

COOL TO CARRY

Target Audience:
Students, ages 7–10

STEM²D Topics:
Science, Design





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Cool to Carry is part of the STEM2D Student Activity Series. The content and layout were developed by the Smithsonian Science Education Center as part of Johnson & Johnson's WiSTEM²D initiative (Women in Science, Technology, Engineering, Mathematics, Manufacturing, and Design), using a template provided by FHI 360 and JA Worldwide. This series includes a suite of interactive and fun hands-on activities for girls (and boys) ages 5–18, globally.

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Credits:

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Cool to Carry

Challenge

Design, build, and test a food storage container to help keep food cool.

Target Population

Students, ages 7–10

Activity Description

In this task, students will explore different types of insulation that may help keep food at a certain temperature over a specific length of time. Many countries' food safety guidelines suggest that refrigerated foods should not be left out at room temperature for longer than two hours, and when the temperature is above 32°C (90°F) it should not be left out for longer than one hour. To avoid the "danger zone" when food can grow dangerous levels of bacteria, the safest temperature for cold food is around 5°C (41°F) or below, and for hot food it is around 60°C (140°F) or above.

Materials for Each Student

For the class

- As many miscellaneous insulation materials as possible. These can include cotton balls, newspaper, aluminum foil, wool, bubble wrap, coffee cup sleeves, cup lids or plastic wrap and rubber bands to make a lid.

For each group of 4 students

- Design a Device Student Sheet
- 1 plastic cup
- 1 Styrofoam cup
- 1 paper cup
- Tape
- Safety thermometer
- Cold water (with or without ice)



Estimated Materials Cost

Materials should cost around \$1 per student. Using recycled materials such as used newspaper or bubble wrap for the insulation materials will keep the cost low.

Explaining the Problem Conversation Starters

- Have you ever used something to keep food cool?
- How far do you travel to purchase food?

Step-by-Step Instructions

1. Divide the class into groups of 4 students.
2. Explain that they will be designing a solution to the following problem.
 - o Sasha goes to a grocery store to get food. The store is 3 miles (5 kilometers) away. Sasha doesn't have a bicycle or a car and must walk to and from the store, partly down a dirt road and partly on a sidewalk. The temperature lately, because it is late summer, has been above 90°F (32°C). Sasha wants to build a carrying container that will keep her food cool. It takes Sasha about an hour and a half to walk to and from the grocery store. What material would you suggest Sasha should use to keep her food cool?
3. Discuss the Conversation Starters.
4. Give a copy of the Design a Device Student Sheet to each group.
5. Instruct students to look at the materials provided for the activity. Ask them to select a plastic, paper, or Styrofoam cup and then draw a design of an insulated food storage device to keep Sasha's food cool in the cup while she is walking home from the grocery store. Give students 5 minutes to draw their design.
6. Hand out 1 plastic cup, 1 paper cup, and 1 Styrofoam cup to each group. Explain to students that they now will have 5 minutes to build the design they drew.

7. Draw the Testing Temperatures Record Sheet on the board or on chart paper. Make sure to have one row for each group.

Testing Temperatures Record Sheet				
Group Number	Materials Used	Initial Temperature	5-Minute Temperature	10-Minute Temperature
Group 1				
Group 2				
Group 3				

8. Give 1 safety thermometer to each group.
9. Ask each team what materials they used in their device design and record it on the Testing Temperatures Record Sheet.
10. Fill each cup with cold water. (Preferably at 40°F [4.4°C] or be low—use ice or a refrigerator/freezer if necessary. If you use ice, you can also visually see how quickly it melts in some of the cups.)
11. Have students take an initial temperature reading and record it on the Testing Temperatures Record Sheet.
12. Have groups take the water temperature again at 5 minutes and 10 minutes after the initial temperature, recording the temperatures in the correct column on the Testing Temperatures Record Sheet.

