



Cindy's Corner

Create a Solar Powered Oven out of a Pizza Box



Use a pizza box to make a solar oven that gets hot enough to cook s'mores! Energy can be tricky to teach – it is not something that our students can hold in their hand to explore. The best way to approach the concept is through meaningful hands-on projects that engage students on a concrete level. Solar energy is a good place to start because it provides instant sensory feedback. You can experience the warmth and brightness of the sun by simply going outdoors. Using a pizza box to make a solar

oven is a tangible way to demonstrate how energy from the sun can be used for cooking – and best of all, you get to eat the s'mores!

Here are directions for constructing a solar oven out of a pizza box (adapted from Family Fun Magazine), with suggestions on how to adapt the activity to varying skill levels. You might decide to start with pre-constructed solar ovens. We sometimes think that students need to actively – and independently – participate in each step of an activity to make it meaningful. While this is a noble idea, using a motivating activity for its parts is just as valuable. Construct enough solar ovens as you need to work in pairs, small groups, or individually.



For each solar oven you will need:

- A pizza box
- A craft knife or scissors, ruler and marker
- One sheet of Black construction paper
- Clear plastic (use sheet protectors)
- Clear plastic packing tape

Graham crackers, chocolate bars and marshmallows
 A stick (for propping the flap open)
 Latex gloves if preparing for others

Directions:

- Cut a square along three sides of the top of the pizza box, leaving a one-inch border. Leave the backside of the square intact to make a flap. Note: Parents or staff should do the cutting in advance for safety reasons.
- Fold the cardboard up along the uncut line of the square to form a flap.
- Wrap the bottom side of the flap in aluminum foil, shiny side out. Keep it as wrinkle free as you can.
- Place a piece of pre-cut foil (shiny side up) on the inside bottom of the pizza box.
- Place one sheet of pre-cut black construction paper on top of the foil.
- Tape clear plastic (or sheet protectors) to the underside of the lid to seal the opening created by the flap. Make it as airtight as possible.



For each s'more, place two graham cracker halves on the black construction paper inside the box. Top one with a marshmallow, the other with a square of chocolate.



Close the box and place your oven outdoors in direct sunlight. Use a stick to prop the flap up at an angle that will reflect the most sunlight into the box.



Within an hour (sooner if it's a really hot day), the chocolate squares and marshmallows should melt enough to assemble into s'mores.



At the entry-level, read simple books about the sun and solar energy. Demonstrate that the sun provides heat and light to the earth by going outdoors to feel the warmth and brightness of the sun (Energy in the Earth System). Provide each student with a way to communicate, "I feel the sun," as you move from indoors to outdoors, from shade to sunlight (e.g., use a Mayer-Johnson picture of the sun, pre-programmed switches, or personal communication devices). Focus on entry-level science concepts, such as hot/cold, indoor/outdoor. Use your senses to explore the environment, e.g., the change in surroundings as you move from indoors to outdoors, the difference between being in the shade and the sun, the change in the chocolate as it melts (*Properties of Matter*), the crunch of the graham cracker, and the gooey taste of the marshmallow (*Life Science / Biology*). Reinforce that weather is something that happens outdoors and changes from day to day (*Earth and Space Science*). Activate a talking thermometer to determine the temperature (*using a weather instrument*). Demonstrate that the position of the sun changes throughout the day by physically tracking sunny locations at regular intervals throughout a sunny day. Start with the first place you found the sun. Conduct simple experiments. Put a pan of water in the sun and one in the shade. Compare the difference in how the water feels.

Incorporate basic number concepts and simple counting. Work on *1-to-1 correspondence* by placing one marshmallow or one piece of chocolate on each graham cracker. Incorporate basic *number concepts* by counting out the graham crackers, marshmallows and squares of chocolate. Use the shape of the pizza box, the graham cracker halves and the chocolate squares to reinforce the concept of shape (*Geometry*). Sort boxes of Graham crackers, chocolate bars and marshmallows into like groups (classification). Work on *tactile discrimination* by sorting the foil, sheet protectors, and construction paper. Reinforce *basic spatial, directional and positional concepts* such as, up/down, open/close, in/out, on/off, and top/bottom. For example, "Put the marshmallow on the graham cracker."

Enlist students to help you construct the solar ovens to reinforce functional hand skills. Students working on grasp and release can be in charge of picking up and handing you the materials and tools, as you need them (*Technology / Engineering: Materials, Tools and Machines*). They can help you press the foil around the flap and put the construction paper in the bottom of the box. Students working on following simple repetitive directions can pick up a single ingredient from a tray to pass to a partner for assembling. Open boxes of graham crackers and unwrap chocolate bars to work on using one hand to stabilize and one to manipulate. Model the appropriate grasp to use when carrying the pizza box ovens (palms facing up). Encourage more independent students to construct their own solar ovens. Set out supplies ahead of time and give them a checklist of items to collect (*organizational skills*). Let students follow instructions independently from printed

directions (using the appropriate medium) or provide verbal instructions to the group, one step at a time, with assistance as needed.

This activity might generate lots of interest around school, be prepared! Offer free demonstrations - invite other classrooms to come by to check out the solar ovens. Have your students make the round of classrooms to issue personal invitations using rote scripts, pre-programmed switches, or personal communication devices as needed (*Social Skills & Communication*). Create posters announcing solar oven demonstrations (*Composition*). Prepare mini informational presentations on how a solar oven works (*Language: Oral Presentation*). Offer to go into classrooms or do presentations on site. Have each student communicate one piece of information, integrating switches, personal communication devices and rote scripts as appropriate. Have a school-wide contest to guess exactly how many minutes it will take for the first s'more to melt. Offer a free s'more as a prize. Send a student to deliver it (*Social Skills & Communication*).

Think about starting a related business. You could package the ingredients for s'mores and sell them to students and staff. Set up an assembly line in the classroom. Package two graham crackers, one marshmallow and one square of chocolate (or 10 chocolate chips) into a Ziploc bag). Sell them from a booth in the lobby for a quarter (*money concepts and coin recognition*). Offer to share your solar ovens or rent them out (another business venture!). Post a signup sheet or send a student from classroom to classroom with a clipboard (*Social Skills & Communication*).

Include the solar oven activity as part of a broader unit on solar energy. Use it to learn about the greenhouse effect. Cook s'mores on different days and record how long it takes for the s'mores to melt each time. Make predictions, chart observations and draw conclusions (*Data Analysis, Statistics, and Probability*). Experiment with different foods, such as apples with cinnamon and chocolate fondue. Create information books about solar energy and perform more hands-on solar energy projects.

Compile a list of sun-related vocabulary words and use the project as an opportunity to shape language and generate communication. Follow-up by creating memory books using tangible objects from the activity, e.g., a piece of cardboard from a pizza box, a graham cracker, marshmallow and piece of chocolate (you might want to put food remnants in Ziploc bags so they don't get eaten on the way home!). Expand the activity into the community by shopping for the ingredients and visiting pizza stores to ask for donations of pizza boxes (*money concepts and communication*).

Have fun!