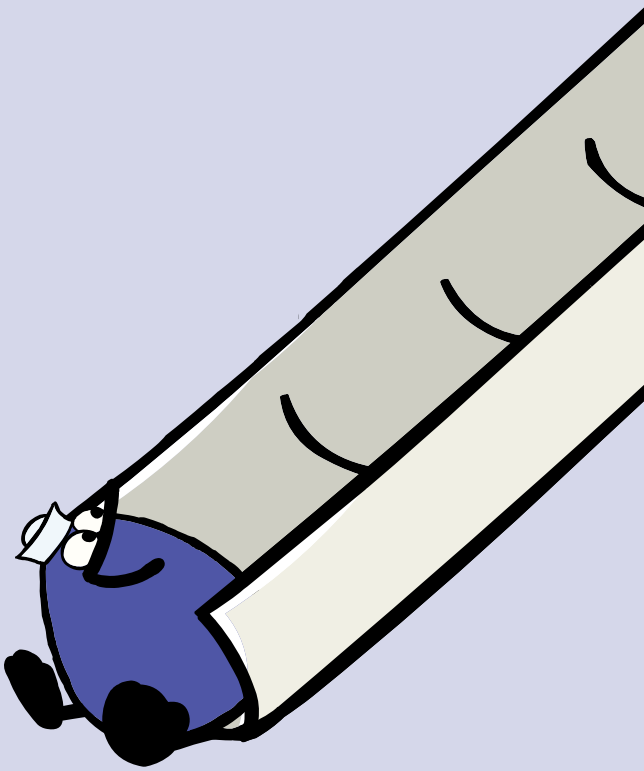

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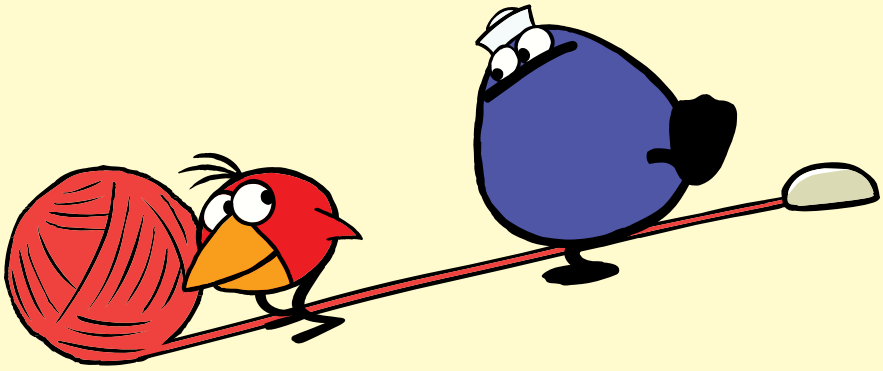

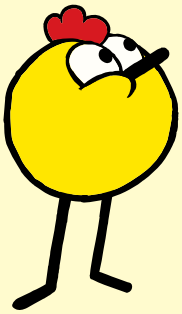

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