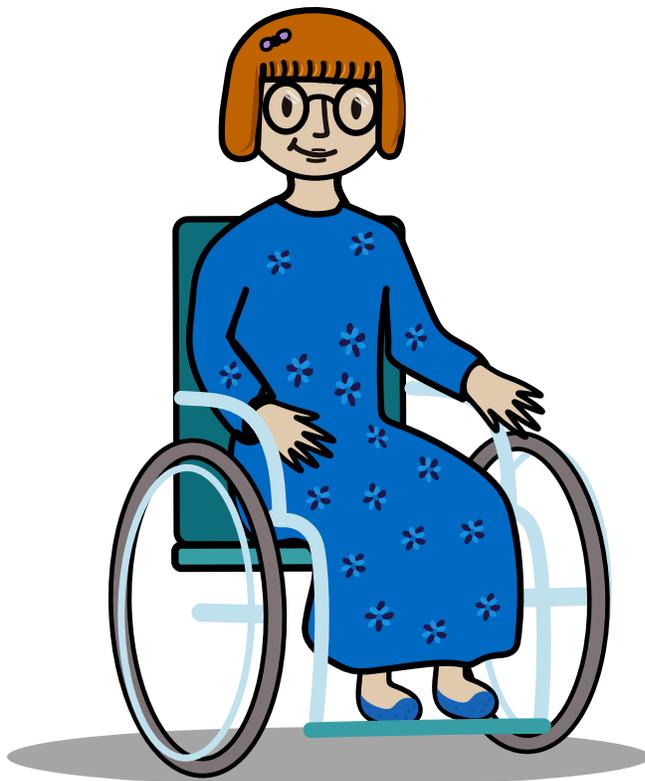


13. While teams are testing and recording their water temperatures, discuss the different types of insulators. For this activity teams used plastic, Styrofoam (polystyrene), and paper cups in addition to insulators. Discuss how these insulators can keep the water cool. Use the following questions to guide the discussion.
- o What if we placed a lid on the cups?
 - o What if we put a sleeve made of a different material on the cups?
 - o What if we placed a cup in a larger cup with cotton, wool, air, or aluminum foil between them?
14. Compare and contrast the groups' results and decide which material the class would suggest Sasha use, and why.

Vocabulary

Insulator: a material that blocks or slows heat transfer

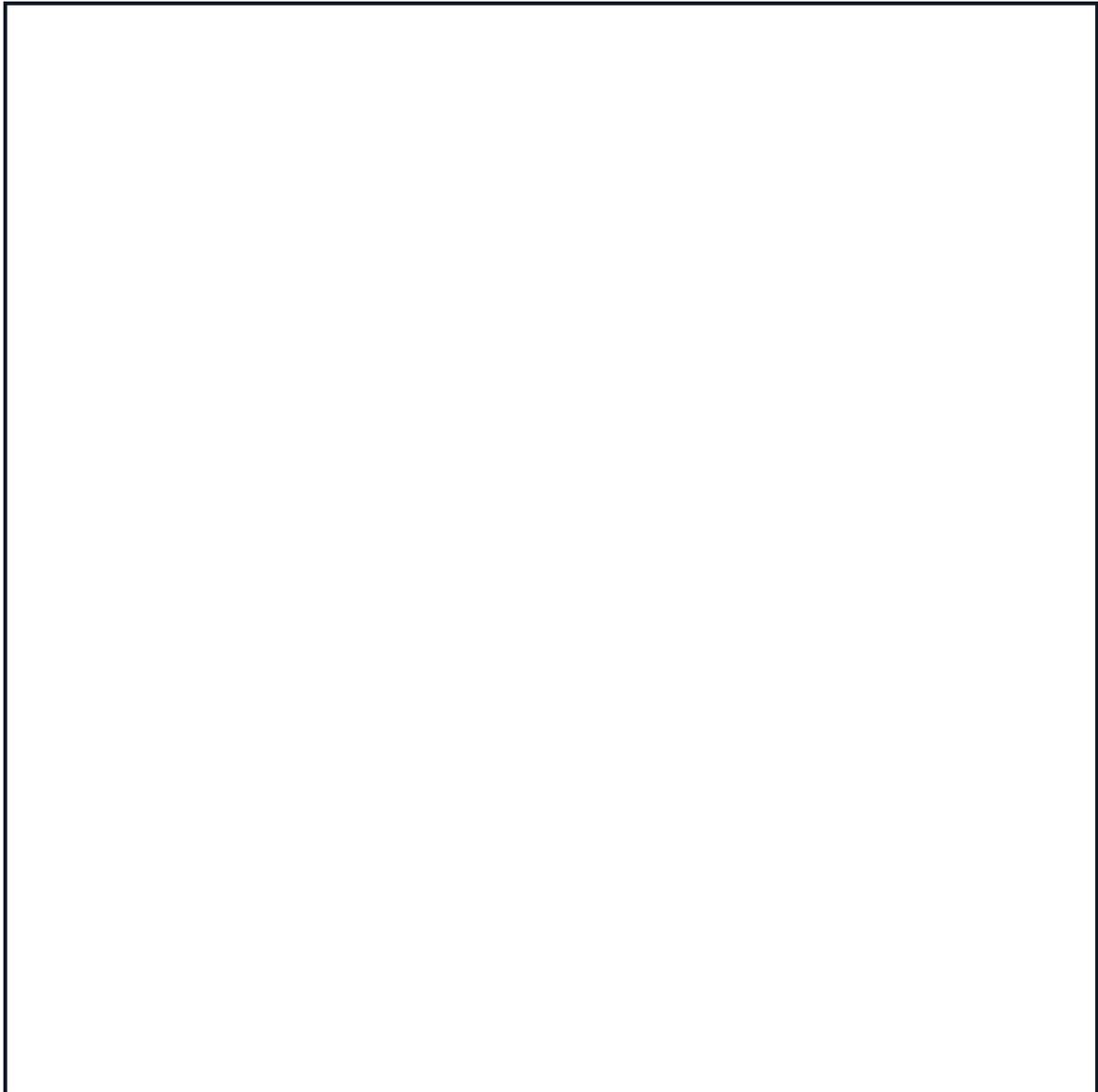
Styrofoam: a commonly used name for white foam used in food containers



Design a Device Student Sheet

Group members: _____

Design



Materials used



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