SOLAR OVEN 2

SOLAR LESSON

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Time Frame:	Standards:
2 Sessions between 45 – 60 minutes 1 Sessions 30 minutes for writing 5th Grade	**5.S.1.2.1** Use observation and data as evidence on which to base scientific explanations and predictions. **5.S.1.2.3** Use models to explain or demonstrate a concept. **5.S.1.5.1** Explain how the shape or form of an object or system is frequently related to its use or function. **5.S.1.6.3** Select and use appropriate tools and techniques to gather and display data. **5.S.5.1.1** Identify issues for environmental studies. **5.S.5.2.1** Describe how science and technology are part of a student's life. **5.S.5.3.1** Identify the difference between renewable and nonrenewable resources.

Objectives:

1. The student will review the basic needs for alternative energy sources.
2. The students will be able to identify at least three different materials that will produce maximum heat.
3. The students will be able to identify at least three different colors that will produce maximum heat.
4. The students will be able to solve a design problem for a solar hot box.

Background Information:

Our sun is a constant source of energy. Each day, the sun bathes the Earth in unimaginable amounts of solar energy, most of which comes in the form of visible light. All over planet Earth, sunlight is by far the most important source of energy for all living things. Without it, Earth would be lifeless.

Sunlight can be a practical source of energy for such everyday jobs as cooking, heating water, or warming up homes. The challenge is to find ways to transform sunlight into usable heat. The most efficient way to transform sunlight into heat is to shine lots of sunlight onto a dark surface. Dark surfaces absorb most of the visible light that falls upon them, and reflect very little. Visible light that is absorbed this way usually causes the dark-colored surface to warm up. Of all colors, black is able to absorb the most light, and produce the most heat.

You are familiar with what happens to a dark-colored surface when sunlight strikes it: it will get warm. But without a little help, there is usually not enough heat produced to cook foods. To produce enough heat for cooking, it is necessary to shine additional sunlight from a wider area onto the black surface. This is easy to do with mirrors or other reflective surfaces, or with glass or plastic lenses.

The solar oven you will be building from this plan uses aluminum foil to gather sunlight. The foil-covered panels of the oven reflect sunlight into the cooking chamber, which is painted black. Heat is produced when the concentrated sunlight is absorbed by the black surface of the cooking chamber. The heat is contained inside the chamber with the help of insulation and a clear plastic oven bag. The result is a great solar cooker and yummy food!

http://www.re-energy.ca/t-i_solarheatbuild-1.shtml

Materials:

1. Shoe boxes
2. different colored construction paper
3. Cellophane different colors
4. aluminum foil
5. thermometers
6. large sheet of paper

Procedure:

ACTIVITIES AND PROCEDURE:

This lesson will begin with a review of what alternate energy sources are. Each student will be required to brain storm as many energy sources as they can in a set time limit. At the end of the time limit the students will discuss which of the energy sources are used every day and which ones are alternative sources. Ask the students to discover for themselves why we consider some energy sources alternate and some not.

Explain to the students that today they will experiment with solar heating to decide if all energy needs in the U.S. can be met by solar energy.

TEACHING PROCEDURE:

1. Experiment with colors to determine which colors will absorb or reflect heat. Use colored cellophane when they build their boxes.
2. Experiment with materials to determine which materials will absorb or reflect heat. Use shoe boxes, foil, and construction paper for the materials.
3. Define what a solar hot box is.
4. Define what a solar collector is.
5. Explain that a solar hot box differs from a solar collector only in the respect that the solar heat is collected and contained in the box is not purposely transferred. The heat from a solar collector is usually transferred from the collector by a heated air or water medium to another location.
6. Students will build their own hot box using the colors and materials they choose. Students can work in pairs or alone to build their box and conduct the experiment.
7. Explain that each hot box groups will go outside and complete a temperature experiment to determine the maximum temperature it will reach.
8. Have each group set their experiment up with a thermometer on the inside.
9. At one minute intervals have each group record the temperature of the hot box. Do this for ten (10) minutes.
10. Bring the results into the classroom and record the temperatures for each group on the board.
11. Ask the students which hot box achieved the highest temperature the fastest.

CLOSURE:

When the students have decided which box worked the best and which one didn't work ask them to brain storm conditions outside that would help or hinder the solar heating process. Make a list on a large sheet of paper and hang it the room.

Assessment:

EVALUATION:

For the next day ask the students to compose a paragraph addressing why solar energy might not be the answer to all the energy needs of the U.S.

References:

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These lesson plans are the result of the work of the teachers who have attended the Columbia Education Center's Summer Workshop. CEC is a consortium of teacher from 14 western states dedicated to improving the quality of education in the rural, western, United States, and particularly the quality of math and science Education. CEC uses Big Sky Telegraph as the hub of their telecommunications network that allows the participating teachers to stay in contact with their trainers and peers that they have met at the Workshops.

Solar Hot Box

An Educator's Reference Desk Lesson Plan

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