NZASE resource

Practical teaching about Antarctica

When we teach about Antarctica as a science topic we need to include some practical activities. NZASE Science Communicator Mike Stone has found hands-on activities that help students learn about all aspects of the curriculum in the context of Antarctica. Some of these are documents that need to be downloaded and are not directly visible onlinel All the sources are free, but some (*) require teachers to register. The few readings included are mostly from Connected *or* School Journal.

Planet Earth and beyond

Begin by finding out what students know and want to know about Antarctica with this KWL activity. Discuss some of these ideas and ask more questions of students while looking at a globe, then introduce students to the continent with a mapping activity. Another reading and modelling activity focuses on the Erebus volcano.

Daylength, seasons and climate

In Antarctica daylength and seasons are very different from Aotearoa. Explore these ideas with a graphing activity. A Year 7 sequence of lessons* explores daylength, temperature and seasons in the context of Antarctica.

Antarctica is the coldest, driest, windiest place on earth, so the weather and climate are extreme. Education Perfect has a lesson* on this. Another activity analyses climate data from two Antarctic stations. A maths activity explores windchill. Another data activity explores temperature in Antarctica, while this activity matches descriptions to data.

Students can observe the weather via six webcams* run by the Australian Antarctic Division, and four run by Antarctica NZ, but these will be mostly black between April and September.

Gentoo penguins on Cuverville Island. Cropped photo by Jeff Overs, CC BY-ND 2.0.

* Accessing resources

Register for free Australian Science resources here.

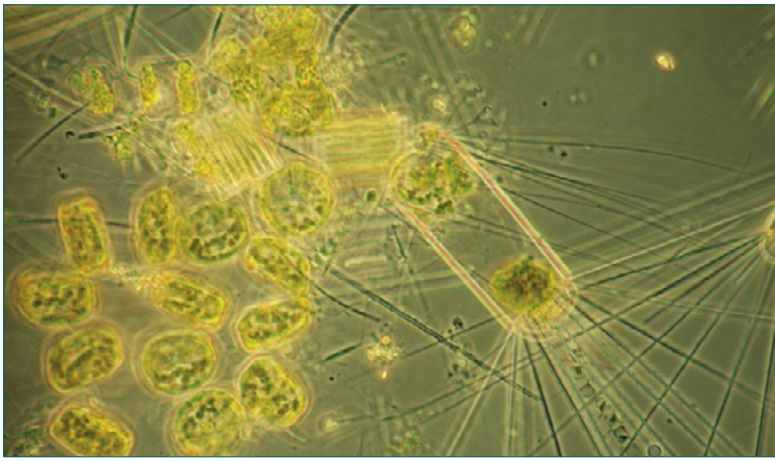
Register for Education Perfect's free Science Alive Mātauranga resources here.

Google Drive, YouTube and other links:

If you have trouble reaching these, select "Copy hyperlink" rather than "open hyperlink", and paste the URL in your browser.

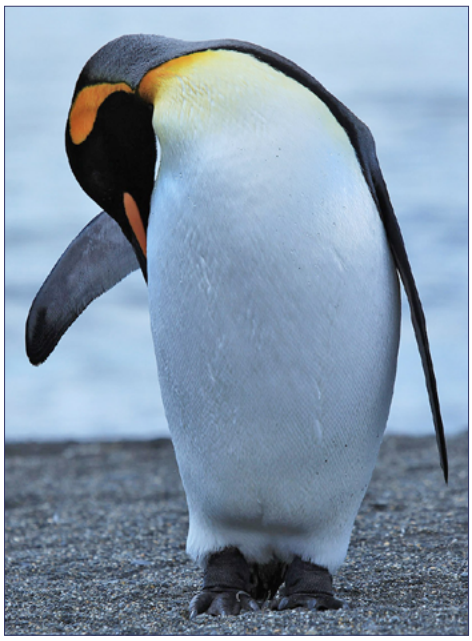
Living world

To do justice to living things in Antarctica, we need to ensure we include an exploration of plankton, the microscopic plants that form the basis of polar food chains. The "Catch my drift" reading in L4 *Connected*, 2012, introduces plankton, after which students could collect a sample of seawater and observe some at a cellular level. They can also observe plankton as blooms discolouring the sea water. Students could also fill clear drink bottles with boiled water, tap water, stream water or seawater and keep them on a window ledge for a week or two to see if phytoplankton become discernible to the naked eye.



Phytoplankton. Image: Antarctic Climate and Ecosystems Co-operative Research Centre.

Penguins



A king penguin preening. Photo: Liam Quinn, CC BY-SA 2.0.

Penguins are the most visible animal in Antarctica. If you are close to a main centre, there may be an aquarium where students can see them live. As students often misconceive penguins as mammals, this activity is a good place to start. Then you can introduce students to the seven different types of Antarctic penguin and ask them to identify penguins on a web cam or the other webcam at the German Antarctic Station, but remember these will be mostly black between April and September.

