

STEM for Infants and Toddlers: Putting Little Problems in Their Way

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Why STEM? Toddlers can think about problems, build and deconstruct (knock over, dump out), try a plan, revise, and share (show, gesture) their creation or plan. This may not be linear or child may stay in one stage for an extended time. That's okay!

Make STEM DAP for infants and toddlers by providing **tools, time, and support** to:

1. TINKER (use stuff),
2. MAKE (use stuff to make stuff that sometimes does stuff but sometimes is just cool), and
3. ENGINEER (use stuff to make stuff that does stuff).

Why Loose Parts? Infants and toddlers use their **senses** to learn. Because the possibilities with loose parts are endless, children mouth, manipulate, and use the parts in ways that are **DAP** for them. There is no right or wrong as children actively explore their world. **They are in charge** of making objects move, tip over, roll, connect, come apart, and more. Loose parts deepen **critical thinking** as children explore, examine, hypothesize, and challenge all types of situations and little problems. Divergent thinking (the ability to generate new ideas) inspires creativity, imagination, and pretend play.

Loose Parts for Infants and Toddlers

(based on *Loose Parts: Inspiring Play with Infants and Toddlers* by Lisa Daly and Mirian Beloglovsky)

Parts: Sticks, pinecones, leaves (fresh and dry), craft sticks, toothpicks, cardboard tubes, straws, pipe cleaners, wheels, paper plates and cups, chopsticks, loofah sponges, corks, spools, fabric balls, spoons (metal, plastic, wooden), keys, clothespins, magnetic tiles, magnets, tree cookies, seashells, stones, tiles, ribbons, and fabric strips.

Tools: Tweezers, magnifiers, rulers, eyedroppers, turkey basters, tongs, funnels, measuring cups, trays, pan balance, balls, PVC pipe parts, cardboard boxes, pillows, tunnels, ice trays, child-size hammers, unbreakable mirrors, colanders, potato mashers, wooden bowls, flashlights.

Provocations:

1. Arrange items simply and intentionally in open baskets or clear plastic jars.
2. Wait.
3. Observe how children respond to them.
4. Include open-ended items so that children can transform and transport them as they play. Incorporate interesting materials that children can use to design, construct, or make into props.
5. Display items aesthetically (by color, by texture) in groups of 3 or 5.
6. Use containers promote independence or collaboration. Place items on the floor or in open baskets.
7. Allow ample time for children to explore.
8. Include an element of surprise. New and exciting parts, a fabric placemat, empty frames, or a mirror as a work surface, a lambs-wool rug or parachute to sort on, interesting textures, enticing aromas, and stimulating sounds.

Intentional STEM Ideas for Infants

Looking: move **flashlight** as child tracks with eyes, hands, or body; cover end of flashlight with colored film or shine light through colored water-filled bottles; set **colored water-filled** bottles in windowsill; lay out **holiday rope lighting** for child to grip and twist.

Touching: roll a few fabric-covered, wooden, whiffle, and/or yarn **balls in a shallow wooden bowl** then place them on the floor; include wooden blocks to see if the ball can knock the block over; make a simple **maze of pillows** for the child to move the child through; make a mobile by tying **loofah sponges** to a hanger and place at child level.

Hearing: make a **cymbal band** by hanging metal pan lids using metal links and providing spoons of wood, plastic, and metal for exploring sounds; make **shakers** by filling plastic water bottles with craft sticks, sand, metal washers, etc.; place jar lid rings, metal napkin rings and cookie cutters beside a **metal paper towel holder** for sound exploration.

Grasping: tie knots in the middle of **bandanas or fabric napkins** to make them easy to grasp; make small loops in **dog pull ropes** and place 6-8 multicolored **ropes in a basket**; tie **ribbons to wooden rings** for child to hang on a mug holder rack; **silicone cupcake cups, spoons, and whisks** are easy to grasp and mouth.

Stacking: make a stacking center filled with **wooden spools and spool holders, tree cookies, metal cans** with labels removed, and 2" ceramic tiles; all sorts of **blocks** that connect and don't connect.

Sorting and Classifying: colored plastic **milk jug lids, legos, and stones** beg to be sorted by color in cups of a **muffin tin** that makes a clinking sound when dropped in.

Force and Motion: fill sensory table with **kinetic sand, potato mashers, wooden kitchen mallets, and golf tees**; sprinkle **corn starch** on the sidewalk for children to push/pull wooden, metal, and stick-made brooms through; fill metal casserole pans with water for children to "paint" the sidewalk with **paint rollers**.

Transporting: encourage the transporting schema by providing **boxes, bags, purses, backpacks, baskets, and tubs** children can fill and transport around the room or playground.

Throwing: rather than constantly saying "no throwing" provide soft objects and a safe space to practice throwing; open **frames, hula hoops, and wide-brimmed hats** offer a target.

Children's Literature-Integrated STEM Activities for Toddlers

Roller Coaster from *Making and Tinkering with STEM* by Cate Heroman

STEM Concepts: centrifugal force, force, gravity, measurement, motion, scientific inquiry, simple machines (inclined planes), speed, structural engineering, velocity

Materials: pvc pipes, pool noodles, cardboard tubes, wooden ramps, balls, toy cars

Read: *Roller Coaster* by Marla Frazee

Tinker: Look at all the materials. Which things roll?

The Problem: Which ball rolls farthest? How can you change the ramp to make the balls roll farther?

Put a Little Problem in Their Way: Tape a piece of cardboard to block the ramp. Give the child a ball that is too large to fit in the tube.

A Sturdy Nest from *Making and Tinkering with STEM* by Cate Heroman

STEM Concepts: animal habitats, climate, environment, measurement, number concepts, properties of materials, scientific inquiry, structural engineering, problem solving

Materials: shredded paper, pieces of string or yarn, craft sticks, pipe cleaners, sticks and leaves, bird nest to examine (optional) toy bird and plastic eggs

Read *The Best Nest* by P.D. Eastman

Tinker: What do you think you could make with the materials? What do you think a bird might do with them?

The Problem: Can you build a nest that is strong enough to hold the bird and the eggs?

Put a Little Problem in Their Way: Fill the plastic eggs with heavy items or provide a heavier bird.

Open-ended Questions to Stimulate Children's Thinking

- What do you think will happen if _____?
- What can you do to keep your design from falling over?
- How can you make the ball roll all the way through the maze?
- Can you show me?
- Can you show your friend?
- What other way could you do it?
- Why do you think that happened?
- Do you like playing with the parts? Can you play with them in another way? What else could you do with them?