

STEM Learning Through Loose Parts Play and Tinkering

How to Support Your Child's STEM Knowledge and School Success

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About Loose Parts

Children are born naturally creative and eager to explore and interact with the world around them. By introducing children to Loose Parts, or unstructured materials that are found in the everyday world, you, as the adults in their lives, are advocating for their independence and natural drive to learn through play. **The theory of Loose Parts** emphasizes the importance of integrating materials that can be tinkered with, taken apart, and moved around (Gribble, 2013). These materials and the unstructured play they encourage are vital for school readiness and success in science, technology, engineering, and math (STEM) subjects (Blue Mango, n.d).

The following lists of materials are just a few examples of loose parts that allow for deeper creativity and engagement than artificial and plastic toys that serve only one purpose.

Natural Materials



Acorns small to large, David Hill (2012). Used under the Creative Commons 2.0 Attribution Generic License.

When adventuring outside, look for and collect small natural materials that can be used for unstructured play! **These materials encourage exploration of natural science and properties of nature.**

- **Pinecones**
- **Small rocks**
- **Seeds**
- **Leaves**
- **Acorns**

Adapted from Blue Mango (n.d.)

Household Materials



Vintage Sewing Buttons, SEMichel (2009). Used under the Creative Commons Attribution-Share Alike 3.0 Unported License.

Consider saving some of these items from your next trip to the grocery store or take a quick look around your home to see how many you already have.

- **Corks**
- **Bread tabs**
- **Peanut Butter & Salsa Tops**
- **Paper towel & Toilet paper Rolls**
- **Bottle Caps**
- **Buttons**
- **Uncooked Pasta**
- **Keys**
- **Beads**

Adapted from Blue Mango (n.d.)

Questions to Ask Your Child to Support Loose Parts and STEM Play

It's important to model curiosity and analytical thinking in everyday experiences for your child. Allow them to explain their thought processes to you!

Type of Question	What Does This Type of Question Do?	Examples
<i>Attention-Focusing</i>	Teaches younger children how to focus on a task, and simple hypothesis-testing skills	“Did you notice how _____?” “Did you spot when _____ happened?”
<i>Measuring and Counting Questions</i>	Helps children learn pre-math skills and skills valuable in engineering	“How many?” “How long?” “How far?”
<i>Comparison Questions</i>	Naturally comes after measuring and counting questions, allows children to condense what they've learned	“Is _____ different from _____?” “How is _____ similar to _____?”
<i>Action Questions</i>	Encourages children to think about future outcomes of events, make educated guesses, and engage in simple, everyday experiments	“What do you think will happen when _____?” “How do you think it will be different if _____ happens instead?”

Adapted from Boston Children's Museum (2016),
“Family Tinker Kit: Everyday Tools for Play and Learning”, p. 11.



A parent models curious behavior
Taniadimas, 2016. Used under Creative Commons CCo
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Simple Do-It-Yourself Projects that Promote STEM Learning

Many Materials that Encourage Loose Part STEM Play
Already Exist in Your Home!

DIY Tool Kit

The tool kit will teach your child:

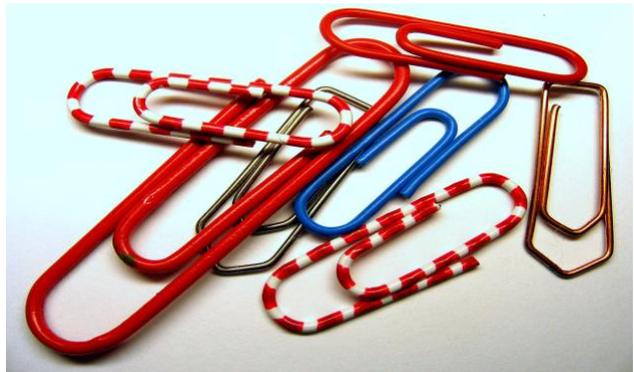
- ⇒ How to manipulate objects of different sizes and understand how they fit together
- ⇒ Basic skills and safety when handling tools
- ⇒ Fine motor skills
- ⇒ Problem-solving skills

Assembling Your Tool Kit

Use loose parts from around your home to create this kit! It is a moveable object that can be brought indoors and outdoors and inspire imaginative, educational play. Consider placing the following items in a tin, pail, or tote for STEM play on-the-go:

- ⇒ Clothespins
- ⇒ Goggles and other protective gear
- ⇒ Washers, nuts, screws, and bolts
- ⇒ Rulers
- ⇒ Paper clips
- ⇒ Pliers, screwdrivers, hammers
- ⇒ Shoelaces
- ⇒ Pom-poms, cotton pads, or balls
- ⇒ Rubber bands or hair bands
- ⇒ Marbles
- ⇒ Pencil and paper for sketching
- ⇒ Tongs

Adapted from tool list in Boston Children's Museum (2016), "Family Tinker Kit: Everyday Tools for Play and Learning", p. 8.



