

Lesson Background

The expedition team will face temperatures as low as -50°C . The body is susceptible to frostbite when the temperature falls below freezing point which is 0°C . The team will need to make many preparations to ensure they can deal with the cold conditions to keep functioning and healthy.

Outcomes

The students will have an understanding of the intense cold, and the equipment and materials that are necessary to ensure survival when living in extreme cold temperatures.

Preparation

Familiarise students with Celsius and Fahrenheit temperature scales noticing boiling point, freezing point and where the two scales intersect (approx -40°). Contact your local supermarket for permission for the students to go into their cool room so the students can experience the cold conditions. Alternatively organise to take students to an ice skating rink for a length of time. Gather examples of materials used for clothing in extreme cold conditions. Collect photos of frostbite. Organise access to a freezer and a thermometer (capable of reading freezer temps -20°C)

Student Activities

Student Activity 1. How cold is cold?

Research the range of temperatures experienced at the North Pole and relate these to the student's own personal experiences. Arrange for a visit to a cool room in a supermarket or visit an ice skating rink. Try out different ways of keeping warm (moving, eating, insulating) and work out which method would be used when, by expeditioners. Ask students to describe what cold is.

Student Activity 2. Equipment and Food below 0°

Most items will freeze around 0°C . Ask students to bring in samples of all the things that they would take on a trip. Place them in the freezer to check at what point they freeze and what they are like when they are frozen.

Students could freeze items such as:

Personal items	Food	Equipment
toothpaste moisturiser sunscreen lip salve	water butter cheese crackers sultanas salami butter milk powder nuts chocolate	wire (eg a phone recharger) torch (with batteries) camera (seal inside a Ziploc bag) gloves beanie (wet and dry) T – shirt (with perspiration and without) Methylated Spirits (expedition stove fuel)

The less water content the less impact freezing has on that item.

Examine the frozen food items. What do they look like, feel like and taste like frozen?

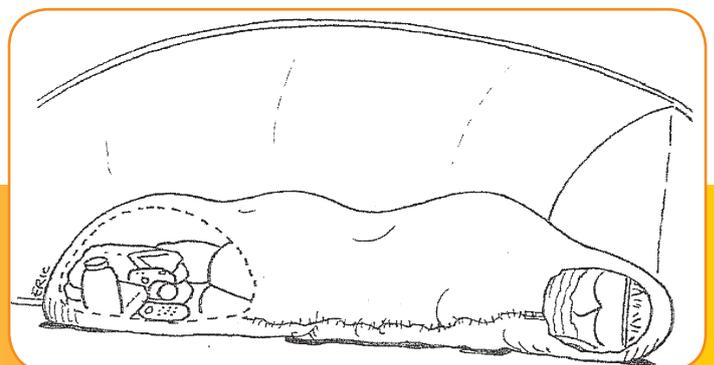
Examine the other items and discuss how they could be used when they are frozen. Discuss ways to thaw them out. Notice whether the camera gets condensation on it when taken out of the freezer Discuss how this could be managed (expeditioners tend to never warm up the camera which means leaving it outside the tent. The batteries need to be warmed up though). Try out how well the cold batteries work compared to warm ones.

Record findings in a data chart.

Student Activity 3. Moisture management and insulation

Investigate the expedition 'clothing system' to understand how the materials assist with insulation and moisture management. Discuss why moisture management is an important aspect of managing the cold conditions. Wet a 'thermal' and a cotton top with an equal amount of water and compare drying times.

Explore the insulating properties of clothing material by seeing which will prevent an iceblock from melting the best (place the iceblock in a plastic bag and then wrap up in the material. Check the iceblock on 3 minute intervals).



Student activity 4. Traditional clothing systems

Research Inuit people and how, prior to meeting white people, they lived in arctic conditions. Inuit people chose different animal skins according to their properties and thus carefully managed moisture, temperature and flexibility. Find out which skins were used in which way.

Compare modern clothing systems with the traditional Inuit system using a data chart.

Student activity 5. Cold Illnesses

Research frostbite and hypothermia. What are these conditions and how can they be treated and avoided?

Extension

Research hyperthermia and heatstroke conditions that are a result of too much heat. Investigate the use of ice vests by sports people as a means of moderating temperature.

Resources

Information books on Arctic animals, Inuit culture.

An Inconvenient Truth (Al Gore) – DVD

Bringing Home Our Rubbish (from the North Pole Expedition)

Icecap Animals – Expedition Notes

Attachments

Arctic trip conditions –descriptions of arctic conditions by two polar expeditioners

North Pole - How cold will it get? Mean monthly temperature charts for the North Pole and other arctic locations

Typical Expedition Menu – list of food that the expeditioners would have with them.

Arctic Clothing List and explanation of the 'clothing system'.

South Pole Expedition Diary – extracts about the cold.

Links

Layering – the logic of layering clothing according to an Australian Outdoor Equipment company

<http://www.paddypallin.com.au/default.aspx?page=137>

