



Introduction

This project uses the problem of the melting Antarctic ice sheet to teach students about what happens when you freeze water – and what happens when you warm it up again.

Links to the curriculum

This project uses the idea of melting polar ice caps to link to SC2: Materials and their properties.

It is designed to help you teach the following:

- to recognise differences between solids, liquids and gases, in terms of ease of flow and maintenance of shape and volume
- to describe changes that occur when materials (for example, water, clay, dough) are heated or cooled
- that temperature is a measure of how hot or cold things are
- about reversible changes, including dissolving, melting, boiling, condensing, freezing and evaporating
- that burning materials (for example, wood, wax, natural gas) results in the formation of new materials and that this change is not usually reversible.
- using first-hand and secondary data to carry out a range of scientific investigations, including complete investigations.
- use appropriate scientific language and terms, including SI units of measurement (for example, metre, newton), to communicate ideas and explain the behaviour of living things, materials, phenomena and processes

Teaching the Project

Introduce the concept of ice and specifically the Antarctic polar ice sheet with some of our spectacular photographs and footage, to be found in the '[Think Tank](#)'.

Melting Ice and Climate Change

Scientists for the British Antarctic Survey have recorded that Antarctic Peninsula temperatures have risen by around 2.5°C since records began in the 1940's.

Scientists do not yet know whether this is a local magnification of global warming, or if it is the result of natural climate fluctuations. This rapid warming has been blamed for the retreat of several ice shelves along the Antarctic Peninsula.

Here are a few interesting Antarctica facts to help get the lesson started

Did you know that:

- Antarctica is 14 million square kilometres wide
- Ice covers all but 2.4% of Antarctica (or 336,000 square miles, making the ice sheet 13,664,000 square kilometres wide)
- The ice is nearly 4.83 kilometres thick at its deepest point.
- The ice averages 1.34 miles thick, making Antarctica the highest continent.
- 90% of the world's ice is found in Antarctica
- And 70% of all the world's fresh water
- The continent of Antarctica is covered by two ice sheets - one is supported by land, the other by mountains under the sea.
- Antarctica is the coldest continent
- The world's record low temperature of -89.2°C was recorded there.

Use the facts to launch a discussion about temperature.

Ask students to draw a thermometer and clearly indicate the boiling point of water (100°C) and freezing point (0°C).

Then ask them to mark off minus points in tens until -89.2°C - the lowest temperature ever recorded on earth.



Let the fun begin!

Each student will need an 'Ice Diary' in which to record their data.

Materials/Resources:

- One approximately 300ml, clear plastic cup
- Freezer to freeze ice
- Celsius thermometer to record temperature
- 100ml tap water

Procedure:

1. Measure 100ml of tap water into plastic cup.
2. Freeze for 24 hours.
3. Remove from freezer and place cup in an open outdoor area away from the shade at 9:00 a.m.
4. **Observe and record the following data at 9:00 a.m.**
 - Surface cup was placed on.
 - Outdoor temperature at location of ice, in °C
 - Weather conditions (e.g. cloudy, sunny, rainy, snowy, windy, humid).
5. Predict how long it will take for the ice to melt using hours and minutes.
6. Check ice every hour, or half hour, or 15 minutes - at your discretion depending on ambient temperature and how fast ice is melting - until it is nearly melted.
7. When ice is nearly melted, check ice at 15 or five minute intervals - at your discretion depending on ambient temperature and how fast ice is melting.
8. **When ice has completely melted, observe and record the following data:**
 - Time of day (to the nearest quarter of an hour).
 - Outdoor temperature at location of ice.
 - Weather conditions (e.g. cloudy, sunny, rainy, snowy, windy, humid).

Inside:

Follow the same procedure but inside. Instead of recording weather conditions, record whether the cup was placed in close to a radiator or not. You could put one cup on a radiator and one next to a window.

An extension experiment

Mix 20 grams of salt with 100ml of tap water. At the same time, prepare a cup with 100ml of fresh tap water. Put both cups in the freezer.

Because it takes much colder temperatures to freeze salt water, the cup with the fresh water in it should freeze first. The cup with the salt water should not quite freeze, but turn to slush with some frozen parts. The salt itself will not freeze.

This experiment helps explain why the Antarctic ice sheet is frozen, even though salt does not freeze. The fresh water freezes first, leaving pockets of salt water which prevent strong ice crystals from forming. But the salt water gradually disappears over time, allowing stronger structures to form.

Recording Data

The data collected during the investigation should be recorded using the tables provided on the student's worksheet. These tables can be cut out and stuck in the 'Ice Diary'. This data should then be transferred to a spreadsheet.

Questions to be answered using individual and Climate Lab data:

- What happens to water when it freezes?
- What happens to ice when it melts?
- Did everyone's ice melt as quickly or slowly as estimated?
- Which ice melted the fastest?
- Which melted the slowest?
- What factors do you think affected the speed of the melting ice?
- Which melted faster - the ice inside or outside? Why?

What did you think of the experiment? Which part did you enjoy? Did any of the results surprise you?

What about climate change?

Scientists believe melting ice caps may be linked to climate change. As the world gets hotter, ice at the poles may continue to melt. What effect do you think this will have on our oceans?

Student Challenge 1

Ice Cap Meltdown!



SCIENCE KS2

CLIMATE LAB

Introduction

Welcome to the Climate Lab Ice Cap Meltdown challenge.

This is an interactive science investigation designed to help you find out all about ice. You will be collecting your own data and then comparing your findings as a class.

The Project

The aim of this challenge is to find out all about ice and what happens when it melts.

Melting ice is one of the problems caused by global warming.

For example, scientists in Antarctica have recorded a rise of around 2.5% in temperatures in the region since the 1940's. They are not sure whether this rise is caused by climate change, or by natural changes in the continent's temperature.

If all the ice in Antarctica melted, what do you think would happen to our oceans?

Let's Find out!

Your teacher will help you set up the Ice Cap Meltdown experiment.

You will be asked to record your findings in an 'Ice Diary'.

You can use the boxes provided on the challenge sheet to record the data. Cut it out and stick it in your Ice Diary.

Some fascinating ice facts!

- Ice is a solid
- Water is a liquid
- When we freeze water, it becomes solid and we call it ice
- This is known as a reversible change, because we can melt the ice and turn it back into water again
- Water freezes at temperatures below 1°C - degree Celsius
- But if you put other things in the water - salt for example - it takes much lower temperatures to freeze the water

Ice Cap Meltdown!



What is ice? Use these words to fill the spaces and create your own fact box

Liquid

0°C

Water

Ice

Ice is frozen _____

Water freezes when the temperature falls below _____

Water is a _____

_____ is a solid

Ice kept inside

I estimate it will take _____ hours and _____ minutes for the ice to melt.

Time							
Conditions							
Estimated % of water which is ice							

Ice kept outside

I estimate it will take _____ hours and _____ minutes for the ice to melt.

Time							
Conditions							
Estimated % of water which is ice							