**ACTIVITY: Clouds and the weather**

**Activity idea**

In this activity, students explore cloud formation. They observe clouds and learn about different cloud types and how they can be used to predict the weather.

By the end of this activity, students should be able to:

* demonstrate and explain how clouds form
* identify at least three basic cloud types
* predict the weather based on cloud formation in the sky and explain why they have given this prediction.

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**Introduction/background**

Being able to predict the weather is important for navigators. It helps wayfinding navigators make decisions about direction and sailing (and whether they should lie low for a day or two). One of the easiest ways to predict weather for wayfinders is by observing the clouds.

***What are clouds?***

Clouds are part of the water cycle (the movement of water from Earth into the sky and back to Earth again). Water covers 70% of the Earth and is found in the form of saltwater (97%) and freshwater (3%). The Sun heats water on the surface of the Earth and causes it to evaporate (change from liquid to a vapour). Water vapour is made up of tiny water droplets in the air. Transpiration – the movement of water out of plants during photosynthesis – also results in water vapour. The water vapour rises up into the atmosphere. As it cools, it condenses, forming visible clouds. Precipitation occurs when so much water vapour condenses that the air can’t hold it any more. The water precipitates back to Earth as rain, sleet, snow or hail.

There are many different types of clouds, and they are formed in different ways in the troposphere depending on how high up they are when they condense. The troposphere is the part of the atmosphere where all weather forms. Different clouds mean different weather. Clouds are classified by their shape and height. The names of the clouds are derived from Latin words that describe the cloud’s form. These are usually divided into three categories: cirrus, meaning curl (as in a lock of hair) or fringe, cumulus meaning heap or pile and stratus meaning spread over an area or layer. Another cloud name – nimbus – means rain-bearing and alto means high (refers to clouds in the middle or high range).

By observing the clouds, an observer can make fairly reliable predictions of what the weather will do within the next few hours or days.

In this activity, students practise observing clouds and make predictions about the weather.

**What you need**

* Hot water (not boiling) – stored in insulated containers such as thermos flasks (¼ cup per group)
* Ice cubes – stored in insulated containers (1 ice cube per group)
* Empty 1 litre soda bottles – labels removed (one per group)
* A notebook and pen
* Access to the article [Observing clouds and weather](https://www.sciencelearn.org.nz/resources/628-observing-clouds-and-weather)
* Camera

**What to do**

***Cloud in a bottle***

1. Divide students into groups of 4–5. Give each group a soda bottle, some hot water and an ice cube.
2. Each group pours the hot water into their bottle. Ask the students what is happening to the air in your bottle? How could you use the ice cubes to cool the air in the bottle? What do you think will happen when you open the bottle and put an ice cube at the mouth of the bottle?
3. After 2–3, minutes students remove the cap and put an ice cube over the mouth of the bottle. A cloud should form just below the ice cube. Ask the students to describe their observations. Ask what happens to air filled with water vapour when it is cooled? What two things must be present for a cloud to form? (Water vapour, cooling air.)

***Clouds and the weather***

1. Discuss with the class what they know about clouds. Keeping in mind the previous experiment, how do clouds form? How does this happen? Do all clouds bring rain? What kind of clouds do you see on sunny days? What do different clouds look like? (Feathers, animals, cotton balls etc.)
2. Have students read the article [Observing clouds and weather](https://www.sciencelearn.org.nz/resources/628-observing-clouds-and-weather) with a partner (or as a class) and take time to become familiar with the types of clouds. Use the internet to look up images of cloud types and learn their shapes. Discuss how different types might suggest changes in the weather.
3. Students start observing clouds. They do this for a week, recording their observations in a notebook. They could draw pictures and take photos of various types of clouds. Students then identify the clouds and use [Observing clouds and weather](https://www.sciencelearn.org.nz/resources/628-observing-clouds-and-weather) to see what the clouds might mean in terms of weather.

**Extension activity**

* Discuss the difference between weather and climate. Weather is the mix of events that happen each day in our troposphere including temperature, rainfall and humidity. Climate is the average weather pattern in a place over many years. For example, the climate of Antarctica is very different from that of a tropical island.
* Students research how the weather in their area ought to be, based on its climate. For example, if it’s summer, should it be mild, hot, cool, cold, wet or dry?
* Using data collected over the week, students compare their weather analysis with the climate for the area. Do they match? Students could collect data (record their observations) for a few more days. They could then compare their results with what should be ‘normal’ for their area. If the results are different, there might be a drastic change happening or it could be just a quick shift. Many scientists are finding that climates are changing – weather is not consistent with the past records. Some scientists say that global warming could be responsible for this. Global warming is a gradual increase in the overall temperature of the Earth’s atmosphere generally attributed to the greenhouse effect caused by increased levels of carbon dioxide, CFCs and other gases.