A *School Journal* reading discusses penguins and their habitats, structure and behaviours generally, or use this PowerPoint of similar information, with teaching ideas. A practical demonstrates the effectiveness of penguins huddling. Another practical demonstrates the counter-current system.

Primary students could build and test a gentoo penguin nest. A penguin poster may also be useful. There are also opportunities for students to get involved in a citizen science project on penguins. Using the penguin card for identification above as a model, students could develop their own cards for seal identification, and slides about adaptations. Teachers can then use student resources the next time they teach this topic.

Whales

Students can learn about types of whales and their feeding adaptations with this video and this practical. Sonny Ngatai's first video has a segment on whales that starts at 4:35. Students can also look at the properties of blubber in this experiment.

Krill

Krill are one of the least visible organisms under Antarctica but also one of the most important. Students can observe krill on a webcam. Use this PowerPoint to discuss aspects of krill. Students could then do some practical investigations with krill's cousin, the brine shrimp.

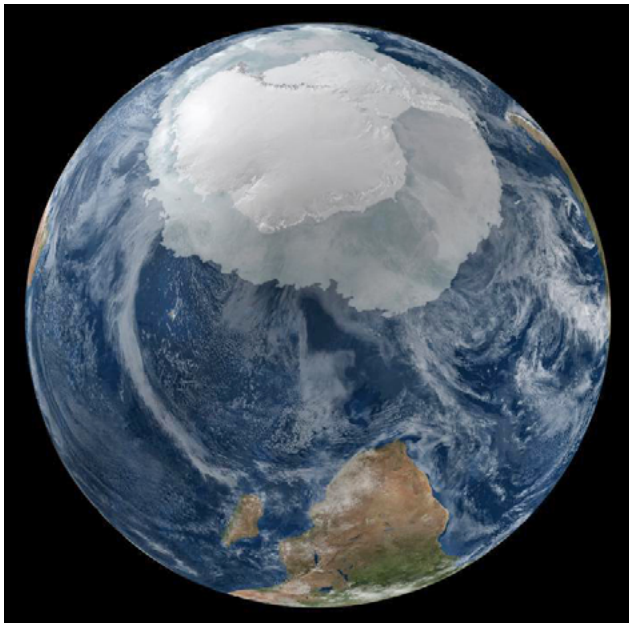
Food chains and webs

Once students have looked at the key species, then it is time to introduce food chains and food webs. Food chains generally could be introduced using this Cutlass activity. Explain that food webs are interconnected food chains. To build an Antarctic food web, younger students may use this online activity, and older students may use this downloadable one. Once students have constructed the food web, ask them to consider the implications of changes with questions such as these. Or students could look at "Who's Eating Who", L4 *Connected,* 2012.

A teacher from a LEARNZ virtual fieldtrip to the ice shared a lesson for Level 5 on how animals survive the cold at Antarctica.

Material world

Snow and ice is all around you in Antarctica. If you live in a place where snow falls you may be able to catch and observe snowflakes. This reading for older students looks at different types of ice, with activities for making sea ice and models of ice flow. This video demonstrates the speed of freezing.



Composite image of Antarctica in global context. NASA/ Goddard Space Flight Center Scientific Visualization Studio; nasa-images.org

Fresh and salt water

Students could explore salt water vs fresh water. In this video a sci-

entist explains the difference between sea ice and icebergs. Another unit explores the water cycle* in the context of Antarctica for Year 7 students, including practicals. Another set of practicals compares fresh and salt water. Here is another practical focussing on density. This practical compares the effect of Arctic and Antarctic ice melting on sea levels.

Ozone

Another way to explore the chemistry of Antarctica is to look at ozone. This video is a good summary for younger students. This reading on ozone and CFCs includes graphing and aerosol activities. Another activity uses modelling clay to explore the meaning of parts per million. Another activity explains the ozone hole for younger students and provides an ozone mapping activity. Education Perfect has a lesson on ozone*.

Anti-freeze and acidification

To survive in Antarctica some fish have anti-freeze in their blood. This experiment for older students looks at the effect of these substances.

Ocean acidification can also be studied in the context of Antarctica. Education Perfect has a lesson* and an investigation* about this.

Physical world

Freshwater and salt water meet in and around Antarctica. These investigations look at the properties of fresh and salt water and how they affect each other.

The warming of our atmospheric temperatures will affect Antarctica. This reading and video demonstrates the ability of oceans to absorb heat, an experiment you could try.

Glacier in the Dry Valley. Image from On thin ice: Nigel Latta in Antarctica, *Razor Films.*

The ice wall at the end of a glacier in the Dry Valley. Image from On thin ice: Nigel Latta in Antarctica, *Razor Films.*

Insulation for people

Heat and its loss has many implications in Antarctica. Scientists need to be able to stand still to work and also move around, getting hot and sweaty. This video demonstrates extreme cold weather clothes, and younger students may enjoy this interactive where they dress a scientist in the correct order. A teacher from a LEARNZ virtual fieldtrip to the ice shared lessons for Level 3 on how humans survive the cold. This practical tests the insulating properties of different materials.

