Solar Ovens

Solar Ovens Lesson 9: Insulation

AUTHOR: Debbie Abel

DESCRIPTION: Students will learn about the importance of insulation in a solar oven. They will use their own background knowledge, as well as observations of insulation used to contain thermal energy, and determine how this will be incorporated into solar ovens.

GRADE LEVEL(S): 4 and 5

SUBJECT AREA(S): Science

ACTIVITY LENGTH: 00 hours, 45 minutes

LEARNING GOAL(S): Students will learn that they can increase the temperature inside of their solar ovens with insulation. Students will determine what makes a good insulator. Students will make observations about different types of insulators. Students will discuss real world examples of insulators.

STANDARDS MET:

Next Generation Science Standards:
4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

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BONNEVILLE ENVIRONMENTAL FOUNDATION
240 SW 1st Avenue
Portland OR 97204
503-248-1905
www.b-e-f.org

Student Background:

Previous lessons about solar energy and observations of solar ovens.

Educator Background:

The ovens need to have a large “window” for sunlight to enter without causing shade patches. Also, if the oven is too deep, patches of shade will cool the food down.

Materials List:

- A thermos, cooler or other item insulated item and a similar item that is not insulated (For example, an insulated water bottle and an un-insulated water bottle.)
- A variety of pictures of insulated items (fridge, cooler, thermos, home insulation)
- About 10 ice cubes

Vocabulary:

- Insulation: Material added to something to stop heat, electricity or sound from going into or out of it.

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Lesson Details:

- Question of the Day/Exit Slip: What are some examples of insulation and how could you use them in a solar oven?
- **STEP 1**: Work as a class to create a vocabulary web for insulation. (Use one of the blank pages in the back of the Solar Energy Student Workbook for the word web.)
- **STEP 2**: Show the photos and talk about the different uses for insulation. Sometimes things are insulated to keep items warn, while others are meant to keep things cool. Some items are meant for both warm and cool items.
- **STEP 3:** Show the thermos, and talk about how they are used to keep items close to the temperature they started. Hot items remain hot and cold items remain cold.
- **STEP 4**: Work with students to fill out page 14 in their student energy workbooks.
- **STEP 5**: Discuss with students possible items to use as insulation in their solar ovens.
- Note: You could again use the example of the greenhouse effect to talk about insulation. Discuss with students the temperature that the Earth would be without clouds. This could also be an introductory piece or “hook.”