NZASE resource

Teaching climate change

Left: Steep walls and the moraine in the foreground show where the Franz Josef glacier used to flow. Right: The glacier in 2001. Both photos: DoC.

Climate change is global issue about which students have marched in many countries. This current real-world topic will engage many students, so how can we not teach it? However, teachers can be hesitant to approach such a complex issue with its potential for controversy and anxiety, so how do we teach it? NZASE Science Communicator Mike Stone asked people with experience.

General principles

Those who teach climate change, such as Sarah Gaze of Cambridge High School, say it's not so much about teaching from the front. "Instead we need to let go and facilitate, be open-minded, listen to students and see their views as valid", she says. As well as teachers listening to what students say, it is important for students to learn to listen to and critique others' perspectives.

Climate change provides many opportunities to learn more about the Nature of Science and develop students' science capabilities. Scientists and students can gather data, use evidence to support claims, use models, interpret representations and take action.

This topic also provides an opportunity for students to engage with our climate scientists – try contacting their organisation to set up a zoom interview, as many are happy to help.

Taking action on climate change can give students the opportunity to be involved in local community projects. "Climate change is a huge topic," says Sarah, "you can't do it all, so look for and focus on a local issue. We linked with a current project promoted by the local council, focussing on ways to reduce transport emissions, e.g., trialling bike lanes."

"In this dairy farming area we avoided the contentious issue of methane emission as we did not want to alienate students from farming families."

Sarah's unit on climate change took a whole term with an Extension Year 10 class, culminating in an assessment of the new Standard, S1.1, AS 91920 Develop a science-informed response to a local socio-scientific issue. As part of their 'climate action', students were asked to "make, build, or create something." They needed to plan an outline and get teacher approval before starting. Some created images, others conducted surveys, built things to reduce emissions, started a business, or created posters which they displayed in town.

That local curriculum approach is the key. It can provide real life opportunities to collectively act and bring hope to what can feel like an insurmountable problem. Since early 2020, Sian Carvell has been working with coastal and low-lying schools in Ōtautahi as part of the Christchurch City Council's Coastal Hazards Adaptation Programme.

A CHS student project – building a worm farm. Photo: Sarah Gaze.

For these schools the risk of climate change is real and a relevant context to pique student interest. To support learning and understanding, Sian developed and used a level four resource, supported by MoE and first launched in 2020. In these 13 schools, Sian facilitates half of the lessons to year 6-10 students, leaving the rest to their teachers.

Actions by students have included producing songs, public artwork, presentations to community boards, as well as innovations to reduce waste and promote active, low emission transport. Students from five participating schools also made a collective submission to the City Council about their Draft Coastal Adaptation Framework. They plan to speak to their submission at the upcoming draft framework hearings.

Mātauranga Māori

Toitū te Ao was designed by Raukura Gillies and carved by Gavin Britt.

This topic can be approached from a mātauranga Māori perspective.

Mere Manning (Ngāti Kahungunu ki te Wairoa), from Taradale High School, suggests starting with how Māori in the past valued the environment and tried to maintain it sustainably. This is quite important from a local perspective, so Māori students see themselves in the learning and other students see the value of what Māori did in the past.

Students could explore how these practices have changed over time and how they are used today in collaboration with western technology (eg, in growing freshwater mussels to improve lake quality.

Shelly Robson of Opihi College, Temuka, begins the topic with a Māori worldview of sustainability using TKI's teaching ideas with the carving Toitū te Ao/a sustainable world. This has deliberately interwoven some symbols of a Māori perspective of the environment.

Where others often say "I love the forest", the Māori view is "We are the forest". Senior students could explore the implications of this perspective and find out more about why understanding this Māori view is important when looking at concepts such as kaitiakitanga, rangatiratanga and mauri.

Student march for climate action, September 2019, Wellington. See News.

Students could ask whānau of local iwi or hapū about local pūrākau or whakatauki they have that reflects this kaupapa (topic) and explain how important they are to the local iwi or hapū. Or students could be encouraged to come up with their own whakatauki that they think reflects the importance of caring for the land and water (explaining their reasoning or perhaps making posters).

