

↑ THINK, MAKE, TRY ↓

Pre-Engineering Activities #1

EXPLORATION OF MATERIALS AND TOOLS

When working on engineering design projects, children will have the opportunity to use a variety of materials and tools. Many materials and tools are new to very young children, so it is important to provide opportunities for children to explore the properties of materials (e.g., size, shape, texture) and how they might be used in a variety of ways. The three activities below may be familiar to you — we recommend engaging with them in an intentional way in order to familiarize children with materials and tools. We also recommend prompting exploration through questions to facilitate children's thinking. For example you can ask questions that start with "What do you notice..." or "How do you think you can use that?" And, you can encourage flexibility of thinking by following up with "Can you think of other ways to use that?"

MATERIALS SCAVENGER HUNT

A materials scavenger hunt is a great way to engage children to think generally about the properties of objects, and eventually how they might use those objects in different ways for projects. Go on a search outside or around the house or classroom for different types of materials that children might be able to use to build or create.

1. For very young children, or children new to this type of exploration, you can keep the hunt open ended and simply discuss what children find "What did you find?" You can also facilitate vocabulary development by narrating what they find "I see that you have a stick." And by asking questions about what they notice about size, shape, or texture of objects "Is that soft or rough?" or the malleability of the object "Does it bend?"

2. Use a bag, basket, or box to collect items so that you can sit down together and explore objects more deeply or make comparisons between objects.
3. Present a theme or challenge to guide your hunt - this could be the number of objects (e.g., "Let's find 5 things") or by other properties of objects such as shape, size, color, or texture (e.g., long things, things smaller than your hand, white things, soft things).
4. You can ask children with more experience to imagine different ways to use the materials.
5. Use a scavenger hunt checklist to track what you have explored — young children enjoy checking things off lists!

EXPLORATION OF TOOLS

Mastery of fine-motor tasks like using a glue stick or operating scissors takes practice. Prepare for design challenges by practicing and building skills around tool use.

1. Choose a tool to focus on such as scissors, tape, string, glue, or large clips or clamps.
2. Then collect a variety of paper materials to use with the tool. Recycled materials are great for this; look for things such as junk mail, old magazines, toilet paper rolls, egg cartons, fabric scraps, etc.
3. Explore how the tool works. Encourage reflection about how the tool works by asking questions. For example, when using scissors you might ask "How do you hold the scissors to make it easier to cut? Which types of paper are easy to cut? Which are harder to cut?"

EXPLORATION OF MATERIALS AND TOOLS

4. Use this activity as opportunity to introduce or practice spatial vocabulary. Use words such as on, around, above, below to describe how to use the tools "I see you put the tape around the toilet paper roll."

5. Let it be messy: this activity might involve tape getting stuck over lots of surfaces or paper strewn about. Try not to let your desire for neatness get in the way of children's exploration. Choose a location (which could be outside!) that will allow you to relax and observe while children freely explore the tools.

✓ **Tips:** For very young children, select one tool to explore at a time. As children are older or have more experience, you can try putting out several versions of the same tool for children to explore and compare. For example, you could put out several types of tape to explore such as scotch tape, masking tape, duct tape, or compare liquid glue versus a glue stick. As children gain even more experience they can compare how different tools compare with each other (e.g., tape versus glue). Help children build a growth mindset when they struggle with a task. When something does not work as planned, ask them to consider a different approach "Is there another way you can try to stick that together?" Let them know that it is ok to struggle and that skills are developed with practice...sometimes over long periods of time "Cutting is hard work. Let's keep practicing this another day so that you keep building more skills." Remember that children might use things in unexpected ways — that's ok! Resist the urge to correct them; children will learn more through their own exploration!

ONE OF THESE THINGS IS NOT LIKE THE OTHER

Explore the properties of materials by playing a fun sorting game.

1. Gather a selection of items from inside or outside the house — or use your items from a previous scavenger hunt!
2. Sort and group materials based on different properties such as color, size, shape, texture, etc. You might first ask the youngest children to find all of one type of thing (e.g., "Find all the round things"), and

then move on to higher level categorization (e.g., "Let's sort these by color"). You can sort items into piles on the table or floor, or into different containers such as bowls, muffin tins, egg cartons, or ice cube trays.

3. Use the activity as an opportunity to practice vocabulary by labeling the properties of materials, and encouraging the use of descriptive words such as thick, thin, smooth, rough, and bumpy to describe materials.

✓ **Tips:** For very young children start with just a few items, and ask children what they notice, and then label other things you notice. As children are older or have more experience, you can increase the number of items and level of vocabulary. Then take it to the next level by introducing a few items into sorted categories and ask children to look for items that "don't belong."

THINK, MAKE, TRY® COGNITIVE SKILLS

Executive function: Exploring properties and the ways to use or categorize objects promotes flexibility in thinking. And, using themed scavenger hunts with checklists or tracking specific categories of objects promotes planning and tracking.

Spatial reasoning: Using spatial language (such as above, below, on top) while exploring materials and tools will help children build their spatial reasoning and is an important concept in developing early math skills.

Growth mindset: Children are likely to encounter challenges with the use of new materials and tools. Children can build growth mindset by working on not giving up when something gets challenging. Even if they are not completely successful, let them know it's ok and that they can keep building the skill. Remind them that they might not be able to do the skill "yet" but that through practice they can improve their skills!

