Solar Energy Hunt

Summary:

Using UV beads, students will observe and draw energy.

Materials:

For each student:

- **Two UV beads (stevespanglerscience.com)**
- **Pipe Cleaner**
- **Paper/pencil/clipboard**

Instructional Procedures

1. Tell students you are going outside on an energy hunt, but first they must put on some energy detectors.
2. Hand out two UV beads and a pipe cleaner per student. Instruct them to place beads on the pipe cleaner and attach it to their wrist.
3. Students will take a pencil and paper (clipboard if available), and go outside for a few minutes to observe and draw the energy they see. Encourage them watch for as many forms of energy as they can see. They should notice that their UV beads have changed color.
4. After a few minutes of students drawing and observing, have them come back in and discuss their observations.
5. Classify their findings and chart them as a class, such as natural and invented light sources or sources of light and reflectors of light (anything that is not a light source is a reflector of light).

Background For Teachers:

Energy is defined as the ability to do work. *Heat, light*, and *sound* are all forms of energy. Some of the things they have in common are that they all travel in waves and can all be reflected (angle of incidence equals the angle of reflection).

Light is everywhere. It is really the only thing we can see, because when you look around you, you are looking either at a light source or something that is reflecting light. Every living thing depends on light energy in some form or another.

Light can be thought of as traveling in rays, which move in straight lines until they hit something. Light also travels in a series of waves. It is only part of a group of waves called *electromagnetic waves*. Radio waves, microwaves, and other types of radiation are constantly surrounding us, along with infrared rays, ultraviolet radiation, X-rays and gamma rays. Scientists have grouped these together and labeled them the *electromagnetic spectrum*.

The sun is our greatest source of light and energy. Other natural light sources include stars, fire, lightning, fireflies, and some bioluminescent animals. Invented light sources include: light bulbs, lamps, lasers, fireworks, flares and glow sticks, etc. Moonlight is not considered a light source because it actually reflects sunlight.

Solar S'Mores

Guiding Question:

Can I use the sun instead of a bonfire to make S'Mores?

Objectives

Concepts:

- Solar energy is the energy given off by the sun.
- When light energy is absorbed by objects it is changed to heat energy.
- Dark-colored objects absorb more light and store more heat from sunlight.

Facts:

- Solar energy is often called "radiant energy."
- Solar energy is produced by nuclear fusion reactions within the sun.
- Solar energy does not pollute.

Principles:

- Dark-colored objects absorb more light and store more heat from sunlight than light-colored objects.
- Light-colored objects appear light to us because they are reflecting most of the light that hits them rather than absorbing it. Objects appear to be black when they absorb all wavelengths of light that hit them.

Materials:

Every two people will need:

- 4 graham crackers
- 16 mini marshmallows
- 2 plain milk chocolate candy bars
- 8-by-11-inch glass baking pan
- a clear glass lid for the baking pan
- 1 thermometer

Room Preparation

This is an outdoor experiment: need to have a place in direct sunlight (no shade) and where animals won't come by to eat the ingredients or disturb the pan! Use your thermometer to see what temperature it is outside. You need to do this experiment when it is at least 85° F. If it isn't hot enough outside, wait for a warmer day.

Introduction

Share the guiding questions:

- Can you cook food outdoors?
- What makes food cook or things melt outside?
- How can and do we use the sun's energy to help us in our lives?

Welcome a discussion about "cooking" outside. Think about how we melt marshmallows over a bonfire, heat a hot dog on a stick over a fire, sear and cook the inside of a hamburger on a grill. Then think about what makes the melting, warming and cooking happen—heat.

Talk about what happens when we are in sunlight. Share how the heat from the sun can be used for cooking, melting and warming food.

May also share ideas and experiences with solar cooking, solar heating, and solar-powered cars.

Activity

1. Put four graham crackers side by side in the bottom of the glass baking pan.
2. Place a chocolate bar on top of two of the graham crackers.
3. Put 8 mini-marshmallows on top of the other two graham crackers.
4. Cover the baking pan with the clear glass lid.
5. Put the pan out in an area where it will get full sunlight—no shade!
6. Let the pan just sit there until the chocolate bars and marshmallows melt.
7. To make a S'More, put one chocolate and one marshmallow graham cracker together to make a sandwich. You should have two sandwiches. Enjoy!

Closing - Original Question

Were we able to make S'Mores using sun energy instead of a bonfire? Talk about what really happened. Review how the sun gives off radiant energy. Share ideas about the ways in which objects absorb light energy and it is changed into heat energy. Talk about dark colors and objects and how they absorb and store more heat.

Another Experiment and Option.

You might repeat this experiment, but this time try lining the glass baking pan with aluminum foil and black construction paper. See if the marshmallows and chocolate melt faster than they did in the plain glass pan. If our hunch is right, and dark paper absorbs more sunlight and heat, we should find out the S'Mores melt faster than in the plain glass pan.

Or try putting the two halves of the S'More sandwiches together before you put the dish out in the sun. See what happens. Does it take longer for the marshmallows and chocolate to melt? Why? It may be that the top graham cracker is sort of like a roof of a house. It shades the chocolate and marshmallow inside. This means that it will take longer for things to melt because the top graham cracker is absorbing much of the sun's heat.