**STEM for Preschoolers:**

**Worms, Ramps, and a New Chair for Baby Bear**

Dr. Carrie S. Cutler, University of Houston

[www.carriecutler.com](http://www.carriecutler.com) [carriecutler@hotmail.com](mailto:carriecutler@hotmail.com)

*Children learn best when THEY do the work of exploring, building, trying, failing, and trying again. Just watching a teacher or peer “do” STEM isn’t enough to build habits of mind such as problem solving, reasoning, connecting, and communicating about our thinking.*

**SCIENCE**

**Using the Sensory Table to Learn Science Concepts and Processes**

*Sound* at the Sensory Table

1. Children make shakers by filling empty playdough cans with a variety of stuff (metal washers, cotton balls, rubber pencil erasers, paper clips, etc.) and comparing the sounds.
2. Children slide vibrating and nonvibrating objects down a metal toilet paper holder and compare the sounds.
3. Children use paper towel tubes, pencils, and wooden spoons to beat on empty oatmeal (cardboard), peanut butter (plastic), and soup (metal) and compare the sounds.

*Scent* at the Sensory Table

1. Children dig for craft sticks scented with peppermint extract, vanilla, orange extract and vinegar hidden among unscented sticks. They add their own descriptive words to a poster for each scent.
2. Children squeeze mostly-empty lotion containers to get a whiff of scents.
3. Children dig in scented rice to find themed objects. For example, rice scented with peppermint extract containing holiday miniatures.

*Taste* at the Sensory Table

1. Children use tweezers to pick up ingredients for a custom-made trail mix of raisins, dry cereal, chocolate chips, mini marshmallows, and banana chips. Eat!
2. Children use eye droppers to fill a small cup with juice to taste. Try unusual juices such as carrot, pickle, pear, prune, and grapefruit. Sip!
3. Children use eye droppers to add lemon juice to a cup of sweetened water. Repeatedly tasting the lemonade, children decide when it has just the right flavor for them. Slurp!

*Sight* at the Sensory Table

1. Children practice visual discrimination by sorting dry pasta shapes (bowtie, rigatoni, shell, etc.) into muffin tin cups.
2. Children match up nuts and bolts and screw them together. Then put an eye patch over one eye and have them repeat the activity to observe how the eyes work together for depth perception.
3. Children use eye droppers filled with vinegar to squirt ice cubes made with baking soda and observe the fizzy chemical reaction.

*Touch* at the Sensory Table

1. Children compare and sort strips of sandpaper, fabric, ribbon, and crepe paper by width, color, or texture. Add a laundry basket with holes for children to weave ribbon through.
2. Children use plastic hammers to break ice and free objects frozen in ice cube trays or ice cream buckets.
3. Children squish water beads and shaving cream between their fingers.

**Observation Station Ideas for Preschoolers**

1. Worms—Children use plastic spoons to dig worms from school yard. Place in clear plastic tub so children can see from beneath.
2. Playdough—In cooking center, make a different playdough recipe each day for a week and observe the differences in texture.
3. Pumpkin planter—Hollow out some of the seeds and flesh. Fill with moist dirt and place in sunny spot. Observe how a new pumpkin plant begins to sprout.
4. Frozen squid or fish—Order a squid from the butcher counter at the grocery store. Place the frozen squid in a bin of cold water. Whole frozen or fresh fish are available year-round in the meat department. Children observe anatomy, texture, and scent!
5. Rotting food—Children compare the decomposition of bread, bananas, and fruit snacks.
6. Butterfly feeder—Place feeder outside classroom window for quick observations multiple times a day.
7. Melting ice—As a class, create an ice sculpture with colored water and forms such as bowls and bundt pans. Children observe changes to the sculpture as the ice melts.
8. Pond water—Children use digital magnifier (available at school supply stores or online for about $40) to project the image onto a laptop, projector, or tablet.
9. Tree cookies—Children make an observational drawing of a set of tree cookies and compare the number of rings.
10. Leaves—Children gather leaves from the playground and observe color, shape, texture, size, scent.

**TECHNOLOGY**

**Analog Technology: Tips for Using Ramps**

* Be patient and allow children to figure out how to use the ramps on their own.
* Allow adequate time for children to explore the ramps.
* Build ramps outside, too. Use sand, gravel, water, balls and ice cubes.

