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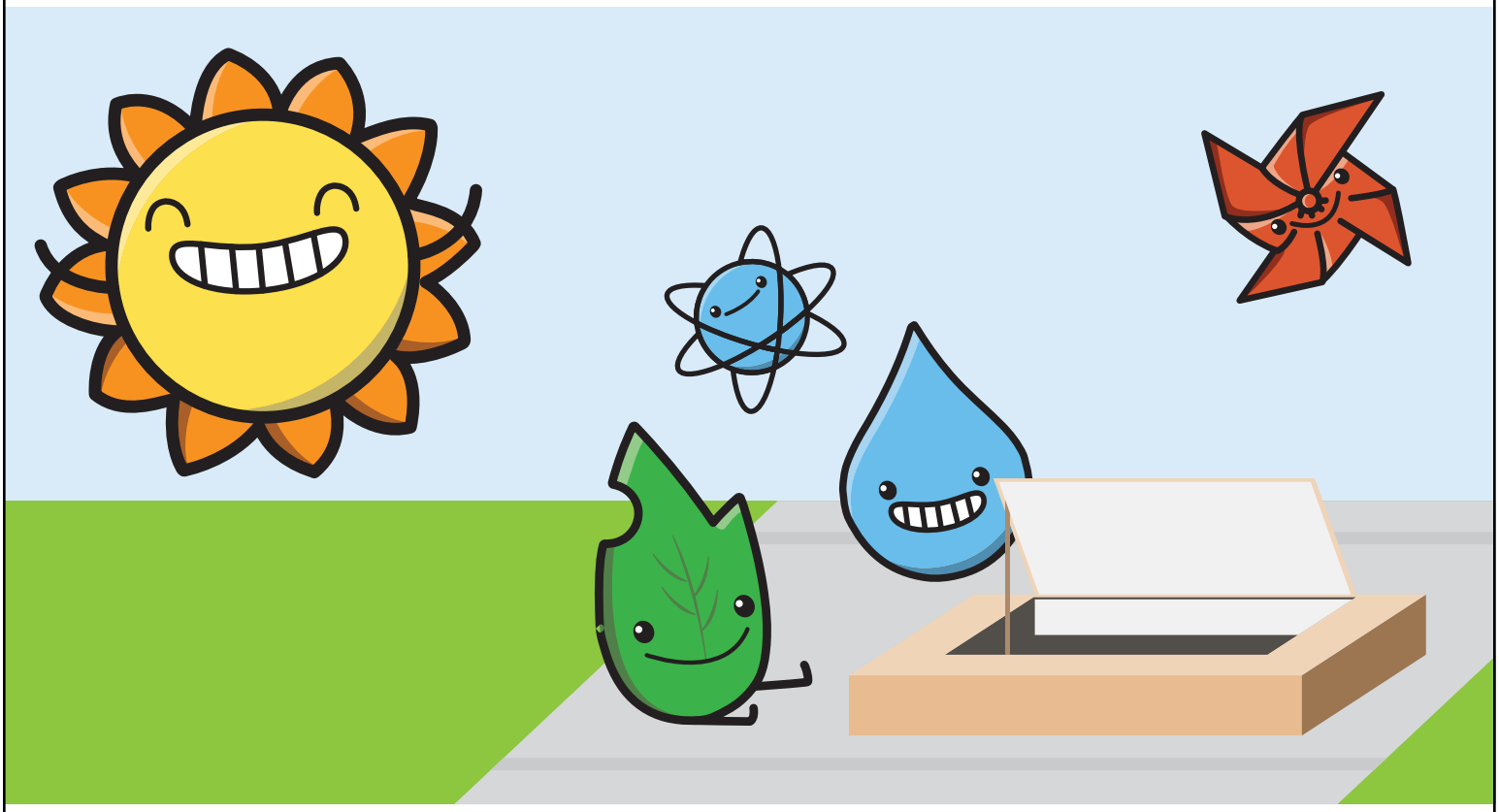
Home Energy Challenge - Solar Cooker Edition

Families work together to explore the sun's radiant energy through hands-on activities, including UV-active solar beads, and building a solar oven.



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Home Energy Challenge - Solar Cooker Edition

What's In The Kit

- Pizza box
- 2 Sheets of black construction paper
- 1 Skewer
- Aluminum foil
- 2 Transparency paper sheets
- Thermometer (for up to 200° F)
- 10 UV solar beads
- Bracelet lanyard

What Else Will We Need?

