



## Unit: Cooking with the Sun and Solar Ovens

### Lesson #2: The Amazing Cardboard Cook-O-Matic

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**DESCRIPTION:** The purpose of this lesson is to introduce the students to the concept of solar ovens and cooking with energy from the sun.

**GRADE LEVEL(S):** 3-5

**SUBJECT AREA(S):** Science, energy, solar energy

**ACTIVITY LENGTH:** 1 hour

**LEARNING GOAL(S):** At the end of this lesson students will understand that the sun can be used to cook food. They will also be introduced to the basic components required to build a successful solar oven.

#### **STANDARDS MET:**

##### **Common Core:**

- W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
- SL.3.4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
- W.4.8. Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
- W.5.8. Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.
- W.5.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

##### **Next Generation Science Standards:**

- 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost
- 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

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- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

### Student Background:

A basic knowledge of different methods and heat sources used to cook food, such as electric stove, gas stove, microwave, campfire, etc. They will be introduced to the concept of solar ovens if they do not already know about them.

### Educator Background:

- A basic knowledge of different methods and heat sources used to cook food, such as electric stove, gas stove, microwave, propane, campfire, etc.
- For this lesson, teachers will need to build a box style solar oven using the directions included in this unit or another style solar oven of their choice. Several designs and instructions can be found on the Internet. There are many inexpensive, simple designs to choose from.

### Other Materials List:

- A note card for each student
- A pre-built solar oven (see directions)
  - A box that is no more than 2 inches taller than your cooking pot
  - A smaller box to fit inside the larger box that leaves at least a 2 inch space around for insulation
  - Aluminum foil
  - Glue
  - Black construction paper or black B-B-Q paint
  - Newspaper for insulation stuffing
  - Tape
  - Piece of Plexiglas to fit the small box (can be purchased at Home Base) or a large turkey roasting oven bag
  - A lightweight, dark cooking pot with a lid
  - A table or desk and a blanket to cover the file box solar oven

### Vocabulary:

Microwave, fire, oven, stove top, cooking plate, griddle, grill, electricity, natural gas, fire, charcoal, propane gas, coal, foil, reflective panels, concentrated sunlight, insulation, Plexiglass

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## Lesson Details:

### Before the lesson:

Write down a food that is usually cooked on each note card. Be sure to have enough labeled note cards for the entire class. Examples of foods include: a hot dog, macaroni and cheese, a roast chicken, frozen vegetables, fresh vegetables, pudding, brownies, bread, a marshmallow, pizza, s'mores, stew, eggs, hamburger, lasagna and cookies etc. Follow the instructions contained in Lesson 9 for building a file box solar oven. It will be good to familiarize yourself with the oven and its components. Also, building this box now will give you two file box ovens once you complete lesson 9. The file box solar oven is good for experiments because it can be altered in several ways for the students to come up with ideas for testing. (i.e., use one panel instead of four, line the inside of the box with foil instead of black paper, cook without the Plexiglas, cook food with a lid on, cook food with a lid off, etc.).

### Instructions:

1. Pass a labeled food card out to each student.
2. Instruct the students to brainstorm all the different ways that the food listed on their note card can be cooked and write them on the back of the card.
3. Students share what they have written. Record their ideas on the board.
4. Have a class discussion on the tools and appliances needed to cook food, for example, microwaves, fire, ovens, stove top, cooking plates, griddles, grills, etc.
5. Have a class discussion on the energy source required to cook the food, for example, electricity, natural gas, fire, charcoal, propane gas, coal, etc.

### Procedures:

#### “Solar Oven Info-mercial”

1. Teacher says:



“What if I told you that I have an amazing appliance under this blanket that doesn’t need electricity, natural gas, coal or biomass fuels to reach up to 280 degrees or more? It doesn’t have a plug. It is lightweight and portable. Best of all, it can be made from cardboard and other recycled items from around the school and your home. I am offering it to you today for the incredible price of \$6.99.”

Do you think I’m trying to pull a fast one on you? Is it too good to be true?

2. Have a class discussion about whether or not an oven can be made out of cardboard.
3. Unveil the amazing “Solar Cook-O-Matic.”

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4. Explain the materials used--cardboard, foil, newspaper, black paper, reflective duct tape and Plexiglas.
5. Explain how the solar oven works:  
The foil panels concentrate the sunlight, the sunlight passes through the Plexiglas. It is captured and transformed into heat to cook the food. The black paper and dark cooking pot absorb the light, transforming it into heat. The newspaper helps to hold the heat in the box.

### Closure:

Students will draw the file box oven on a piece of paper and label its different components: foil reflective panels for concentrating the sunlight, black paper to absorb the light, a box to support the panels, a smaller box to allow newspaper around the box for insulation to hold the heat in, Plexiglas to allow in sunlight and trap the heat.

### Evaluation:

Students will be evaluated on the accuracy of their solar oven drawing, labels and explanations.

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