

INVENTIONS: BAG OF JUNK

Source: Adapted from an activity, What Can You Invent from a Bag of Junk? on the www.howtosmile.org website, developed by the Smithsonian National Museum of American History

Grade Level: 5-8

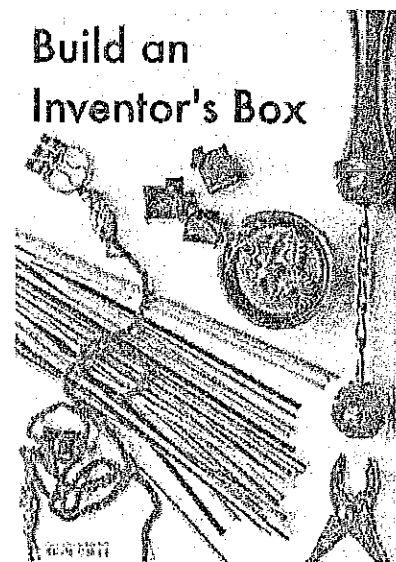
Objectives:

- To encourage youth to tinker, experiment, visualize, and think outside the box.
- To explore the science of invention and identify inventor role models.

Time: Two 30-minute activities

Materials:

- Facilitator Resource, Inventor Stories
- Broken equipment to take apart and put back together (cut off all cords!)
- Tools: screwdrivers, pliers, hammers
- Cool trash: egg cartons, Bubble Wrap, huge appliance boxes, tiny jewelry boxes, and every kind in between
- Watering devices: turkey baster, squeeze and spray bottles, funnel, hoses, straws, pitchers and bowls
- Small stuff: bottle caps, toothpicks, screws, thread, and needles
- Things that roll: marbles, dowels, toy wheels, paper towel and toilet paper rolls, balls, beads, old trike and bike tires
- Sticky, attaching stuff: magnets, clay, glue, tape, paper clips, sponges
- Building materials: blocks, wood scraps, tiles, plastic wrap, Popsicle sticks, wire, clay



Background:

When children pretend, build with blocks and boxes, solve puzzles, take things apart, or rig a new way to do something, they are practicing flexible habits of mind and making important new connections. Children who engage in this kind of thoughtful play with a wide variety of materials are forming the basis for lifelong creative talents, like those of inventors.

Preparation (before the session):

1. Place an identical collection of items in individual paper bags for each youth.
2. For the second activity, be sure to have common materials such as newspaper, cardboard, aluminum foil, Styrofoam, pipe cleaners, etc.

Procedure:

Part One: What Can You Invent with a Bag of Junk? (30 minutes)

1. **(Engage and Connect—2 minutes)** Begin by asking:
 - Who can name an inventor and something that person invented? (Hear a few examples.)
 - Can you imagine ever inventing something?

Explain that inventors sometimes stumble upon their inventions. Often they were just tinkering, experimenting, or visualizing a different way of doing something. (Note: read one of the descriptions of the inventor and their invention from the Facilitator Resource.)

2. **(Introduction and Set Up—3 minutes)** Say something like:
 - This is going to be an opportunity to tinker around with stuff.
 - I'm giving each of you the same bag of junk.
 - Take the things out and mess around with them.
 - See if you can create or invent something interesting or useful out of your junk.
 - You'll have 15 minutes or so to just play with this stuff and be creative.
 - Later, each of you can show what you put together.
3. **(Creating and Inventing—15 minutes)** While the youth are tinkering, walk around, observe, show interest, and be supportive.
4. **(Display and Discuss—10 minutes)** Ask participants to take turns sharing what they created or invented. Process with the following questions:
 - How was the tinkering? Did you enjoy it? Was it easy or challenging?
 - How often do you tinker with stuff? Day dream or fantasize? Notice interesting things around you? Have creative ideas that get you excited?

Read about another inventor and their invention. Explain that many inventors recall playing a lot and being creative as children. They say they still "play" as adults.

Part Two: Experiment with One Material at a Time (30 minutes)

1. **(Introduction and Set Up—5 minutes)** Before the session, place common materials on a table: newspaper, Styrofoam, cardboard, aluminum foil, rubber bands, pipe cleaners ... Remind participants of the activity where they tried to create something from a bag of junk. Tell them that today they will try tinkering again but this time with only one material. Ask them to come to the table and choose a material.

2. **(Tinkering with One Material—15 minutes)** Distribute paper and pencils. Give the following instructions:

- Take your test material: fold it, wet it, stretch it, tear it, pull it apart, put it back together, draw on it, heat it (with supervision!), cool it, play with it, and pretend with it.
- Make notes about the different things you make with your material.
- You have about 10 minutes.

Allow more or less time depending on the level of engagement. Get everyone's attention and ask:

- What different things you did you make with your material?
- How did it change each time?

Now tell the group to go to the table and get a few other materials. Give these instructions:

- Try adding just one other material to it and see what you can create.
- Then try adding connecting materials—things like foil, cardboard, rubber bands—with household objects to make a device that: waters a plant, feeds a pet, turns out a light.

3. **(Display and Discuss—10 minutes)** Ask participants to take turns sharing what they created or invented. Process with the following questions:

- How was the tinkering with just a few objects?
- Who had a great idea that needs a little more work?
- How often do you notice something interesting when you're out in nature—at the park, by a lake, at a zoo, etc.? (Get some examples.)
- Are there things in nature that might inspire part of a future invention?

Facilitator Resource: Inventor Stories

Newman Darby—Sailboard

Newman has been building boats since he was a boy. He experimented with different ways to steer a boat. He discovered that he could steer a boat by just tipping the sail left or right. From there, he tested different-size sails. His most important invention (or innovation) was a universal joint. It worked like a joystick, connecting the sail to the board. This allowed for greater control of speed and steering.

Krysta Morlan—Cast Cooler and Waterbike

As a teenager, Krysta had to spend months with her legs in casts. She came up with two great inventions to help with her recovery. The first one is her Cast Cooler. It's a system that keeps skin cool and comfortable while bound in a cast. The second, called the Waterbike, is an underwater bicycle used for physical therapy—or just for fun.

Art Fry—Post-it Notes

Art got a batch of “bad” glue that was super weak instead of super strong. In the past he had thought it would be cool to create a bookmark that you could just peel off. After playing with the weak glue for a while, he realized it had possibilities for his peel-off bookmark idea. Instead of tossing the sticky stuff, he used it to invent Post-it Notes.

Stephanie Kwolek—Kevlar

Stephanie worked in a lab and experimented with materials every day. She discovered Kevlar when she realized that a plastic solution she often studied was acting “different.” The material was super tough and superlight. She ended up with Kevlar, a chemical fiber best known for its use in bullet-resistant vests. As a young girl, Stephanie liked to spend time exploring in the woods. She also designed and sewed her own clothes.