Insulation and Conservation	Grade 5 - Earth & Space Systems

Lesson Plan

Safety Notes

Be careful when using ice cold water. Do not allow it to enter the bag.

Description

In this lesson, students will investigate different types of insulation used to conserve thermal energy.

Materials

- Large ziplock bags
- Medium ziplock bags (large enough to fit your hand)
- Tape
- Various materials to test
- Bucket (or other waterproof container large enough for your hands)
- Cold water
- Ice

Science Background

It can get very cold in Canada! A significant portion of the energy we use in our country is used to keep us warm. Thermal energy always wants to move, as it tries to go from where it is hot to where it is cold. To counter this affect and stay warm, more energy is required, unless some of that heat can be trapped using an insulator. Most insulators are light fluffy materials that trap heat in small air pockets inside of them, reducing the rate that the thermal energy escapes. In this experiment we will explore a variety of materials to see how well they work as insulation.

Activity Procedure

1. Fill the bucket or or container part way with water and ice. The water level will rise when you stick your hands in, so leave lots of room.
2. Fill a large ziplock halfway with the material you want to test.
3. Put your hand inside the smaller ziplock.
4. Put the small ziplock, with your hand in it, partway inside the large ziplock. Tape the bags together and shift the insulation to fill the space between the bags evenly. (If necessary, untape the bags and add or remove material.)
5. With your hand still inside the bags, put them into the ice water. **DO NOT allow the ice water to fill the bag!** Wait a moment. How cold does it get? Use the worksheet to record your observations.

6. Repeat steps 1-5 with a different material. Use the worksheet to record your observations. What sort of material makes the best insulation?

Debrief

Different types of insulation have different abilities for retaining heat. The better the insulator, the less thermal energy escapes which in turn helps to conserve energy.

Handout

First, try with no insulation in the bags (this is called a “control”).

- Control: No insulation
  How cold did it feel?

Now try other materials.

- Material #1:
  How cold did it feel?

- Material #2:
  How cold did it feel?

- Material #3:
  How cold did it feel?

- Material #4:
  How cold did it feel?

- Material #5:
  How cold did it feel?

Questions:

1. Which material was the best insulator?

2. Try and find out what insulation is used in your house. Do you think it works as good as the material you tested?

3. Energy cannot be created or destroyed, just converted from one type to another. What type of energy does your house convert into thermal energy?

4. Keeping thermal energy from escaping your house in the winter saves energy on heating. How can insulation help us conserve energy in the summer?

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Handout Answers

1. Which material was the best insulator?
   This will vary.

2. Try and find out what insulation is used in your house. Do you think it works as good as the material you tested?
   This will vary. Answers can include: styrofoam, spray foam, pink fiberglass, blown cellulose, and "I don't know. I can't see through walls."

3. Energy cannot be created or destroyed, just converted from one type to another. What type of energy does your house convert into thermal energy?
   This will vary. The most common will be chemical potential energy (if you heat with propane, natural gas, or wood) and electrical energy. You may also see solar energy or geothermal energy.

4. Keeping thermal energy from escaping your house in the winter saves energy on heating. How can insulation help us conserve energy in the summer?
   By keeping thermal energy out of the house, you don't need to use as much electrical energy to run an air conditioner, if you have one. Your refrigerator and freezer also use insulation to keep heat out so it needs less energy to keep food cold.