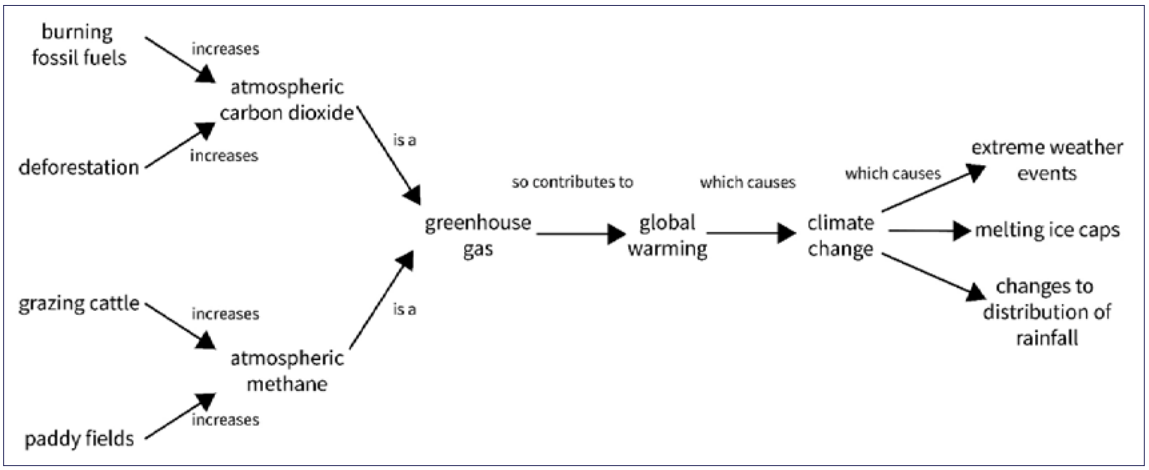
With older students it may also be possible to explore mauri. The very readable article, Papatuanuku, Earth Mother: Indigenous knowledge in 21st century soil management, by Robert McGowan, explores the concept of mauri and how it relates to the capacity of soils to support the life that belongs there. It would not be a huge leap to ask students to link this idea to climate change.

Māori communities, especially those living on the coast, are also vulnerable to the effects of climate change. In some vulnerable areas local papakāinga projects are being developed in response, providing an opportunity for students to look at sustainable housing for Māori that live there. See Stuff and Te Puni Kokiri.

Find links

This topic has good potential for cross-curricular learning. Primary teachers are well versed at drawing many learning areas together, and Sarah Gaze suggests including other HoDs in your secondary planning.

Hayden Walsh, Enviroschools teacher at



Cause and effect flowcharts can help clarify ideas about climate change. Royal Society of Chemistry.

Hobsonville Point Primary, used World Ocean Week as a context, and the resources of the Young Ocean Explorers website for learning.

Shelly Robson used the MoE resource (below) then got students to compare consumer products; they analysed different brands to see which had the biggest carbon footprint (including type of transport, food miles and other components).

Students tried to use local brands; the two brands of tomato sauce chosen included Heinz and local company Barkers. "I emailed companies I buy products from and they sent students sample packs to take home in exchange for a plug on Facebook," Shelly says.

In a second unit on infrastructure, Shelly used the education edition of Minecraft. Over six lessons students explored a city built for sustainability, with characters that explained the design. Then students were asked to build a sustainable home, explaining the science of the features they chose.

Dealing with data

As climate change is a gradual process, graphs showing change over time can be a powerful teaching tool to help students better understand climate trends.

There is a wealth of data on the evidence for climate change, its causes and effects. To avoid getting swamped, teachers need to think first about what they want students to learn, and target the data which shows this most clearly.

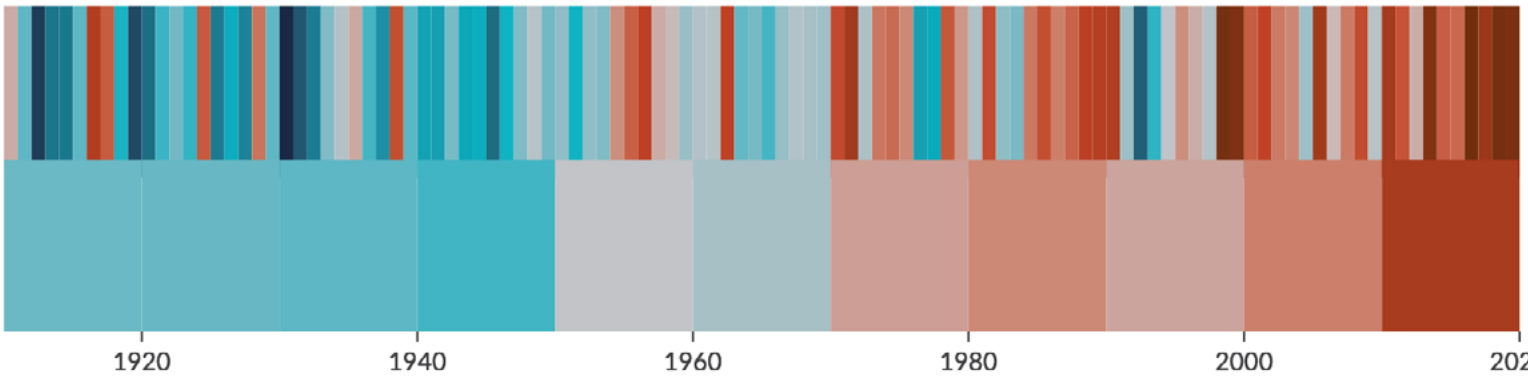
To interrogate the data with students these questions may be helpful: What do you notice? What do you wonder? What story is the graph telling you? It works best to do this in small groups first, then discuss as a whole class. As they hear each other's comments, students dig deeper and discover more aspects to the story.

