

BREAKING IT DOWN

with Dr. Michelle Dickinson



CLIMATE

Welcome to Breaking It Down with Dr Michelle Dickinson.

This worksheet is to help you to support your teaching (ako) after your students (taura) have watched the 'Climate' episode. It contains a summary of the science knowledge (pūtaiao), experiment instructions, topics for further inquiry, and links to the NZ curriculum at levels 3-4.

Use this sheet alongside the video for the climate episode of "Breaking It Down with Dr Michelle Dickinson" to help with your teaching around the science of climate, climate change, and climate measurement. During the episode, Dr Michelle Dickinson will cover the difference between climate and weather, how we measure climate, and global climate change. She will talk with Professor Tim Naish of Victoria University of Wellington, and conduct an experiment which students can follow along with.

For this session, your students will each need:

- **An egg or a few pieces of eggshell**
- **White vinegar**
- **A glass**
- **Notebook to draw in and write down their observations**

Achievement Aims

NZ Curriculum Strand: Living World

Ecology (L3-4) Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.

NZ Curriculum Strand: Planet Earth and beyond

Earth Systems (L3-4): Develop an understanding that water, air, rocks and soil, and life forms make up our planet and recognise that these are also Earth's resources.

Interacting systems (L5): Investigate how heat from the Sun, the Earth and human activities is distributed around Earth by the geosphere, hydrosphere and atmosphere.

Learning Outcomes

- Understand the difference between 'weather' and 'climate'
- Understand the effects of changing carbon dioxide levels in the atmosphere and ocean
- Understand how we measure climate changes over time
- Carry out an experiment to show the effect of low pH on calcium carbonate shells, and be able to relate this back to natural environments

BREAKING IT DOWN:

Science of Climate

'Climate' and 'weather' are two different things. Weather describes the atmospheric conditions at a point in time, whereas climate (āhua o te rangi) describes the long-term patterns in weather over a period of time anywhere from decades to millennia. For example, today's weather may be hot (wera), rainy (ua) or cloudy (kapua), whereas the climate may be temperate, tropical or polar. Talking about 'climate change' therefore means we are looking at long timescales to see differences in general trends.

Humans have been recording weather patterns for hundreds of years, and we can use evidence from fossils, mud, rocks and ice cores to give us clues about what the climate was like before records began. We know that there have been periods of massive climate change throughout history, including at least 5 ice ages followed by thawing periods. The reasons for these changes are varied by may include changes in the Earth's orbit, and the concentration of various gasses in the atmosphere.

When we look at climate change today, we can see that the rate of climate warming is faster than it has been in the past. We also know that there are high concentrations of greenhouse gases such as carbon dioxide, water vapor and methane in our atmosphere. These can prevent the Sun's heat from leaving the atmosphere, causing it to warm.

Excess carbon dioxide in the atmosphere can also dissolve into the ocean, which we call a 'carbon sink' because it absorbs more carbon products than it produces. Once dissolved, carbon dioxide reacts with seawater to form carbonic acid. Higher carbonic acid concentrations can lower the ocean pH, in a process called 'ocean acidification.' The chemical and biological effects of ocean acidification are still being researched and understood by scientists.

EXPERIMENT INSTRUCTIONS

Experiment: Dissolving Eggs

- Place your egg into a glass or bowl
- Cover the egg with vinegar

- Observe any physical and chemical changes to the egg as it sits in the vinegar

EXPLORE FURTHER

(Use these prompts to start a discussion or further inquiry on the topic of climate)

- Will planting more trees take more carbon dioxide from the atmosphere?
- Will higher sea levels mean that beaches will disappear?
- What can I do to help mitigate the effects of climate change?
- How do I calculate my carbon footprint?
- How do scientists even get the teeth from a sea urchin?

FURTHER EXPERIMENTS & INFORMATION

Check out the 'Oceans of Tomorrow' workbook from the University of Otago for more experiments with ocean acidification and warming: <https://bit.ly/3eCbKDE>

Check out this climate change computer modelling online activity <https://www.stem.org.uk/resources/elibrary/resource/26878/modelling-climate-change>



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