

# Activity 2: Inventing a Better Lunchbox

## Introduction

You probably have a lunchbox that is used to protect your food at school. Imagine you are on a long field trip to an outdoor place at the end of the school year. Or you are a soccer player and have long practices on hot days. Will the food in your lunchbox go lukewarm before you eat it? Have you ever wished for a better lunchbox in the summertime? Well, the “Eat it!” category focuses on inventions that involve food/water or agriculture. In this activity, you will experience one such invention project by creating a lunchbox that can keep food cool for a longer time. You will develop the hands-on skill of using common materials to create a better-insulated lunchbox. This activity will take about 30 minutes, or you can take as long as you want. Have fun inventing!

## Activity Guide

### Materials

- Container (any container that you want to convert into a lunchbox; e.g., cardboard box, bag, metal box, or even a lunchbox, etc.)
- Materials that you can find (e.g., newspaper, cotton balls, packing peanuts, foam, bubble packaging, feathers, aluminum foil, felt, etc.)
- Plastic bag that closes tightly
- Something frozen (ice pop, ice cube, etc.)

### Design Instructions *(This is adapted from PBS Kids’ Design Squad activity “[Build a Better Lunchbox](#)”)*

1. First, let’s think about the lunchbox you have and how it helps keep food cold/warm. Grab your own lunchbox and examine it carefully. Do you notice any insulation materials used in it? Why are some lunchboxes made with insulation materials? Record your findings.
2. You may already know that insulation materials can minimize heat transfer. What is heat transfer? Basically, heat energy tends to move from hot objects to cold ones. Heat transfer occurs in three ways: conduction, convection, and radiation. Insulators are materials that transfer heat slowly, whereas conductors are materials that transfer heat fast! Materials such as bubble wraps or packaging peanuts can trap air inside, which helps to insulate, or minimizes heat transfer. Air is an excellent insulator!

Watch [The Science of Keeping Cool](#). This is a five-minute video about an invention designed to help soldiers stay cool in extremely hot desert

environments. This video explores how the U.S. military is researching, designing, and testing clothing that helps to keep soldiers from overheating during long days in extremely hot environments.

In fact, you probably already use materials that minimize heat transfer every single day. You just never thought about them in those terms. For example, have you ever used oven mitts to remove a hot tray from the oven? The oven mitts act as thermal insulators, minimizing the transfer of heat from the tray to your hand. Have you ever used a foam sleeve to keep a soda can cool on a hot day? Then you've used an invention that minimizes the transfer of heat from the air surrounding the can to the cool beverage.

3. Next, let's examine the materials you've gathered to help us plan what we can do. It's important that inventors know their materials! Look through the materials you have and consider these questions:
  - a. Think about the container that you think you can use to create the lunchbox. Which one would be better, a conductor or an insulator?
  - b. Think about the materials that you plan to put inside the container to help with insulation. Should they be conductors or insulators?
4. Draw your ideas for your lunchbox design. Which container do you plan to convert to the lunchbox? What materials do you plan to put inside the lunchbox to help insulate?
5. Now let's assemble the lunchbox:
  - a. Choose the lunchbox. Insulate the lunchbox by covering the bottom half of the lunchbox with the insulation materials you've chosen.
  - b. Put the ice pop inside the lunchbox. Place at least one layer of insulation material both underneath and above the ice pop, respectively, to minimize heat transfer.
  - c. Be creative in making the inside of the lunchbox more insulated. You can crumple the materials to trap a lot of air, make multiple layers of insulators, etc. Be creative and have fun!
  - d. Close your lunchbox. Remember, this is a lunchbox and you need to carry your food somewhere!
6. Test your invention: wait 30 minutes and open your lunchbox. Is your ice pop still frozen?
  - a. Yes? Eat your treat.
  - b. No or not satisfied? Try again!