

Things Are Heating Up!

Summary

Students will learn that heat is produced from mechanical and electrical machines and human activities.

Materials

Hand Boiler

"Hand Boiler" toy

Ice cubes

Melting an Ice Cube

Ice cubes in Ziploc bags

Producing Heat

Thermometer

Penny

Piece of paper

Small piece of wool

Rubber band

Lotion

Heat Scavenger Hunt

Radiometer

- [Things Are Heating Up handout](#) (pdf)

Electrical machines (hair dryer, space heater, etc.)

Mechanical machines (blender, pencil sharpener, etc.)

Additional Resources

Books

- *Science For Fun-Experiments*

(*Friction*, pp. 70-71 and *Get A Grip*, pp. 72-73), by Gary Gibson (Copper Beech Books); ISBN 0-7613-0517-3

- *The Magic School Bus Plays Ball: A Book About Forces and Friction*

, by Joanna Cole; ISBN 0-590-92240-8

- *Hands-on Physical Science Activities (What Happens When You Rub Your Hands Together?)*

p. 188 and *Friction* pp. 189-193), by Marvin N. Tolman (Parker Publishing Co.); ISBN 0-13-230178-4

Background for Teachers

In this activity students will learn that heat is produced from mechanical and electrical machines and human activities. Students can look for, and note, things that give off heat—lights, flash lights, pencil sharpeners, radios, televisions, running motors, the sun, polishing surfaces, sawing wood, animals, people, etc.

Students may also have some misconceptions. Some things that keep us warm such as blankets, sweaters, or gloves and mittens may be thought of as sources of heat. Clothes do not produce heat. Other things like metal may be thought of as cold. Ice cubes do not give off cold.

Use materials that can be easily found in the classroom. Mechanical machines may include: scissors, stapler, flag pole, mechanical pencil sharpener, a skate board, etc. Electrical machines may include: electric pencil sharpener, projector, television, laminator, overhead projector, copier, computer, etc.. Electrical machines that also produce light may include a flashlight, television, etc.

When you rub your hands together you feel resistance. When you rub your hands together you are

doing work. The result of this work is the heat produced. Many things rub against each other creating heat. Breaks on a bike create heat as they apply force to the wheels. Have you ever had a rope burn? Sliding your hands along a rope can cause burns as the rope rubs against the palms of your hands. Have you ever had a carpet or rug burn when you accidentally slid across the carpet on your knees?

Intended Learning Outcomes

- 1: Use Science Process and Thinking Skills
- 2: Manifest Scientific Attitudes and Interests
- 3: Understand Science Concepts and Principles

Instructional Procedures

Invitation to Learn

Hand Boiler

Show students a hand boiler and have someone hold it. The liquid will go to the top, not because the student squeezed the boiler, but because the heat from their hands warms the gas that pushes the liquid into the top chamber.

Challenge students to get the liquid back to the bottom without turning it over. What happens if you put your hand on the top of the hand boiler? What happens if you rub your hands together before touching the bottom of the hand boiler? What happens if you hold an ice cube before you hold the hand boiler?

Instructional Procedures

Melting an Ice Cube

Hold an ice cube melting contest between cooperative learning groups in your class.

First, have students estimate how many minutes it will take them to melt their ice cube.

Give each group an ice cube in a Ziploc bag.

When the group's ice cube is melted, have them record how many minutes it took to melt.

What did the group do to get the ice cube to melt? (Did students rub the ice cube?)

Students write what they learned from this activity in science journals. What should be done differently next time?

Producing Heat

Students hold their hands together, palms touching. Do they feel cold, warm, damp, or sticky?

Record observations.

Make a hypothesis. What will happen if hands are rubbed together?

Students rub their hands together very fast for ten seconds. What happened? (The movement or force caused heat. The amount of heat will vary depending on how dry the hands are.)

Students place their hands on their cheeks. Feel how warm they are. Try rubbing hands. Now check their hands on their cheeks for warmth. Students then rub their hands together faster and place their hands on their cheeks. Do they feel the heat? Ask, "In what kinds of situations would you rub your hands together? Is it useful or helpful?"

For about ten seconds, try rubbing a penny with wool, or a penny with paper. Touch the penny, touch the paper, and touch the wool. What happened?

Students place a thermometer between their hands. What is the temperature reading? Try rubbing their hands together for about 30 seconds and then place the thermometer between them. Now how hot are their hands? Apply some lotion to their hands. Then try rubbing them together for 30 seconds. Check the heat with a thermometer. What happened? (The lotion provided a lubricant, reducing the friction, and now their hands do not heat up as much.)

Ask students to think of examples where lubricants reduce heat. (Oil in engines, oil on door hinges, etc.)

Have each student take a pencil and quickly scribble for 30 seconds. Then quickly touch the tip

of the pencil to his/her other hand and note the temperature. Is it hot? What two objects were rubbed against each other? Was heat created?

Each student touches a rubber band to his/her forehead, then stretches the rubber band and touch it to their forehead. Does it get hot? Ask students to think of examples in their own lives where rubbing things together creates heat. (Skidding on a bike, etc.)

Students should write the answer to the question, "What happens when two objects are rubbed against one another?" listing examples in their science journals.

Heat Scavenger Hunt

Have students either jog in place, stomp their feet, or wave their arms again and again. After a few minutes, have students stop their activity and discuss their reactions. Do we produce heat when we are physically active?

2. *Discuss:*

Do people need heat? What are some sources of heat? What kinds of machines produce heat? Introduce students to the radiometer. The vanes are delicately pivoted and will rotate when exposed to light radiating from the sun or a light bulb.

Using the [Things Are Heating Up handout](#), take your class on a "Heat Scavenger Hunt" of your school. Look for mechanical and electrical machines that produce heat or light. *Note:* Blender may be filled with water. Measure temperature. Run blender for several minutes. Take temperature again.

Extensions

Students could collect pictures from old magazines of mechanical and electrical machines and arrange these on a poster or collage to share and display in the classroom.

Assign students to draw a cartoon with conversation bubbles explaining an activity just completed.

Sand and paint a small wooden key holder for a Mother's Day or Father's Day gift (demonstrating the heat created with sand paper).

Question: Is a glove or mitten warmer, colder, or the same as the air?

Take the temperature of the air.

Take the temperature inside of a glove or mitten.

Next, do some exercises with your gloves or mittens on for a few minutes. Now take the temperature inside of the glove or mitten.

Discuss what students have learned.

Family Connections

Assign students to check around their homes with help from their parents and list as many mechanical and electrical machines as they can that produce heat. Bring your list to school and share with the class.

Students try rubbing their hands together as they did in this activity at home with family. Check the temperature. Then put their hands in water and try rubbing their wet hands together. How do they feel? Check the temperature. Now try it with other substances, like cooking oil, etc.

Hold a "Keep-a-Cube" contest. Each student will build a container at home out of trash and other readily available materials. Hold your contest to see which container can keep an ice cube from melting longest.

Assessment Plan

Check science journals and check for student understanding.

Authors

[Utah LessonPlans](#)