- Scissors or safety shears
- Tape
- Newspaper, scrap paper, or other "insulation" material
- Other recycled, household, or "found" materials to enhance solar oven design
- Food to cook - s'more or alternative food item such as a hot dog/veggie dog, or nachos
- Meat thermometer (optional)

Background Information & Overview

Every day, the sun radiates, or sends out an enormous amount of energy as light. The sun radiates more energy each day than the world uses in one year. Solar energy is a renewable energy source. Solar energy is also light we can see. This visible light is also called radiant energy. Radiant energy travels in waves, and visible light is just one type of energy that can travel in waves. Radiant energy that reaches the Earth can transform into other forms of energy to allow us to do work such as growing crops, heating water, generating electricity, and more. These activities will explore how radiant energy can be transformed. First, we'll explore how radiant energy can transform into chemical energy with the UV solar beads. The second activity will showcase how radiant energy can transform into thermal energy (heat) in a solar oven. Students will use their observations from activity 1 to find the perfect location for the oven they build in activity 2. What do you say we get cookin'?

Safety Note

The solar oven portion of the activity will require some cutting of cardboard, if completed as directed. Cardboard can be cut with household scissors safely. **Please ask an adult for assistance when cutting or using sharp objects.** Use caution and cut away from the body. For even safer cutting for younger students, safety/trauma shears or cardboard cutting safety tools are recommended.

Home Energy Challenge - UV Solar Bead Activity

When radiant energy travels to Earth it is either absorbed or reflected by the ocean, the land, living things, and other surfaces. However, radiant energy from the sun is not just visible light that we see, it's also traveling with other types of energy or rays.

When some surfaces absorb radiant energy from the sun, they might not only heat up, they can also undergo a change from catching those rays. Plants for example, have chemical compounds called chlorophyll that allow them to create food and grow when they absorb the sun's rays. UV stands for ultraviolet light, a type of electromagnetic radiation that travels in a wave-like pattern. UV light is found within sunlight but is invisible. You are probably aware of the effects of UV radiation because you wear sunscreen and sunglasses to protect you from it. UV light causes chemical reactions that can make a substance glow or your skin to burn or tan. It also causes the formation of Vitamin D, an essential vitamin for humans and other organisms. A good amount of harmful UV radiation is blocked by the Earth's ozone layer, but the little amounts that get through will cause these chemical changes.

UV beads contain special color-changing pigments that are sensitive to UV light from the sun and other sources. These beads will quickly change back to white when they are not exposed to UV radiation. We can look outside and say "it's sunny," or "it's cloudy," but we can use the UV beads to help us get a better picture of how much of the sun's energy is reaching a certain spot in a safe way. The brighter the color change in the beads, the more UV radiation is received in an area. This area might make a great spot for catching the sun's energy!

✔Procedure

1. String the UV beads onto the lanyard. Tie the lanyard to make a loosely fitting bracelet to wear on your wrist.
2. Take your bracelet outside and observe the color changes in your beads.
3. Cover them or move to a very shaded spot to see how they fade and change back to their original color.
4. In activity two, you will build a solar oven. You will need to place your oven in a location that receives lots of solar energy. Using the UV beads as your guide, move around your outdoor area and find the perfect spot for your oven that receives lots of consistent radiant energy on a sunny day.
5. Record the name or description of your best location here:

Home Energy Challenge - Solar Cooker Activity

You've probably heard a phrase like this before: "it was so hot outside; you could fry an egg." You have probably also been the victim of a chocolate bar left in a hot car. The car is hot because of the sun's radiant energy. The energy hits the car, traveling through the glass, and is absorbed by the surfaces inside the car. The inside of the car then gets hot. Your car is now a solar collector, trapping the energy in as heat and warming up anything else inside it. Your car is almost acting like an oven! Solar collectors are not just good at melting candy! We can make solar collectors that use the sun's energy to heat homes and water, allowing homes to use less electricity or natural gas. You can use solar ovens to bake cookies while camping!

