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Lesson Plan #:AELP-SPA0020

Solar Energy Experiment

An Educator's Reference Desk Lesson Plan

Author: Beatrice Ortiz**School or Affiliation:** Ann Parish Elem., NM**Endorsed by:** 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.**Date:** May 1994**Grade Level(s):** 3, 4, 5, 6, 7, 8**Subject(s):**

- Science/Space Sciences
- Science/Environmental Education

Purpose:

The purpose of the following experiment is to demonstrate that energy from the sun can be collected and stored in many ways.

Resources/Materials:

1. one plastic bottle painted white
2. one plastic bottle painted black
3. several small balloons

Activities and Procedures:

General information:

Our sun is an average sized star and it has been burning for about 4.5 billion years. Few people think of the sun as a nuclear furnace and fewer realize this is a source of nuclear energy that does not pollute. About four million tons of the sun's matter turns into energy every second and only one-billionth of the sun's light ever strikes the Earth.

At the equator the Earth receives about one kilowatt per square meter of solar energy. A kilowatt is 1000 watts or the amount of energy needed to light 10 one-hundred watt bulbs. If man could make full use of solar energy, almost every house in the world could be energy independent. Only a few households would have to be dependent on the electric company and this would reduce the pollution problem greatly. The consumption of gas, oil, or coal would be reduced and this would also help reduce the level of pollution. The automobile could be powered by the sunlight during the day and use battery power at night. This would also reduce pollution and help prevent global warming.

Turning solar energy directly into electricity today is not very efficient; however, solar energy can be best collected as heat. The following experiment will teach young people how to collect and store the sun's energy in the form of heat.

The teacher will notice the experiment demonstrates a method to collect and store solar energy and has been designed for grade one through six. It is possible for young students to expand the concepts of these experiments into local science fair projects.

The Black and White Bottle Experiment

The experiment is performed with the two plastic bottles. The teacher will note one bottle is painted black and the other is painted white. Place the open end of one small balloon on the mouth of the white bottle and do the same for the black bottle. Make sure the balloon forms an air tight seal. Now place both bottles in bright sunlight. Within a few minutes, the students will notice the balloon on the black bottle will start to expand. The balloon of the white bottle will remain limp. Have a student touch the black bottle to notice that it is warm. Then have the same student touch the white bottle to notice that it is much cooler than the black bottle.

Questions:

1. Why do you think the balloon on the black bottle expanded?
2. Does heat make air expand?
3. Does a black object get warmer in the sunlight than a white object?
4. What would be a good color to paint your car if you wanted to stay cool in the summer?

Explanation: The black bottle will absorb the sun's energy much better. The white bottle reflects away most of the sun's energy. As the bottle absorbs energy, the air inside the bottle warms up and expands making the balloon full with air.