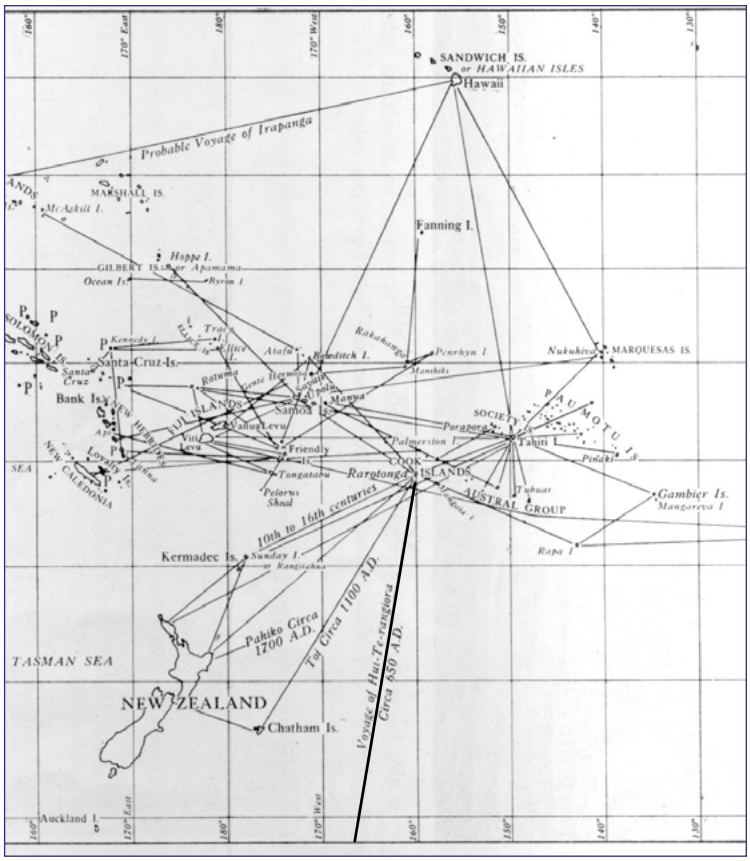
Concept cartoons are good discussion starters that show student thinking, and can be effective for addressing misconceptions – here's the theory. This is a great concept cartoon for exploring students' ideas about insulation.

Nature of Science

Scientists live and work in Antarctica. This video explains what it is like to be in Antarctica. Antarctic scientists discuss their work in both of Nigel Latta's *On Thin Ice* videos, episode one and two. LEARNZ virtual fieldtrips also have short video clips about scientists' work. Much of the scientific work focuses on climate change and *Alpha* 120 explores this theme. This practical explores sea level rise.

In this *Connected* article an ecologist explains her work with Adelie penguins.

Scientists drill and extract cores from the ice, to find out what went on here in the past. This video shows the steps involved and this *Connected* article tells the story of one scientist drilling cores, and what she finds about Antarctica's past climate.



Some Polynesian voyages, including that of explorer Hui Te Rangiora to Antarctica, ~650CE. Recorded by Elsdon Best, 1923.

Te Kaiwhakatere o te Raki, the Navigator of the Heavens, in front of Scott Base. Master carver Fayne Robinson (Poutini, Ngāi Tahu) designed and carved the two-metre pouwhenua, which personifies exploration, adventure and discovery. The head looks straight up to the sky, symbolising celestial navigation. It is decorated with stars, waves, water and animals.

Mātauranga Māori

There is evidence of earlier Polynesian and Māori explorers venturing this far south centuries before Bellingshausen and Lazarev, who are often credited with being the first to see Antarctica in 1821.

Both Polynesian and Māori narratives tell of explorers who travelled to Antarctica – download this student activity. A unit on Antarctica could also look at Polynesian navigation and voyaging as in Education Perfect's Antarctica resources*. Research into historical voyages is ongoing – it is possible that other Ngai Tahu waka would have explored the area.

And Māori scientists have in the past and continue to participate in Antarctic research. In this video geologist Dan Hikuroa (Ngāti Maniapoto, Tainui, Te Arawa) speaks about his time as a scientist in Antarctica.

Students can explore the several carvings that have been installed at Scott Base.

Tītī are a valuable seabird to Ngāi Tahu and they will travel as far south as Antarctica. Download student resources on tītī.

As well as ngā kupu on the right, this ngā kupu poster could also be useful.

This article was improved by critique from Sandy Jackson and Mere Manning, Ngāti Kahungunuki te Wairoa, who contributed three Mātauranga Māori resources.

Ngā Kupu

Āhuarangi hurihuri – Climate change
Ika moana – Whale, saltwater fish
Kekeno – Seal
Kōura rangi – Krill
Meroiti – Plankton
Paikea – Humpback whale
Pākawatanga – Acidification
Parāoa – Sperm whale
Pekerangi – Ozone
Tāhuahua – Food chain
Tahu-nui-a-rangi – Aurora Australis
Te Tiri o te Moana – To paint, painting
Toka haupapa – Iceberg
Whakatere – To navigate, navigation.

From Te Aka Maori Dictionary and Paekupu