



# OCEAN CURRENTS

This worksheet is to help support your teaching after your students have watched the 'Ocean Currents' video from Nanogirl Labs, hosted by marine biologist Dr Kate Sparks.

Ocean currents can flow for thousands of kilometres, generated as a result of the forces acting upon the water like the Earth's rotation, wind, temperature, salinity differences and the gravitational effects of the moon.

In this video we explore the 'global ocean conveyor' - the interconnection of the world's oceans as a result of currents - and the collective value of protecting different regions of the oceans in combatting climate change.

These notes contain a summary of the science knowledge, experiment instructions, topics for further inquiry, and links to the curriculum.

For this session, your students will each need:

- **Shallow tray e.g. baking dish (clear or light-coloured work best)**
- **Cold water**
- **Hot water**
- **Spoon**
- **Ice**
- **Food colouring x 2 different colours**
- **Something to use as 'islands' e.g. small rocks, shells etc.**

## Achievement Aims

### 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

**Earth Systems (L5):** Investigate the composition, structure and features of the geosphere, hydrosphere and atmosphere

### NZ Curriculum Strand: Nature of Science

**Understanding about science:** Identify ways in which scientists work together and provide evidence to support their ideas

**Investigating in science:** Ask questions, find evidence, explore simple models and carry out appropriate investigations to develop simple explanations

**Communicating in science:** Begin to use a range of scientific symbols, conventions and vocabulary

## Learning Outcomes

- Understand that ocean circulation is caused by uneven heat distribution
- Understand the role of ocean currents in our climate and ecosystems
- Carry out an experiment to demonstrate that mixing warm and cold water creates movement

## BREAKING IT DOWN:

Science of Ocean Currents

All parts of the global ocean are connected by the 'global ocean conveyor,' a circulating system of currents driven by differences in seawater temperature, density and salinity. When warmer and cooler water masses meet, their different temperatures mean that the cooler, saltier, more

dense water sinks underneath the warmer, fresher, less dense water. This creates movement of water on a large scale, which drives the ocean circulation. Strong winds over the ocean surface can also influence circulation. Moving ocean currents have a large effect on both the land and the sea. Currents can move warm and cold air around with them, which influences our climate here on land. Currents also carry nutrients, oxygen, animals and plants around with them, so they play an important role in marine food webs.

At the boundaries where cold and warm waters mix, we might see spiral structures called 'eddies' when we look at a thermal image of the ocean. These eddies help to mix different water masses together, and can also affect climate, as the changes in temperature tend to affect the air above them.

One possible outcome of global warming is change to the global ocean conveyor. Climate change can lead to higher rainfall, melting ice, and an influx of fresh, cold water into the ocean at the poles, which could alter the circulation. If this happens, parts of the world including most of Europe could see drastic changes to their climate.

## EXPERIMENT INSTRUCTIONS

### Experiment: Ocean Circulation

- Use food colouring to turn your hot and cold water different colours.
- Pour the cold water into a shallow tray and add ice. Make sure the water is really cold.
- Add some 'islands' into your cold ocean.
- Slowly, pour the hot water into the tray, starting from one corner.
- Observe how the hot and cold water masses mix, noting the mixing patterns.

## EXPLORE FURTHER

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

- How do the currents behave in the ocean closest to where you live?
- Which is saltier - colder seawater or warmer seawater?
- Which animals navigate using ocean currents?
- How does density affect current circulation?
- Do currents have a start and an end point?
- Does the sea ever freeze over in winter?
- How does climate change affect the weather over the ocean?

## FURTHER EXPERIMENTS & INFORMATION

Investigate real ocean thermal images taken via satellite, and see if you can spot some eddies!

<https://www.ospo.noaa.gov/Products/ocean/sst/contour/>  
<https://www.climate.gov/maps-data/dataset/sea-surface-temperature-map-viewer>

Experiment with how salinity and density affect ocean mixing with the [Climate Change Learning Program Teacher Resource](#)



Nanogirl Labs offer a full programme of Teacher PLD and in-school student engagement in support of the Climate Change curriculum. For more information, or if you have any questions, please contact [info@nanogirllabs.com](mailto:info@nanogirllabs.com).