Investigation Four – Heat Misconceptions

Standard V

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.

Intended Learning Outcomes

1. Use science process and thinking skills.
3. Understand science concepts and principles

Standard V

Objective 1

Background Information

Heat is the name given to the flow of energy from hotter to cooler objects. Temperature is used to measure the amount of heat energy. A temperature reading is the average amount of energy movement in a substance. The molecules in cold things move very slowly and the temperature lowers. Cooled substances usually shrink (contract) and become smaller. The molecules in hot things move very quickly, and the temperature rises. Hot substances usually expand when heated.

When a hot substance comes in contact with a cold substance, the heat energy will flow from hotter to colder, until the objects become the same temperature.

Insulators are materials that block the flow of heat, while conductors are materials that allow heat to flow easily. Sometimes students believe that insulators are really heat sources because they seem to make things warm, or heat things up. Insulators will stop the heat from flowing, so things that are warm tend to stay warm, but they are not a heat source. Good insulators include plastics, air, fabrics that hold air, feathers, or other similar materials.

Pre-Assessment/Invitation to Learn

Invite a student to come to the front of the room and hand the student an ice cube to hold (can put in a sealable bag). Ask the student what is happening. Clarify that the ice is not bringing cold to the hand, but its heat is moving from the warm hand to the ice cube, until eventually they become the same temperature. When their hand is cold, sometimes people also believe that it is their gloves that keep them warm.

Instructional Procedure

Materials
- Ice cubes in sealable bags
- 8 Thermometers (be sure all thermometers have the same temperature)
- Assorted gloves, mittens, coat, etc. so each group of students has something to experiment with
- Experiment worksheet

1. Use several different types of gloves, and ask students to predict if these gloves would warm up their hand. Does one glove work better than the other?
2. Divide students into four groups and hand out a worksheet for each student.
3. Each group will set the glove or coat on a counter out of direct sunlight and place a thermometer in each glove, and one thermometer on the counter.
4. After 5 minutes, check the thermometers. The temperatures should both be the same.
5. Discuss what has happened so far. Do gloves make your hands warm? They seem to. Have one student in the group put the glove or coat on with a thermometer touching them.
6. After 5 minutes, record the temperature on each thermometer.
7. Now put the thermometer back in the glove only and let them sit again for five minutes. What is the temperature now?
8. Draw a conclusion: Gloves do not give heat, but will insulate, or hold in any heat that is in your hand. As long as a warm hand is in the glove, the glove will be warm. If the hand is removed, then the glove returns to room temperature.
9. Have students complete the worksheet, fill in their observations, and record a new science question.

Grading student worksheet:

10 points	correct, complete, detailed
8 points	partially correct, complete, detailed
6 points	partially correct, partially complete, complete, lacks some details
5-1 points	incorrect or incomplete, missing data, needs help

Curriculum Extensions

Math –
- Read and record the temperatures to the nearest ten degrees using a Fahrenheit thermometer. (*Standard IV, Objective 2)*

Science –
- Some students may also try different experiments, such as how to keep an ice cube the coldest, or how to melt an ice cube the soonest. The experiment worksheet will work for any student experiments. (*ILOs 1, 2, 4*)

Language Arts -
- Discuss the different temperatures found in ecosystems around the world. What do animals that live in very cold places do to survive the cold? What kind of insulators do they have? What types of materials make good insulators? (*Standard VII, Objective 3*)

Resources

Books:

- *Make it Change* by David Evans (Dorling Kindersley)
- *Experiment with Heat* by Salvatore Tocci (True Books)
- *It's Much Too Hot! An Early Learner Book About Heat* by Bob Graham

Web sites:

- www.sciencelinks.com
- http://www.nasaexplores.com/lessons/01-009/k-4_2-thtml (Lesson Plans for "Solar S'mores")

Homework & Family Connections

Insulator Activity in "My Book About Heat and Light

My Observations

See _____

_____

Smell _____

_____

Touch _____

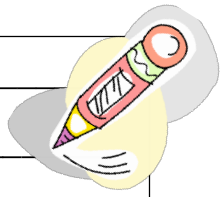
_____

Hear _____

_____

My Results

My Answer to the Question:_____



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My New Question:_____

_____

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_____

Name: _____

What I Know About Heat

Write a “True” or “False” by each statement about heat.

_____ 1. When I touch a cold rock with my warm hand my hand will get warmer because heat travels from hot to cold.

_____ 2. When I touch a cold ice cube with my warm hand, my hand will get colder because heat travels from hot to cold.

_____ 3. My gloves keep my hands warm because they produce heat.

_____ 4. A cold snowball will give off cold air.

_____ 5. A warm cup of hot chocolate will take heat from my cold hands.

_____ 6. My hat keeps my head warm because it traps the heat from my head.

Draw a picture of how heat ravels when you hold an ice cube in your hand.

Heat Story

1. Where does heat come from?

_____

_____

2. Write three things you know about heat!

- _____
- _____
- _____

3. Write the most interesting thing you learned about heat.

_____

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_____

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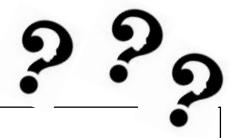
_____

Name: _____

My Science Experiment



My Question_____

_____

_____

My Hypothesis_____

I think_____

_____

My Materials

My Plan