



Lesson Plan: Cooking with the Sun

Big Idea: You can collect energy from the sun, convert it to electricity, and store it for use at night or on cloudy days.

Learning Goals:

- Children will be able to describe the sun as a source of electrical power.
- Children will discover that you can use the heat produced by the sun to cook food by building an oven out of a pizza box.
- Children will consider aspects of the pizza box oven's construction, and speculate as to how they work.

Related Cyberchase Episode: "Going Solar" (Ep. 902)

Grades: 3rd - 5th grade

Materials:

- "Pizza Box Oven Directions" handout (included)
- Pizza box
- Aluminum foil
- Packing tape
- Black construction paper
- Glue
- Safety scissors, appropriate for children
- Box cutter (adults only)
- Stick or ruler
- Plastic wrap
- Oven mitt or towel
- S'more ingredients – graham crackers, marshmallows, chocolate
 - Feel free to use a healthy alternative if you prefer, such as apple slices, cheese and crackers.

Prep:

- Plan to do this activity on a sunny day.
- Print enough copies of the handout "Pizza Box Oven Directions" for each group.
- Cue up the provided video clip from "Going Solar."

Before Watching the Video Clip:

- Ask students to name items in their household that are powered by electricity. Where does that electricity come from?
- Call attention to the sun as one source of energy. Ask students if the sun can be used to power everyday household items. It can. Direct students to the *Cyberchase* clip to find out how.

Find more math games and activities at pbskids.org/cyberchase

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(Continued)

Watch the Video Clip:

Who's the skateboard champion of Cyberspace? A contest will decide if it's Slider or Hacker. But the power plant at the skate park has been mysteriously sabotaged. Now the CyberSquad must come up with an alternate source of electricity. In this clip, the kids discover the *power* of solar power – using solar panels and batteries to store electricity for later use.

After Watching the Video Clip:

- Have the students tell you what they observed in the video. How do the kids in the clip collect energy from the sun? How do they store it?
- Tell the class that it's possible to use the sun's energy in other ways. Today, they'll learn about *thermal* energy produced by the sun. Note the similarity between "thermal" and "thermometer," and ask students to speculate about its meaning, verifying that the connection is "heat."
- Explain that, instead of using *light* from the sun, solar thermal energy uses the *heat* of the sun to cook, heat water, heat the rooms of a building, or even boil water to produce electrical power.
- Tell the class that today, you'll be exploring and building your own simple ovens, using the sun's heat to create energy to cook food.

Tips for Cooking with the Pizza Box Oven:

- Follow the directions on the next page for making the Pizza Box Oven, observing the following safety precautions: (1) Only adults should use the box cutter. (2) Use care when removing hot food from the oven, and use an oven mitt if needed.
- To increase student involvement, you may wish to have students work in small groups, each group creating its own pizza box oven. Doing step #1 prior to class will make this go more smoothly.
- Once students have completed the cooking project, summarize what they learned by asking the following:
 - Describe what happened in the pizza box oven in your own words. What made the food cook?
 - How did the angle of the flap affect what was happening in the pizza box?
 - Does the color of the construction paper make a difference in the effectiveness of the oven? Will white paper work as well as black? Why?
 - How does weather impact the effectiveness of the oven?
 - What other variables would affect the effectiveness of the oven?

Lesson Extension:

- Ask students to come up with ways to test the explanations they offered above.
- Explore solar panels with simple tools such as solar powered calculators, toys, or lights.
 - Attempt to use the calculators, toys, or lights at the beginning of the day without charging them in the sun.
 - Leave the items in sunlight for the rest of the school day, and attempt to use them again at the end of the day.
 - If using gadgets with multiple solar panels, cover some of the panels with masking tape and compare the power of those with the covered panels to those with all solar panels uncovered.

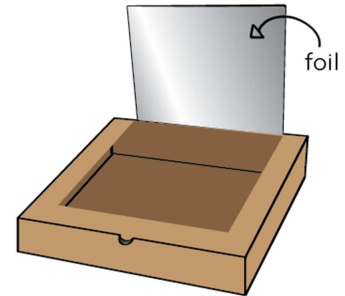


Pizza Box Oven Directions

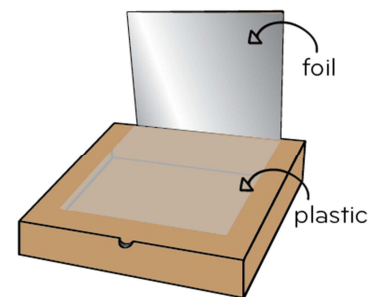
1. Ask an adult to use a box cutter to cut a window in the top of the pizza box, as shown by the dotted lines. Cut along 3 sides of the box, about an inch from the edge. Leave the 4th side attached to the box.



2. Bend the flap back and line its inside surface with aluminum foil, shiny side away from the cardboard. To hold the foil in place, tape it to the back of the flap. *When closed, there will be a "window" in the cover of the box. The flap will stick up.*

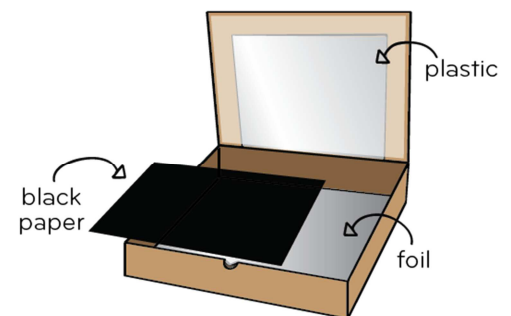


3. Tape clear plastic over the "window" in the lid, allowing a 1-inch overlap on each side. Put tape along each edge to create an airtight seal.



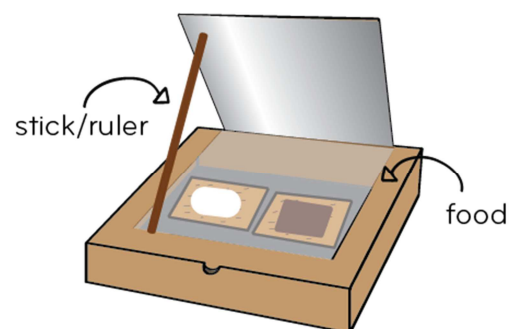
4. Open the box. Glue a piece of aluminum foil to the inside bottom of the box.

5. Next, tape a piece of black construction paper on top of the aluminum foil on the bottom of the box.



6. Place the pizza box outside in direct sunlight. Put the food you want to warm inside the box. Do not stack the ingredients. For example, if you are making s'mores, place one marshmallow on one graham cracker. Place a piece of chocolate on another graham cracker.

7. Close the plastic-covered box lid. Open the foil-covered flap. Tilt the flap until the foil-covered side reflects the sunlight into the pizza box. Use a stick or ruler to hold it in position.



8. Check the oven once in a while, and adjust the angle of the flap if needed. It may take your food up to an hour to get warm. Be careful when you take the food out: it may be HOT.