**Investigating How a Pulley Works**

* Stack up 4-5 heavy books. Tie together with rope, leaving 6 feet rope dangling.
* Have children try to lift books over their heads by pulling up on the rope.
* Loop the rope over a doorknob. Children take turns pulling down on rope to raise the stack of books.
* Ask: Does it seem easier to lift the books now than it did to push them up with their hands or pull them up using the rope? Why?
* Ask: Where can we put the rope if we want to raise the books over our heads?

**ENGINEERING**

Children identify a problem then use stuff to make stuff that does stuff to solve the problem.

**Engineering Design Challenges and Tips for Preschool Engineering Centers**

**1. Block Center**

a) Supply ample blocks and ramp pieces. A good rule of thumb is 200 unit blocks for a group of 3-year-olds, 300 for 4-year-olds, and 400 to 600 for 5-year-olds.

b) Introduce balls and marbles of varying weights to test ramps.

c) If children do not seem to be visiting the block center, paste children’s photos on blocks to encourage social-dramatic elements such as a castle for Lily and Max to live in or a racetrack for Emily and Carlos to speed around.

d) Use a tabletop fan to test the stability of structures.

e) Take photos of children’s structures and include them in a book that is kept in the center. Children can look through the book to find structures to re-build.

**2. Math/Science Center**

a) Provide children with squeezable condiment bottles and an assortment of items. Challenge children to find out which 3D shapes can be blown across a finish line by squeezing the bottles.

b) Construct a maze by taping obstacles on a tabletop. Blow air to move a ping pong ball through the maze. Use thicker and thinner straws and compare the ease of blowing.

c) How far can you blow the ping pong ball UP an incline? Build a ramp and tape a ruler or number line to the side to measure. Graph the results of ten trials.

**3. Sensory Table**

a) Design a scoop to dig for treasure.

b) Design a pan balance to compare the weights of treasure finds.

c) Design a boat that can carry a plastic animal across the water.

**4. Dramatic Play Center**

a) Engineering Theme: Design and create a toolbox with either a handle that can support the weight of five pounds or a drawer that works.

b) 3 Bears Theme: Design and create a chair that can support the weight of a 5-lb bag of sugar.

c) Pet Store: Design and create a pet carrier for an animal of their choice that can support 5 pounds. Refine the pet carrier design to include a working door and a usable handle.

**MATHEMATICS**

**Wrapping Paper Sets**

Materials: scraps of wrapping paper or wallpaper with repeating items

Instructions: Child circles sets of two objects, such as two teddy bears, two presents, or two balloons—whatever pattern is found on the wrapping paper. Next time, circle sets of three, four, or five. Repeated practice with the same number develops automaticity. The process of circling a set foreshadows addition and joining sets.

**Hole Punch of Fun Counting Game**

Materials: hole puncher, index cards with numbers written on them (don't forget zero!)

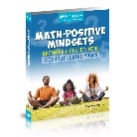
Instructions: Child chooses a card, reads the number, and punches the correct number of holes into the card.

Punching the card supports one-to-one correspondence and counting. The child recognizes the digit and matches it to its value.

**Shark Teeth**

Materials: gray construction paper (one per child), white construction paper folded into triangles (3 per child), scissors, glue

Instructions: Child draws an oval on the gray construction paper to represent the shark’s head. Ask how they might use the white construction paper triangles to make shark teeth. They may do this by snipping the end points of each of the three triangles. Glue the small triangles to the oval. This activity blends art with mathematics and spatial thinking. Snipping the ends of the large triangles makes smaller triangles. So cool! Shapes can be composed of smaller shapes.

Many of these teaching ideas can be found in [*Math-Positive Mindsets: Growing a Child’s Mind without Losing Yours*](https://www.amazon.com/Math-Positive-Mindsets-Growing-Childs-without/dp/1935099841/ref=sr_1_1?dchild=1&keywords=carrie+cutler&qid=1624057047&s=books&sr=1-1)(Cutler, 2020). The easy-to-follow Q&A format tackles more than 100 of the most perplexing questions about helping children with math from preschool to fifth grade. For parents and teachers!