Shelly Robson found infographics with pictures helpful to clarify complex data. "The book *100 things to know about saving the planet*, published by Usborne, ($18 from The Warehouse) was good for my students with weak literacy and had great activities," she said.

Anxiety

Some students will get anxious, and it's important to validate and acknowledge their concerns. For Pasifika students this issue may already be affecting their families in the islands. To help teachers navigate these issues, MoE developed a well-being guide (see resources).

NZ's average temperature, showing annual and decadal data. From 11.5°C (dark blue) to 13.5°C (dark brown). Top bar shows annual data, bottom bar shows data over 10-year periods.



Rachel Bolstad, climate change education researcher at NZCER, says students feel less anxious when they get a sense of agency. This means that as well as teaching the science, it's important for us to focus students on what they can do, individually and collectively.

Understanding the science behind climate change also helps students deal with their feelings, Sian Carvel says. Student feedback has said "I feel so much more empowered because I know what I know." Learners also say they do not want it left up to adults because there is not enough urgency. Sian reports "The kids have said they are concerned others do not miss out on climate change education - the more people who know, the less alone they feel."

Useful resources

Sarah Gaze suggests "you don't have to start from scratch. Look at what is out there and modify it to your context, link to the local area." While there are many resources from overseas, NZ resources are often more relevant. For example:

Pūtātara incorporates sustainability and global citizenship across the curriculum, with a focus on tūrangawaewae, kaitiakitanga and whakapūawai.

MoE resources, developed by Sian Carvell: Climate Change – prepare today, live well tomorrow and its accompanying Well-being guide. A new version is due out soon, as is a kaupapa Māori version.

Programs from the Mātauranga Project TV series; some are available on the Science Learning Hub (search for 'scottie').

Science Learning Hub has many resources, and a section on exploring mātauranga Māori and climate change.

A good carbon footprint calculator, which takes into account NZ's lower reliance on fossil fuels.

School Journal has a recent series of three articles: Our biggest challenge; Feedback;and Reducing our footprint.

Connected articles: Building for the future describes impact and action in Samoa; Global action looks at modelling and agricultural solutions; and Rising seas.

Concept cartoons help surface students' ideas about climate change.

Enviroschools provide a wealth of resources. Schools in this program develop student-lead projects; e.g. planting a vege garden, building bird feeders, creating garden art.

Thin Ice video teaching resource includes NZ scientists.

NZ data from the Ministry for the Environment and NIWA data activities.

A *New York Times* article on teaching using climate change data.

Sustainable Development Goals NZ provides lesson plans.

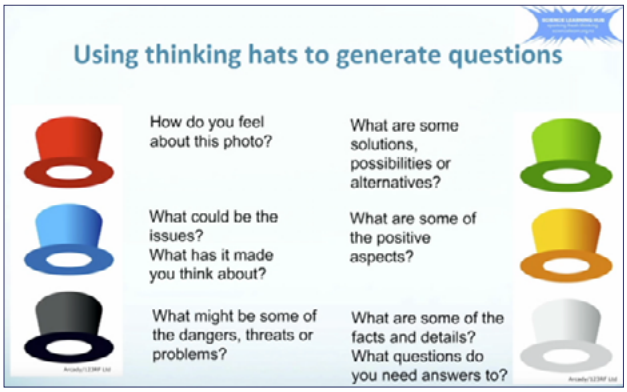
The new Rangitāne o Wairarapa Education website may also be useful.

Rangi is NIWA's climate change teaching resource.

Many LEARNZ virtual field trips have a sustainability theme and each has learning resources.

TKI provides an Education for Sustainability Teaching And Learning Guide for teachers (link to) and Guidelines for Environmental Education.

The NZAEE subject association also provides support.



Thinking hats is a useful teaching strategy to use with socio-scientific issues. Science Learning Hub.

Tamaki Drive, on Auckland's Harbour, was closed to vehicles during heavy seas in 2015. See News.

From *Pāekupu*

Ngā Kupu

Āhuarangi hurihuri – Climate change
Āwangawanga – Anxious, anxiety
Pūrākau – Traditional stories
Pārongo whakairoiro – Infographic
Raraunga houanga – Time series data
Tairaru āhuarangi – Climate crisis
Tau waenga – Median (of a data set)
Toitū – Sustainable, sustainability
Whakamana – Empowered, empowerment.