

Engineering Design: Invention Center

Activity Overview

Children engage in the design process as they invent and build imaginative creations. They improve their designs and problem solve along the way as they explore creative ways of expressing their ideas. As they invent, children learn about the properties of different materials and how they can be utilized in new and different ways.

Engineering Practices: Asking questions, defining problems, imagining, planning, creating, improving, using tools to make an invention for a specific purpose.

Underlying Engineering Concepts:

- Engineering starts with identifying a problem and creating and testing solutions and making improvements.
- Different materials have varying properties and can be used for different purposes.

Materials:

Recyclable Materials	Connectors and Tools	Craft Supplies
<ul style="list-style-type: none">▪ Small boxes▪ Empty yogurt containers▪ Egg cartons▪ Paper cups and bowls▪ Paper tubes▪ Spools▪ Packing material▪ Old CDs▪ Parts of broken toys/games▪ Sponge pieces or foam▪ Fun, random "doo-dads"	<ul style="list-style-type: none">▪ Different types of tape▪ Glue▪ Pipe Cleaners▪ Brads or brass fasteners▪ Rubber Bands▪ String▪ Paperclips▪ Hole Punchers▪ Scissors▪ Staplers	<ul style="list-style-type: none">▪ Markers▪ Feathers▪ Stickers▪ Colored paper▪ Fabric pieces▪ Beads▪ Craft sticks▪ Pom-poms▪ Ribbon▪ Googly eyes

Getting Ready:

- Designate an area of the room where you can set up an Invention Center. Keep the materials organized in this area for an extended period of time so that children have multiple opportunities to invent or continue working on projects. Depending on the structure of your program, the Invention Center could be open only at certain times. You may also want to limit the number of children that can be in the Invention Center at one time. Decide what will work best for your situation.
- Organize and label materials so that children know where to gather and return materials. For example, depending on your materials you may sort them by item type, by size, or purpose.
- Decide ahead of time if children will be able to take their creations home.
- You may want to designate a shelf or countertop as a display area for finished creations. Cards containing information about the children's inventions (such as stories, name of the invention, what it's used for) can be included in the display.

→ Engage

- Ask the children if they have ever heard the word "inventor" before. Allow time for children to share their ideas.
- Explain that an inventor is someone who invents, designs, and builds things for a certain purpose. Someone invented and designed everything around us! Discuss some examples from the classroom such as a chair, easel, paper clip, toothbrush, umbrella, or other low-tech everyday objects. Point out how each item is used for a specific purpose or helps people do a certain job.
- Tell the children that today they will get to be inventors! Show the collection of materials and hold up one of the items. Discuss what the item is and where it came from, and then brainstorm all of the things it could become!
 - Example: Paper tube
 - Say, "What is this?" (A paper towel tube). "I don't need it for paper towels anymore, so what could it become now?"
 - Allow children time to brainstorm all of their ideas. They might suggest things like a flag, a telescope, a fire hose, a musical instrument, etc.
- Show the other types of materials, connectors, tools, and craft supplies they can use for their inventions.
- Explain the parameters and any rules of the Invention Center, such as: how many children at a time, when it will be open, clean up procedures, etc.

When the Invention Center is first introduced, children's interest tends to be very high. Therefore, you may want to rotate small groups of children through in order to ensure that everyone has equal opportunity.

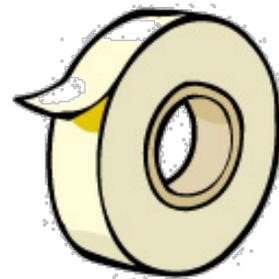
→ Explore

- In the Invention Center, allow the children to freely explore the materials. Allow them plenty of time to simply get familiar with the materials and to create without a structured goal. After gaining experience and more familiarity over time, children will naturally begin to design things with more of a purpose in mind.
- Encourage exploratory play and practice with the different tools rather than pushing children to immediately make something.
- Every child will approach this activity differently. Some children might thoughtfully consider the materials they would like to use, while others will develop their ideas as they go.
- Different types of behaviors you may observe are: repeated use of a tool (such as the hole puncher), using pieces for pretend play without necessarily connecting them, taping lots of things together without a visible goal in mind, adding decorations to objects. These are all part of investigating the possibilities of all of the different materials and should not be discouraged.