What makes a good solar collector or solar oven? A good solar oven has transparent surfaces that allow light to travel through dark surfaces that absorb the light, and shiny surfaces that help reflect light and heat back towards the food. When you cook at home, do you leave the oven door open? Not if you want those cookies to get hot and gooey! A good oven is sealed well, using insulation materials like gaskets around the openings to trap in any heat that might escape.

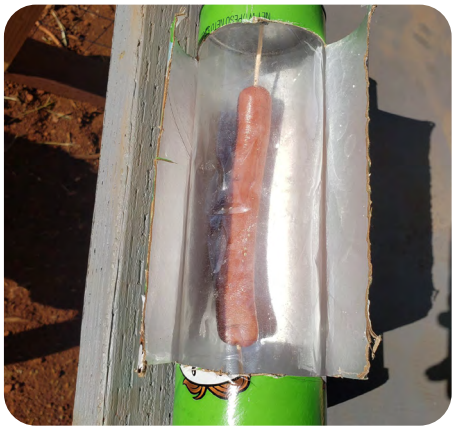
✔Your Challenge

- Build a solar oven to cook a s'more or other favorite food item.
- Use the sample instructions (page 5) or create a design totally on your own.
- Use the materials provided and any additional materials you would like.
- A good solar oven allows light in, traps light as heat inside, and uses the heat to warm food. It should contain:
  - Reflective materials
  - Absorbing materials
  - Insulating materials
  - Transparent materials
- Place your food inside with your thermometer. Let's get cookin!

✔Procedure

1. Read the **Sample Oven Instructions** on page 5 the whole way through. Think about all the things you might be able to change to make the design better. Decide if you will build your oven following these steps or get creative and design your own.
2. Gather the kit materials and any additional materials you will need to create your oven. Don't forget materials to seal and insulate the sides of your oven.
3. Assemble your oven and ensure you will have a sunny time period to test and/or cook.
4. Gather your s'more ingredients or the food you wish to heat. Consider what you'll place it on in your oven (plate, dish, skewer, etc.) Place your food inside the oven with the thermometer nearby in the oven.
5. Take your oven to your perfect location – the location where it will receive lots of direct solar radiation. Make sure your thermometer is inside and your oven is sealed tightly.
6. Record the starting temperature and time on the submission form.
7. Take pictures of your oven to share with your submission form.
8. Observe your oven for as long as possible or as long as necessary to cook your s'more or other food to a safe temperature for eating. Use a meat thermometer if you have one to check your food. Record the time and the final temperature on your submission form and answer any questions.

Solar Oven Design Inspiration



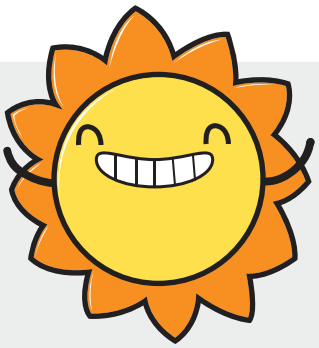
Sample Oven Instructions

1. On the top (lid) of the pizza box, use a marker to draw a square one inch from all sides of the box. See Diagram 1.
2. Use scissors to cut only the front and sides of the square you just drew. It may help to poke scissors down into the box to start the cut. Leave the fourth side along the box's hinge uncut, as shown on Diagram 1. This will create a flap in the lid.
3. Tape aluminum foil to the inside surface of the flap you just cut. Make sure the shiny side of the foil is visible. Smooth out any wrinkles. See Diagram 2. This will be your reflector lid.
4. Tape plastic wrap over the opening that remains from the pizza box lid. Seal all four of the edges with tape. See Diagram 2.
5. Open the entire box lid and tape black construction paper to the bottom of the inside of the box to help absorb the incoming sunlight. See Diagram 2.
6. Cover any air leaks around the box edges with tape. Make sure that the box can still be opened to place food inside or remove it later.
7. Go outside in the sunlight and place the box on a flat, level surface.
8. Place food on a paper plate and place inside the oven. Close the lid with the plastic wrap but leave the reflector open.
9. Tape one end of the skewer to the reflector lid. Attach the other end to the pizza box as needed to adjust the reflector for catching the sun. You may need to adjust the skewer over time It is best to tape to the outside of the box. See Diagram 3.
10. Let food cook, and check the reflector angle periodically to make sure sunlight is getting inside the solar oven.

