#3615

HEAT

Grade Levels: 3-5
10 minutes
FILMS FOR THE HUMANITIES 1994

DESCRIPTION

Does heat travel? How? Can you see it? What's an insulator? A conductor? Jamie asks Kate questions about heat and its properties. Activities demonstrate heat traveling, and examples of everyday conductors and insulators help clarify this familiar scientific phenomena.

ACADEMIC STANDARDS

Subject Area: Science

- Standard: Understands energy types, sources, and conversions, and their relationship to heat and temperature
  - Benchmark: Knows that heat can move from one object to another by conduction and that some materials conduct heat better than others (See Instructional Goals #1, #2)
  - Benchmark: Knows that heat can be transferred through conduction, convection, and radiation; heat flows from warmer objects to cooler ones until both objects reach the same temperature (See Instructional Goals #1, #2)

- Standard: Understands the nature of scientific inquiry
  - Benchmark: Knows that learning can come from careful observations and simple experiments (See Instructional Goal #4)
  - Benchmark: Plans and conducts simple investigations (e.g., makes systematic observations, conducts simple experiments to answer questions) (See Instructional Goal #4)

INSTRUCTIONAL GOALS

1. To explain that heat travels and that when it travels it goes from where it is warmer to where it is cooler.
2. To introduce the concepts of insulation and conduction and show examples of both.
3. To explain that things expand when they heat up.
4. To demonstrate simple experiments related to heat traveling, liquids and solids expanding, and various types of insulators.

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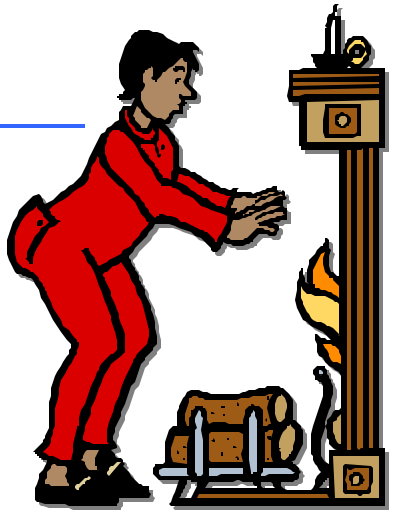
VOCABULARY



1. liquid
2. material
3. insulator/insulation
4. conductor/conduction
5. container
6. expanding
7. contracting
8. thermometer
9. experiment
10. results

BEFORE SHOWING

1. Create a list of things that are warm or hot and things that are cold. Discuss how cold things can become warmer and vice versa.
2. Bring in two thermos bottles or jugs. Discuss the purpose of a thermos. Hypothesize how it keeps things warm or cold. Experiment with hot and cold liquids in the thermos containers.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause after the balloon on the bottle goes in the freezer. Hypothesize what will happen to the balloon. Defend the hypotheses.
3. Pause as each graphic is shown during the section with the three examples of traveling heat. Discuss which way heat is traveling in each example. Elicit additional common examples of heat movement.
4. Pause before each experiment is completed. Predict the outcome of the experiments.

AFTER SHOWING

Discussion Items and Questions

1. Describe what a heat conductor does. Name different materials that conduct heat.
2. Describe what an insulator does. Name some things that function as insulators.
3. Since cold does not travel, discuss why a metal spoon handle feels cold when stirring cold things.
4. What does water do when it heats up? What does it do when it cools down?
5. Give examples of heat traveling.
6. Name animals that have natural insulation. Describe the kind of insulation they have.
7. Identify ways that humans insulate themselves for different environments.

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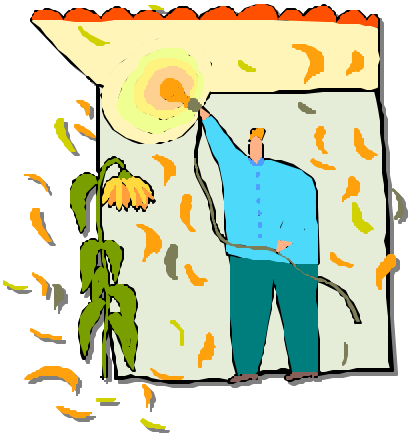
8. Why do the thumbtacks fall off the wax-coated copper wire? What does this experiment prove? Is copper wire an insulator or a conductor?
9. How might it be possible to keep an ice cube from melting for longer than a day?
10. Why did the balloon on the bottle get sucked inside the bottle in the freezer? What will the balloon do if the bottle is left outside in the sun? How could you make the balloon blow up a bit?

Applications and Activities



1. Repeat the experiments shown in the video. Explain the principles demonstrated in each experiment.
2. Research why things expand when they are heated. Role-play molecules in different materials as they are heated. Show the difference between insulators, conductors, solids, liquids, and gases.
3. Practice reading thermometers. Experiment with hot water and ice water in two jars or beakers. Record the temperatures every five minutes. Graph the data. Explain the results. Make a thermometer.
4. Pour hot water into containers made of different materials. Record the temperature in each container every few minutes. Compare the results. Rank the materials in order by how well they insulate.
5. Stand barefoot with one foot on a rug and one foot on a tile or linoleum floor. Explain why the foot on the rug feels warmer longer than the other foot.
6. Compare the conduction properties of different objects. Hold a toothpick in one hand and a nail in the other. Touch both objects to an ice cube. Note which object feels colder faster. Explain.
7. Set a variety of objects made of different materials on a table at room temperature. Touch two objects. Determine which feels warmer. Compare all of the materials. Determine which are better conductors.
8. Cut pictures out of magazines or newspapers to make a collage or poster showing various kinds of heat exchanges. Add arrows to show the direction of the heat exchanges.
9. Create a bulletin board or mural showing ways different animals and people insulate themselves from their environments.
10. Research a variety of sources of heat energy. Investigate the environmental effects of various sources of heat. Debate which sources of heat should be eliminated or further developed.

RELATED RESOURCES

Captioned Media Program

- Heat and Work #1980
- How Does Heat Change Material? #2484
- The Sources and Uses of Heat #2432

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World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid-safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

- **PHYSICS4KIDS: THERMODYNAMICS**

www.kapili.com/physics4kids/thermo/index.html

The information on this Web site is text-based, but written at a level usable with students. It includes sections on thermodynamic laws, heat, expansion, transfer, and work. Some information is technical.

- **WHY IS THE SKY DARK AT NIGHT?**

www.arachnoid.com/sky/index.html

Four of the seven sections of this interactive Web site provide information and experiments related to thermodynamics at an upper elementary level. There is not a lot of detail, but it is clear.

- **ABOUT TEMPERATURE**

www.unidata.ucar.edu/staff/blynds/tmp.html

This Web page is aimed at middle-school level teachers and students. It provides detailed information about thermodynamics, thermometers, heat and other related technical information.

- **ENERGY QUEST**

www.energy.ca.gov/education/

Although this Web site does not deal specifically with the heat, it is designed for kids and covers many energy topics including: the energy story, fossil fuels, nuclear energy, projects, and more.