Activity Title: Cooking with the Sun

Recommended Grades

Kindergarten, Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6

Curriculum Connections

Matter
- 1 – properties of objects (measurements, e.g., size of oven)
- 2 – transparency, reflection (light in the oven)
- 6 – particle model of matter, expansion/contraction when heating/cooling

Energy
- 2 – sources of light (the Sun)
- 5 – renewable energy (solar)
- 6 – management of energy resources, processed vs unprocessed resources

Earth Systems
- K – changes in environment (temperature, sunlight)
- 1 – caring/respect for nature (using less electricity)
- 3 – Earth is heating up from natural and human causes (relate to greenhouse effect, clean energy)
- 4 – Earth's surface is warmed by the Sun, conservation (electricity)
- 6 – impact of climate change

Living Systems
- 2 – human behaviours affect plants and animals

Computer Science
- K – instructions to be followed, have steps
- 1 – instructions to be followed, have steps

Time

15-20 minutes (to build), 1-3 hours to cook food

Skills Focused On

• Creativity • Critical Thinking • Decision-making • Innovation	• Observation • Planning • Problem-solving • Resourcefulness

Materials Needed

- A clean pizza box or shoe box
- Marker
- Scissors
- Tape
- Glue stick
- Ruler or stick
- Black paper
- Tinfoil
- Saran wrap
- Newspaper or fabric
- A pie plate to put your food on (so the oven doesn't get dirty)
- Something to cook - s'mores, a hot dog, nachos, toast, cheese, leftovers
- Oven mitts
- *Optional:* thermometer

Background Information

Today we are going to cook with the Sun by making solar ovens. Using the Sun to cook? Let's think about that. We use the Sun for light and to make electricity with solar panels. The Sun gives us energy by making plants grow, which we then eat. We can also burn wood for our campfires to cook food and those trees originally grew because of sunlight.

To cook our food, we generally use our stoves. If you look at your stove, it may use electricity if it's an electric stove or it may be a natural gas or propane stove (these are fossil fuels). Or you may use your microwave, which runs on electricity. But we can also directly use the heat and light from the Sun to cook our food. Instead of using a solar panel where the energy of the Sun is transformed into electricity, we trap the energy of the Sun inside of our solar oven to cook our food. Light is made up of photons and when these photons interact with other molecules, they get excited and start to move. This creates heat.

Have you ever got into your car after it was sitting in the Sun all day? It's hot right?! Well this is the same idea. Let's get started.

Experimental Steps

1. Draw a rectangle on the lid an inch or two in from the edge, other than the edge at the hinge of the box.
2. Cut the three edges to create a flap.
3. Line the inside of the flap with tinfoil, make sure the shiny side is out. You can glue or tape it down.
4. Open the box and tape down a double layer of saran wrap on the inside of the window. Tape all around the edges to keep the heat trapped inside.
5. Line the bottom of the box with black paper. Black absorbs heat which will help the food cook.
6. You also want to insulate the box. You can use crumpled up newspaper or fabric. You need to attach around the four sides. Make sure that you can still shut the box, but that you are reducing the air and heat that can escape.
7. Set up your oven outside. Place the food in the pie plate in the oven and shut it.
    a. You want to cook when the Sun is high overhead.
    b. Optional: place a thermometer inside to watch what temperature your oven gets to.
8. Tilt the flap so that the tinfoil is reflecting sunlight into the box. The heat will start to build up inside because it can't escape through the saran wrap or the newspaper we used to insulate. Use a ruler or stick to hold it open. It may even be possible to cook with a solar oven on cloudy days, though it will take longer.
9. Leave the box outside until the food is cooked. You may need to adjust the angle over time.
    a. It will take longer to cook with a solar oven than a regular oven.
10. When the food is done, make sure you use oven mitts to take the food out, because it will be hot!

Discussion/Experimental Extensions

Try different materials to insulate, different shapes for the box, different angles to the Sun. Try lots of different ways to engineer your best oven. What methods cook your food the fastest? Why do you think that is?

By using the energy directly from the Sun to cook our food, we have cooked without polluting and have reduced the electricity or fossil fuels we use. These solar ovens can also be very useful in places where people have limited access to fuels. What areas of the world do you think use solar energy to cook with?

Additional Resources

Cooking with the Sun experimental video produced by Future Energy Systems - provides background information and instructions for experiment: https://youtu.be/S4oL1k77oJ4.

This video was produced as part of Future Energy Systems Learning Resources, by Valerie Miller, Future Energy Systems' Outreach and Engagement Lead.

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