

## Lesson Plan

Assessment  
Cross-curricular

Assessment, Checklist

### Big Ideas

- Energy can neither be created nor destroyed, but it can be transformed.
- Conservation (reducing our use of energy and resources) is one way of reducing the impacts of using energy and resources.

### Learning Goals

- To become aware what role insulation can play in conserving energy.
- To come up with ideas how students could make their own homes more energy efficient.

### Specific Expectations:

- 1.1** analyse the long-term impacts on society and the environment of human uses of energy and natural resources, and suggest ways to reduce these impacts
- 1.2** evaluate the effects of various technologies on energy consumption and propose ways in which individuals can improve energy conservation
- 2.4** use appropriate science and technology vocabulary, including energy, heat, light, sound, electrical, mechanical, and chemical, in oral and written communication
- 3.5** explain that energy that is apparently “lost” from a system has been transformed into other energy forms (usually heat or sound) that are not useful to the system

### Description:

This is the **fifth** of a five-lesson unit on energy storage and conservation. Understanding energy loss is key in coming up with better ways to conserve energy in our daily lives. In this lesson we will specifically focus on energy loss in the context of our own homes and thermal insulation.

### Materials/Resources:

- Small Tupperware containers (ice cube sized)
- One or two ice cubes per student
- Various insulating materials:
  - Wool, Fiberglass insulation, Bits of towel, Sawdust

- Aluminum foil, Paper (for example wax paper)
- Water (you can submerge the ice cube in water and see how that compares to other materials)
- Plastic (e.g. a plastic bag. Can be cut into small pieces)
- Styrofoam, Insulating emergency blanket pieces, Down (from an old pillow?), Etc.

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## Introduction

### Introducing the Insulation Experiment

- What is insulation used for? (e.g. to shield your house from cold (and hot) temperatures)
- What other uses for insulation can you think of? (Winter clothes, blankets, etc.)
- There are many types of insulation: Wood (In an old log home for example), bats of fiberglass, paper bits (for example in your attic), cloth (For example for blankets), fleece, down (for example in a winter coat), etc.
  - As you go through this list you can show examples from the materials students will use to shield their ice cubes.
- We tend to think of insulation as being helpful in keeping something (e.g. your house or body) warm, but what insulation does is to prevent energy from flowing through it. So it is also great to keep something cold (Think of an ice cooler).
- Today we will test insulation by seeing how long we can make an ice cube last if we shield it with different materials.

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## Action

### Shielding an Ice Cube

The challenge is to choose insulation that will best protect your ice cube from melting. It may take the ice cubes that are well insulated well over the time of one class period to melt. If possible extend this activity by checking on the progress of each ice cube for **several hours**.

### Rules:

- You can only choose as much as fits into the container, while still fitting the ice cube.
- You can choose any combination of insulation but each material you choose has to form a LAYER all the way around.
- Suggestions:
  - Make a “nest” (bottom and sides) first, then place the ice cube in it and cover it with a top layer.
  - Make it easy to lift the top layer off to see how much the ice cube has melted.
- Once the ice cubes are all shielded leave them to do their thing (melt slowly) but have the students check on how they are doing about every 10 minutes.

**Wrap up discussion**, whenever you choose to end the activity – suggested AFTER the activity on home energy efficiency.

- Why did the insulation work particularly well? Why not?
- Is there anything you could have improved?
- What can we learn from this experiment?
  - E.g. that packing the insulation in may not be helpful. Air spaces between the insulating materials (such as fiberglass wool) actually increase the insulating property of the material.
  - Not all materials work equally well. For example your house may stay warmer if it was all insulated with foam board instead of fiberglass wool. However it may be much more expensive.

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## Consolidation/Extension

### Recap of what we learned about energy loss

- We have learned that energy cannot be created or destroyed, but only change from one state to another.
- Energy can still be lost from one system though as it transforms. (Give examples)
- We have seen that when we want to store and use energy we need to reduce those losses as much as possible in order to get high-energy efficiency.
- Your homework was to find something in your house that could be improved for better energy efficiency.

### Your Home - Option 1: Group Discussion

- What did you pick, why, and what their idea is for improving it.
  - What did you pick and why? (Is it a particularly cold/hot part of the house? Can you feel wind? Is it old? Does it look damaged? Did your parents tell you that this is a problem?)
  - What is your idea for improving it? (Replace it? Insulate? Fill the cracks?)
  - Did anyone else find something similar in their house?
- You can see that we can all find things in our houses to reduce energy loss. This will help with conserving energy and reducing our utility bills. It may also make the house more comfortable to live in!

### Your Home - Option 2: Write a short report

Hand in to be marked. You can use the Home Checklist worksheet.