Some teachers choose to start off the Invention Center by having all the children make something using the same type of item, for example a paper tube or a paper bowl. This focuses the initial activity. The children's purpose is to transform the paper tube (or other object) into something else. This approach is a good way to introduce the center, but be sure to give children more free choice in the Invention Center at a later time.

➔ Reflect

- To keep children's interest in the Invention Center going, invite children to bring inventions they have made to group time or circle time. When a child is sharing their invention, ask them questions such as: *What is it called? What is it used for? How did you come up with the idea?* As children are exposed to a diversity of creations and ideas, it helps them to develop broader perspectives and give ideas for new investigations.
- The Invention Center offers great opportunity for language development as children describe the properties and attributes of materials and inventions and communicate about their ideas.
- Taking photos of the process of inventing as well as of finished inventions and posting them where the children can see them is a good way to involve children in reflection.



Teacher Tips

Things adults often discard are perfect for young children to tinker with. Seek help from parents to donate and collect unique items to add to the Invention Center. Make sure to check all items for safety.

Be aware that some children may have a desire to hoard certain items and may just want to "take cool stuff home." You will need to handle these situations on a case-by-case basis and be sensitive to the fact that some random "doo-dads" are like treasures to some children.

Involve children in keeping the Invention Center organized so that they take pride and ownership in it. Avoid letting it become a giant mess.

Creative Confidence

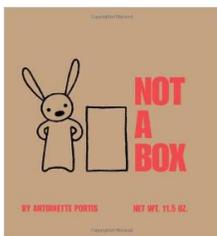
- This is a very open-ended activity that fosters creativity, real-world problem solving, and the spirit of invention.
- When children use familiar objects in unfamiliar ways they are practicing flexible habits of mind.
- Children who engage in this kind of innovative play with a wide variety of materials are forming the basis of lifelong creative talents, like those of engineers and inventors.
- Children "think with their hands." They often don't decide what to make beforehand. Rather, ideas and inspiration come to them as they are "messing around" with the materials.
- Let children know that "copying" is okay. Inventing is often about using another person's idea in your own way.

Ideas for Further Explorations

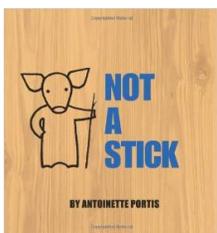
- Introduce suggestions for themes at the Invention Center. For example: a hat, an animal, a vehicle, a game to play, a musical instrument, or a toy. For certain themes, it may be helpful to add specific materials (such as items that could be used as wheels, or waterproof materials).
- For certain projects, a glue gun or other teacher-controlled tools could be used.
- Allow the children to take apart old toys or machines to get an idea of how they work. Make sure all items are safe for them to take apart, and closely supervise during the activity. Provide tools such as screwdrivers. Thrift stores and parent donations are great resources for materials to dismantle.

Some Books to Inspire Little Inventors

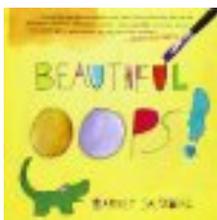
Not A Box by Antoinette Portis. A box is just a box . . . unless it's not a box. From mountain to rocket ship, a small rabbit shows that a box will go as far as the imagination allows. Inspired by a memory of sitting in a box on her driveway with her sister, Antoinette Portis captures the thrill when pretend feels so real that it actually *becomes* real—when the imagination takes over and inside a cardboard box, a child is transported to a world where anything is possible.



Not A Stick by Antoinette Portis again captures the thrill of when pretend feels so real that it becomes real. With a stick in hand, the options are endless—whether it's conducting an orchestra, painting a masterpiece, or slaying a dragon—give a child a stick and let imagination take over and the magic begin.



Beautiful Oops by Barney Saltzberg. A life lesson that all parents want their children to learn: It's OK to make a mistake. In fact, hooray for mistakes! A mistake is an adventure in creativity, a portal of discovery. A spill doesn't ruin a drawing—not when it becomes the shape of a goofy animal. And an accidental tear in your paper? Don't be upset about it when you can turn it into the roaring mouth of an alligator.



Rosie Revere Engineer by Andrea Beaty. Rosie may seem quiet during the day, but at night she's a brilliant inventor of gizmos and gadgets who dreams of becoming a great engineer. But when her contraption doesn't fly but rather hovers for a moment and then crashes, Rosie deems the invention a failure. On the contrary, her Aunt Rose (Rosie the Riveter) insists that Rosie's contraption was a raging success. You can only truly fail, she explains, if you quit.