Video Instructions

Solar Oven, Sample Instructions:
https://youtu.be/3BzbLPW_XMM

Solar Oven, alternative instructions example:
https://youtu.be/tuUhK2Rs9xg



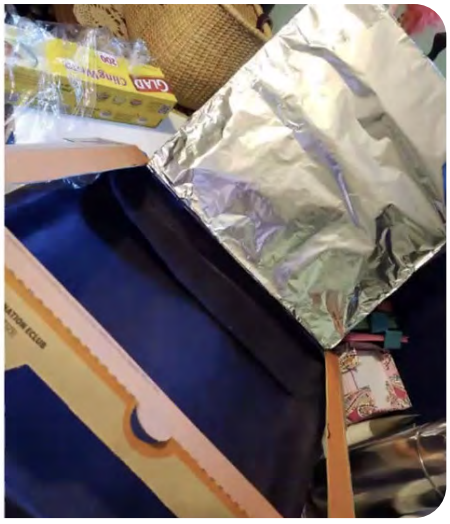


Diagram 1

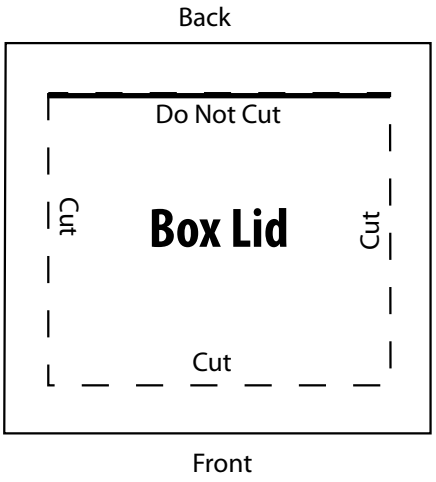


Diagram 2

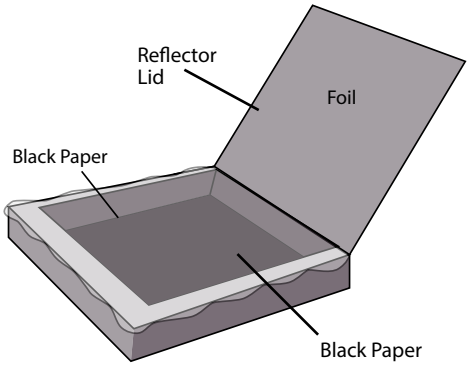
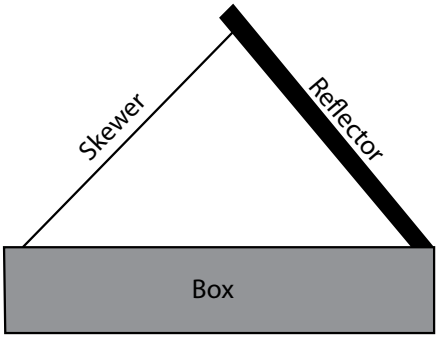


Diagram 3



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Final Data Collection & Submission Form

Submit this form with your data and photos of your family completing the Eversource Home Energy Challenge - Solar Cooker Edition Activities to be entered in our prize drawing.

Student Name: _____

Student Address: _____

Student Grade: _____ School:_____

Parent Email:_____ Parent Phone Number:_____

Data

Time	Temperature	Observations
Start time:_____		
End time: _____		

1. What modifications did you make to your solar oven to help it cook and trap in heat?

2. What changes would you make to improve your oven's cooking capabilities?

3. Email or mail this form and pictures of your student working on the project to win an iPad. Submissions are due on or before August 8, 2023:

   Email: info@homeenergychallenge.com

   Mail:
   Eversource Home Energy Challenge
   P.O. Box 313
   Rowley, MA 01969-9998
   ATTN: Scott Halstead

4. Optional (but encouraged): Post a photo of your solar oven on your social media channels (Facebook, Twitter, Instagram, etc.). Use #HomeEnergyChallenge and tag Eversource in your particular state: @EversourceMA, @EversourceCT, or @EversourceNH. **Posting on social media does not increase your chances of winning.*

x _____

By signing this form I confirm that I am a legal U.S. resident residing in one (1) of the Massachusetts, New Hampshire, and Connecticut communities listed in the Official Rules, am eighteen (18) years of age or older, and am a parent or guardian of a current student in grades K-12. Visit our website for official rules **www.homeenergychallenge.com**.