

Heat and Insulation

3rd Grade Science

Standard V: Students will understand that the sun is the main source of heat and light for living things 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.

Indicator a: Provide examples of how sunlight affects people and animals by providing heat and light.

Science Intended Learning Outcomes

1 Use Science Process and Thinking Skills

a Observe simple objects and patterns and report their observations.

e Use instruments to measure length, temperature, volume, and weight using appropriate units.

f Conduct a simple investigation when given directions.

h Use observations to construct a reasonable explanation.

2 Manifest Scientific Attitudes and Interest

a Demonstrate a sense of curiosity about nature.

3 Understand Science Concepts and Principles

c Explain science concepts and principles using their own words and explanations.

4 Communicate effectively using Science Language and Reasoning

a Record data accurately when given the appropriate form and format (e.g., table, graph, chart).

3rd Grade Social Studies Connection

Standard I: Student will understand how geography influences community location and development.

Objective 1: Describe how various communities have adapted to existing environments and how other communities have modified the environment.

Indicator c: Describe how communities have modified the environment to accommodate their needs (e.g., logging, storing water, building transportations systems).

Background Information:

Insulation is very important to our lives—not only to keep us warm or cool, but to save us money too. There are many types of insulation and many ways insulation is used. We have insulation for machines, houses, our bodies, refrigerators, heaters, travel containers, and many appliances. Not only is insulation used to keep heat or cold in for our houses, but it also doesn't let heat from a motor go to other parts of the machine or appliance. Science is always coming up with better insulation to keep costs down and cool and heat in (or out).

Materials

- Cups with flannel, paper, tin foil, cloth around them.
- Cups with nothing around them.
- Styrofoam cups
- Hot water, 120 degrees F.
- Worksheet “Which Insulation Works Best?”
- Thermometers for each cup
- Worksheet, *Which Insulation Works Best?*

Procedure

Pre-activity

1. Talk about what people do or have done to stay warm during the wintertime and stay cool in the summertime.
2. What have we done to our house to keep them cool and warm? (You may want to bring in some building insulation to look at—but not feel.)
3. What kinds of clothes do we wear during the different seasons?
4. How does heat and cold affect us with insulation?
5. Talk about insulation and how it helps us stay warm and cool.
6. Talk about how insulation saves us money.
7. Talk about the different degrees of insulation we use so we don't overheat our bodies.

Activity One

1. Give each student the paper, *Which Insulation Works Best?*
2. Explain to them that there are different types of insulation around each cup except one. The one that doesn't have insulation is a control. A control is something that shows us what usually happens. There will be six cups in all.
3. Tell them that they will be in groups of 3 where each student will get two cups each.
4. Tell them that their cups are going to be filled up with hot water, about 120 degrees F.
5. We want to see which cup will hold the heat the best. That means that the temperature won't drop very much during the next 16 minutes. The ones that do drop in temperature more quickly are not-so-good insulators.
6. When we are done with the experiments, we are going to share with our partners and graph what happened.
7. Pour the water into the cups.
8. Have the students take the beginning temperatures for their cups and write them in the appropriate columns.
9. Continue to do this in increments of two minutes until all the spaces in your columns are filled.
10. Share your results with your partners by having them write down your information in their appropriate spaces and you writing their information in your appropriate spaces.

Activity Two

1. Tell the students that we are now going to graph their information with a line graph. You may want to tell them what a line graph is used for—to chart the change of things over time.
2. Teach them how to plot points on the vertical lines by looking at the horizontal lines where the temperatures are.

3. Tell them they are going to chart the two insulators they observed, but they are to chart each insulator separately.
4. Tell them to chart the first one by putting one mark on each line.
5. When there is a mark on each line, they are to connect the dots horizontally going to the right with a crayon.
6. Tell them to do the same with the second insulator. Draw the line with a different color.
7. When they are done, explain to them what to look for, for comparison. Have them look if the slopes of the lines are somewhat flat or somewhat steep. A good insulator is more flat than steep and a bad insulator is more steep than flat.
8. Compare the two lines to see which one is the better insulator.
9. The teacher can do one of two things: He/she can have the students chart the rest of the insulators or have them compare the groups' papers with each other to see which one is the best insulator.

Post Activity

1. Have the students share with each other in their groups which one is the best insulator, the worst insulator, and the ones in between.
2. Have them share their findings to the class.

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Which Insulation Works Best?

Each of you has a cup with one of the pieces of material around it listed below. You will be working in groups of four, each having different testing cups. Each will get some hot water in their cups. Write down the beginning temperature in the “beginning” row under your type of cup cover. Then every five minutes we will take the temperature of the water in the cup and write the temperature in that same column of your cup cover. Every five minute the temperature of the water in the cup could drop, but some cup temperatures could drop faster. If the temperature is dropping quickly the cup cover is a “poor” insulator. If the temperature is dropping slowly it is a “good” insulator. Let’s see what happens to your groups’ water temperatures as we do this experiment.

Minutes	Towel	Tin Foil	Paper	Styrofoam	Fabric	Control
Beginning						
5 minutes						
10 minutes						
15 minutes						
20 minutes						
25 minutes						
30 minutes						
35 minutes						
40 minutes						

Insulation Comparison

