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Third Grade Lesson Plan: Where does heat come from?

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Lesson Plan – 3rd Grade

Unit Theme: Heat and Energy
Lesson Title: Where does heat come from?
Grade Level: 3rd

Subject Area: Science
Number of Learners: Entire class
Time Needed: 30 minutes

Curriculum

Standard 5

Students will understand that the sun is the main source of heat and light for things living on Earth. They will also understand that the motion of rubbing objects together may produce heat.

Objective 1

Provide evidence showing that the sun is the source of heat and light for Earth.

Objective 2

Demonstrate that mechanical and electrical machines produce heat and sometimes light.

Objective 3

Demonstrate that heat may be produced when objects are rubbed against one another.

Materials Needed

- Griddle
- Kerr quart jar
- Water
- Ice
- Gloves, coat, or beanie
- Lotion
- Flashlight with hand turning power
- Hand warmers
- Small glass bottle with quarter size top or smaller
- Quarter
- Cup

Learning Objectives

Students will understand that the source of all energy for the earth comes solely from the sun. They will also be able to distinguish mechanical and electrical sources of energy in everyday life activities.

Background Knowledge

Mechanical Energy: Sum of the total energy in a system including kinetic energy, the energy of motion, and potential energy, the stored energy of position.

Electrical Energy: The presence and flow of an electric charge.

Chemical Energy: Energy created from a chemical reaction.

Instructional Procedure

Objective 1

Provide evidence showing that the sun is the source of heat and light for Earth.

- a. Compare temperatures in sunny and shady places.
- b. Observe and report how sunlight affects plant growth.
- c. Provide examples of how sunlight affects people and animals by providing heat and light.
- d. Identify and discuss as a class some misconceptions about heat sources (e.g., clothes do not produce heat, ice cubes do not give off cold).

Examples

Ask the students what the main source of all heat is for the Earth. The sun is the main source of all heat and light for the Earth. Some ways to show this to the students can be done by discussing the following topics.

-Ask the students what they know about plants and how plants use the sun as a source of energy to make food. Ask them what they think will happen if a plant is placed in a shady area of the yard versus in a place with no shade. Explain to the students how the sun provides all the necessary energy for a plant to perform photosynthesis and make food that we eventually use by eating a plant directly or by eating an animal that ate the plant directly.

-Ask the students to explain the difference in temperature between sunny and shady places. Shade occurs when something whether it is a tree, building, umbrella, or anything that obstructs the sun's radiation from coming through. This allows the area to become cooler due to the lack of radiation from the sun. Sunny areas do not obstruct the sun's radiation from coming through and therefore it is much warmer because all the sun's energy is being permitted.

-Heat a griddle up and then have a student come up and put their hand above the griddle to ask them what they feel. Then place a sheet of paper in between their hand and the griddle and ask them what they feel. This can also help solidify the idea of the sun being the source of all the energy and when the heat is blocked, creating shade, it is cooler. Next put some water on the griddle so it boils. Then place a quart Kerr jar upside down with ice on the top over the boiling water. The students see the water vapor begin to collect in the bottle. Ask them what they think it is. Explain how the griddle is like the sun acting as the source of heat for the water cycle. The water is heated up and then evaporated off and when it cools in the upper atmosphere, the cold end of the Kerr jar, it condenses and begins to fall again.

Objective 2

Demonstrate that mechanical and electrical machines produce heat and sometimes light.

- a. Identify and classify mechanical and electrical sources of heat.
- b. List examples of mechanical or electrical devices that produce light.

Examples

Ask the students to think of different sources of heat and name them off. Then explain where the different sources of heat come from and the two groups, mechanical and electrical.

Mechanical Demonstrations

-Submerge a glass bottle with a quarter size top in ice water along with a quarter. Once it is cold enough, pull both of them out and place the quarter on the glass bottle opening. Have a

student come up and place their hands around the bottle to warm it up. You will hear a tiny “pop.” Ask the students what they think caused the “pop.” Explain that the warming of the air is caused by the student’s hands. Heat left the student’s hands and went to the bottle. This is a mechanical source of heat.

-Using a hand crank flashlight, turn it on and have a student crank the handle to produce light. Ask the students what they think is happening. Discuss why light is only produced when the handle is turned on the flashlight.

-Using a beanie, gloves, or coat ask students why they get warm once they put them on. Explain to them that the beanie, gloves, or coat capture the heat that is given off from their bodies. It is a common misconception that the beanie, glove, or hat is warm, but that is not true. Clarify this misconception with the students.

-Use a hand warmer and before you break the chemicals inside, have a student come up and ask them if it is warm or not. Ask the students how you warm it up. Then break the chemicals up by moving the package around in all directions. Explain to the students that by using mechanical energy from their hands to break the chemicals up, they cause a chemical reaction that releases energy in the form of heat. Once it is warm, pass it around to the students and have them feel the difference.

Electrical Demonstrations

-Ask students where they think electricity comes from. Show them an outlet and a power cord and explain to them that the electricity is made at a power plant where other forms of energy are converted to electrical energy.

-Use a heated griddle and ask the students where the energy came from to give it power to heat up. Show them the power cords leading to the wall and explain about power plants again.

-Ask the students to think of examples in their house that are powered by electricity. Some examples may include cooking at home with an electric stove, a TV, computer, heater, iron, stereo, cell phone charger, vacuum, toaster, microwave, or lamp. Ask them to think of items powered by electricity in their classroom. Examples may include a computer, TV, VCR, projector, radio, or pencil sharpener.

Objective 3

Demonstrate that heat may be produced when objects are rubbed against one another.

- a. Identify several examples of how rubbing one object against another produces heat.
- b. Compare relative differences in the amount of heat given off or force required to move an object over lubricated/non-lubricated surfaces and smooth/rough surfaces (e.g., waterslide with and without water, hands rubbing together with and without lotion).

Examples

Explain to the students that another way to obtain heat is to rub objects together. Ask them if they can think of any examples. One common example is rubbing two sticks together to create a fire. After a few more examples have been given, have the students place their hands on their cheeks and ask them if it feels warm or cold. Have the students put their hands together and rub them quickly while counting out loud to ten. Then ask them to put their hands back on their cheeks, and ask them if it is warmer or colder than before. Explain to them that the friction from their hands produces heat and energy.

Have three students come up. One student will rub their hands together with lotion while another does it without. Have the class count to ten again while the students rub their hands together. Then the students that rubbed their hands together will place one hand on the cheek of the third student. Ask the third student which hand is warmer, the one with or without lotion. The one without the lotion should be warmer. Explain to them that lotion acts as a lubricant, preventing their hands from heating up as quickly by reducing friction.

Assessment

Upon completing the examples, ask the students if a particular object uses electrical or mechanical sources for its energy. This will help solidify the learning objectives.

Extensions

-Purchase a hand boiler from the following website: www.teachersource.com. Demonstrate how mechanical energy is used to heat the liquid up and cause it to boil.

-Have students go home and make a list of mechanical and electrical sources of energy in their home and bring the list back to share with the class.

-Using two plants put one in a sunny area and one in a shady area such as a closet all year. Have the class observe the difference in growth. This can help the students understand how the sun is the source of all energy and how plants use the energy to grow and make food.