

## SOLAR ENERGY

Embark on a sunny adventure as we explore the power of the Sun and its ability to cook delicious treats in our very own solar ovens!



### Grade Level

3rd - 12th



### Focus

Physical Science,  
Environmental Science,  
Engineering, Design



### Standards

4-PS3-2, 5-PS3-1

## BACKGROUND INFORMATION

Solar energy is a renewable and sustainable source of power harnessed from the Sun's rays. It can be transformed into heat energy, making it an ideal candidate for eco-friendly cooking solutions. Solar ovens capture sunlight using reflective materials and convert it into heat, allowing us to cook food without the need for electricity or gas. Understanding how solar ovens work can inspire us to use clean energy and reduce our impact on the environment.

## STUDENT REAL-LIFE CONNECTIONS

- Have you ever noticed how hot a car can get on a sunny day? How is that related to the Sun's energy?
- What are some everyday objects that use solar energy, like solar panels on calculators or outdoor lights?
- How can we use solar energy to reduce our impact on the environment?

## LESSON OBJECTIVES

- Recall the basic principles of solar energy and its potential for harnessing heat.
- Design and construct a functional solar oven using provided materials, demonstrating their understanding of how sunlight can be converted into heat energy.
- Collaborate to plan and conduct a controlled experiment, testing their solar ovens' ability to cook food. They will record observations and analyze results to draw conclusions about the effectiveness of their designs.

### MATERIALS

### LIST

- 30 pizza boxes (recycled or donated)
- Aluminum foil (30 square feet)
- Plastic wrap (30 square feet)
- Black construction paper (30 sheets)
- Clear tape (several rolls)
- Scissors (30 pairs)
- Craft knives (for teacher use)
- Rulers (30)
- Pencils (30)
- Thermometers (at least 5)
- Cooking ingredients (e.g., marshmallows, chocolate, graham crackers)
- Stopwatch or timer (several)
- Safety goggles (for teacher and student demonstration)

### ACTIVITY

### DIRECTIONS

#### Engage

- To kick off the lesson, start with an engaging question: "Have you ever cooked food using sunlight? Just like we use sunlight to cook here on Earth, astronauts on the Moon need to use the Sun's energy for their daily needs, including cooking and generating electricity. Today, we'll learn how to make our own solar ovens, similar to what astronauts might use on the Moon."
- Introduce the concept of solar energy by discussing how the Sun provides us with light and heat, which are essential for life on Earth and for astronauts on the Moon. Explain that understanding and using solar energy is crucial for future lunar exploration.
- Show images or videos of lunar missions and explain that the Moon is far away from Earth, so taking fuel for cooking and generating power is challenging. Mention that solar energy is a sustainable and vital resource for lunar outposts.

#### Explore

- Divide the class into small groups and provide each group with a pizza box, aluminum foil, plastic wrap, black construction paper, and other materials.
- Explain the task: Students are engineers tasked with designing and building their own solar ovens. Their goal is to create an oven that can heat and melt marshmallows and chocolate to make s'mores.
- Encourage students to brainstorm and plan their solar oven designs. They should consider how to maximize sunlight absorption and heat retention.
- Encourage them to think like lunar engineers, considering how they can maximize the capture of sunlight on the Moon's surface.

#### Explain

- Bring the class back together and have each group share their initial designs and ideas. Discuss the importance of using renewable energy sources like solar power on the Moon to reduce the need for transporting heavy fuel from Earth.
- Explain the steps for constructing the solar ovens (*refer to the solar oven diagram on the next page*), emphasizing that astronauts on the Moon rely on solar panels to generate electricity and heat water. Solar ovens can serve as an eco-friendly cooking solution, helping lunar outposts become more self-sufficient.

### ACTIVITY

## DIRECTIONS (CONT.)

- Explain that solar rays are more intense on the Moon compared to Earth. This is because the Moon lacks an atmosphere, which means there are no clouds, gases, or particles to scatter or absorb sunlight. As a result, solar radiation on the lunar surface is direct and unobstructed, making it much stronger and more intense than what we experience on Earth.
- Discuss safety precautions, including the use of safety goggles when cutting materials and handling sharp objects.

### Elaborate

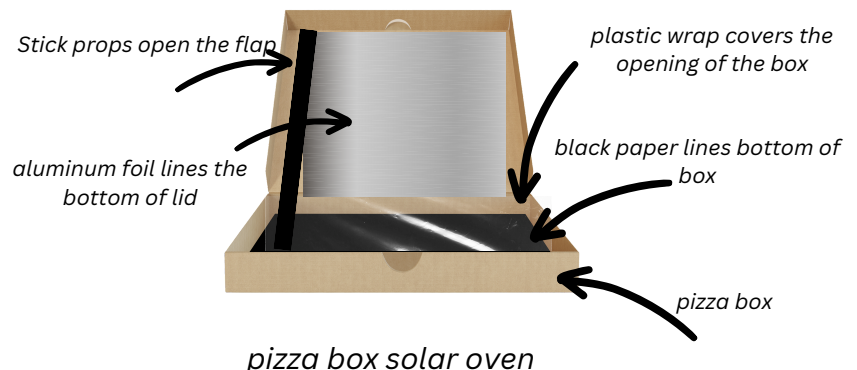
- Have each group complete the construction of their solar ovens. Allow them to work collaboratively and assist as needed.
- Once the ovens are built, explain that they will conduct an experiment to test the ovens' effectiveness in cooking food. In each oven, students should place a snack item (e.g., marshmallows, chocolate) on a plate.
- Position the ovens in direct sunlight, ensuring that they are all facing the same direction.
- Use thermometers to monitor the temperature inside each oven and record the data at regular intervals.
- While the snacks are cooking, students can discuss their predictions and hypotheses about which oven will cook the food the fastest and why.
- Explain that on the Moon, there are long periods of sunlight followed by long periods of darkness, so capturing and storing solar energy efficiently is crucial for survival.

### Evaluate

- After a designated amount of time, have each group check their ovens and observe the results. Discuss how using solar ovens on the Moon can help astronauts conserve resources and reduce their reliance on Earth for supplies.
- Discuss the data collected from the thermometers. Which ovens reached the highest temperatures? Why is it important for lunar outposts to efficiently harness solar energy for heating and electricity?
- Have students reflect on their designs and what they learned about the critical role of solar energy in establishing and sustaining a lunar outpost.
- Conclude the lesson by emphasizing that understanding solar energy is a key aspect of future lunar exploration and colonization, enabling astronauts to thrive in the harsh lunar environment.



*solar oven*



*pizza box solar oven*