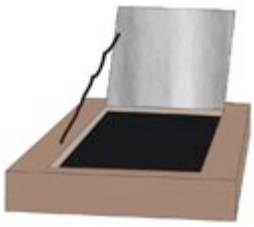
ORLANDO SCIENCE CENTER

STEM Night: Family Take Home Activity

Solar Ovens



Objective: Make your very own solar oven – and use it to make 'smores!

Materials: cardboard pizza box, aluminum foil, plastic wrap, black construction paper, newspaper, scissors, tape, ruler or stick, plate, graham crackers, chocolate bars, marshmallows.

FCAT Vocab: thermal - having to do with heat; energy -usable heat

Procedure:

1. **Ask**: how is food cooked? What do ovens, microwaves, and toasters all have in common to help them cook food?
2. **Imagine** how you could use heat from the sun to cook your own food. What kind of contraption would you build? How would it work?
3. **Design** and **create** your solar oven using your gathered materials.
   - **a.** Cut a flap on your pizza box lid. The flap should face the pizza box opening. Leave an inch between the sides of the flap and the edge of the lid.
   - **b.** Which material will reflect light from the sun? Wrap a sheet of this material around the flap.
   - **c.** The flap will leave a square opening on top of your pizza box. The sun's light will be reflected from the flap through this window. What material can you wrap on top to allow sunlight to pass through?
   - **d.** The bottom of the pizza box needs to absorb heat. This will help the food cook faster. What material can you tape on the bottom to absorb heat?
   - **e.** The oven needs a little more insulation. What material can you roll up, place on the bottom of the oven, and form a border around the cooking area?
   - **f.** The oven needs to stay open so sunlight can be reflected on the flap. What can you use to prop your oven open?
4. **Test** your design. Take out your solar oven on a sunny day between 11 am and 3 pm. Adjust the flap until as much sunlight as possible is reflected on the oven panels. Put a graham cracker, a chocolate bar, and a marshmallow on top of a plate on the bottom, in the insulated area. See how long it takes for the chocolate bar to melt!
5. **Improve** your design while the 'smores are cooking. Adjust the flap to let more sun in, change insulation materials, or move the oven to a sunnier spot if the 'smores aren't cooking!

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Discussion:

How can you cook food without electricity?

For centuries, people found ways to cook food without modern conveniences such as electric-powered stoves, microwaves, and ovens. Instead, they depended on other heat sources, such as fire, to cook their food. More recently, people have developed solar ovens, which harness heat from the sun and use that energy to cook food.

How do solar ovens work?

Solar ovens capture energy from the sun and use the heat to warm up food. To capture the sun's energy, solar ovens must *reflect* sunlight onto the food. This is done using aluminum, mirrors, or other reflective material to bounce the sun's rays onto the food. The oven converts the sunlight into **thermal energy**, or power made from heat.

Solar ovens must also *absorb* sunlight to make the oven hot enough to cook food. Black surfaces are used to absorb as much heat as possible. Solar ovens must also hold on to this solar heat by using *insulation*. Cardboard, newspaper, and other insulation can be used to prevent the heat from escaping the oven.

How can you improve your solar oven?

Solar ovens can only reach about 200 to 250 degrees in direct sunlight, which means they will cook food slower than conventional ovens will. In order to reach this maximum temperature, solar oven engineers must make improvements to their technology. Some improvement tips include making the reflective surface movable, so that it can be moved if the sun moves in the sky; adding plastic covers to trap heat; and adding more insulation material to the inside of the oven.

Web Resources:

- http://www.solarcooker-at-cantinawest.com/pizza_box_solar_oven.html
- http://www.hometrainingtools.com/build-a-solar-oven-project/a/1237/bhcd2/1262811159/
- http://www.teachengineering.org/view_activity.php?url=http://www.teachengineering.org/collection/cub_/activities/cub_energy2/cub_energy2_lesson09_activity3.xml