Examples of Different Kinds of Paper Clips
"Büroklammern WbgArchives, 2005. Used under the Creative Commons Attribution-Share Alike 3.0 Unported License.



Examples of colorful shoelaces
"Schnürsenkel in verschiedenen Farben", 1971Markus, 2011. Public Domain.

Simple Do-It-Yourself Projects that Promote STEM Learning

DIY Magnetism Box

Construct a box that is filled with objects that are magnetic and those that are not magnetic to *teach your child about the properties of magnetism*. It is easy to assemble; just gather these items from around your home:

Instructions for the Magnetism Box

1. Assemble the container and wand, covering container tightly with plastic wrap
2. Collect items that are and are not magnetic from around your home
3. Model using the wand on top of the plastic wrap to determine which items are magnetic and which are not magnetic for your child

What Can Your Child Learn from a Magnetism Box? In addition to hours of fun, your child will learn the properties of magnetism, differentiation between what is magnetic and what isn't, fine motor and hand-eye coordination, cause-and-effect relationships, and pre-math concepts, such as patterns and symmetry!

Adapted from
"How We
Montessori"
(2017)

For the container

- ⇒ A cardboard box, using the lid to create dividers OR
- ⇒ Food storage containers
- ⇒ Enough plastic wrap to cover the entire container tightly
- ⇒ Tape (to hold down the dividers OR to connect the separate food storage containers, as well as to secure the plastic wrap on top)



Nut, bolt, and washer, "connectors", S Brennan83, 2016. Used under Creative Commons Shared Attribution 4.0 International License.

For the items inside & wand

- ⇒ Nuts
- ⇒ Bolts
- ⇒ Washers
- ⇒ Screws
- ⇒ Similar magnetized items
- ⇒ Seeds
- ⇒ Acorns and other natural items
- ⇒ Buttons
- ⇒ Pom-poms
- ⇒ Beads
- ⇒ Similar items that are not magnetic
- ⇒ A moderately strong stick (a tongue depressor or a twig from outside will do)
- ⇒ A strong, flat magnet
- ⇒ Super glue or tape to secure the magnet to the stick



"plastic beads", Aney, 2006. Used under Creative Commons Attribution-Share Alike 3.0 Unported License.

Simple Do-It-Yourself Projects that Promote STEM Learning

DIY Water Table

What will your child learn from a water table?

- ⇒ Properties of water, including displacement
- ⇒ Basic concepts of volume and measurement
- ⇒ crucial early math and science skills such as experimenting, observing results, and drawing conclusions
- ⇒ How water flows and moves, and how they can manipulate its movement
- ⇒ Cause-and-effect relationships
- ⇒ Fine motor skills (e.g., precise pouring)
- ⇒ Concepts of buoyancy (whether something sinks or floats) and density

Adapted from Bairaktarova, Evangelou, Bagiati, & Brophy (2011)

The table itself can be made out of several different items. Here are a few examples, but get as creative as you want!

- ⇒ Large, wide plastic containers such as those used for storage
- ⇒ Cardboard boxes waterproofed with duct tape and a white plastic bag
- ⇒ A bathtub
- ⇒ A kitchen sink

Note: Make sure you use food coloring in the water so it is as visible as possible.



Children feel water on their hands. Untitled, Stocksnap, 2017. Used under Creative Commons CCo License.

Fill your water table with different sized items like these

- ⇒ Food storage containers
- ⇒ Measuring cups
- ⇒ Bowls and drinking cups
- ⇒ Items that float and sink; rocks, marbles, pieces of foam pool noodles, bath toys, etc.
- ⇒ Sponges
- ⇒ Funnels
- ⇒ Basters
- ⇒ Droppers
- ⇒ Sifters and colanders

“Children learn most readily and easily in a laboratory-type environment where they can experiment, enjoy, and find out things for themselves.”

- Simon Nicholson, 1972
Developer of the Theory of Loose Parts