genesis school-gen | STEM PLD
presented by
nanogirl

The Water Cycle

Summary:

This resource supports your teaching around the topic of **the water cycle.** It contains an activity suitable for Years 5-8.

Your students will:

- **UNDERSTAND:** Renewable energy is important for sustainability. The Earth's resources, including water, are part of what makes renewable energy possible.
- **KNOW:** The phases of the water cycle keep water moving around the planet, providing fresh drinking water, rain, rivers and other water resources.
- **DO:** Build a model of the water cycle and use it to investigate the processes of evaporation, condensation, and precipitation.

Curriculum Links:

Learning Areas	Achievement Objectives	Levels	Years
Science **Nature of Science:** Investigating in Science	Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.		5–8
Physical World: Physical Inquiry and Physics concepts	Explore, describe, and represent patterns and trends for everyday examples of physical phenomena, such as movement, forces, electricity and magnetism, light, sound, waves, and heat.	3–4	5–8
Planet Earth and Beyond: Earth Systems	Explore and describe natural features and resources. Appreciate that water, air, rocks and soil, and life forms make up our planet and recognise that these are also Earth's resources.	1–2 3–4	5–8 5–8
Planet Earth and Beyond: Interacting Systems	Investigate the water cycle and its effects on climate, landforms, and life.	3–4	5–8

Understand

Earth's resources, including water, can be harnessed to use as sources of renewable energy. Water (***wai***) is a taonga with huge importance to people everywhere. Water affects so many aspects of our daily lives, from drinking water, as a source of kaimoana, supporting agriculture, to extreme weather events. It's important to learn how the water cycle affects our lives, by breaking down the water cycle into different processes and learning how systems on Earth are all connected to one another by the water cycle.

By learning about the water cycle, students can make connections between large-scale processes that occur all over the world and the local and seasonal weather patterns that affect their lives. By using a model to learn about the processes of the water cycle, they are developing their observation and interpretation skills, as well as investigating like a scientist.

Ko te wai te ora ngā mea katoa—Water is the life giver of all things.

Know

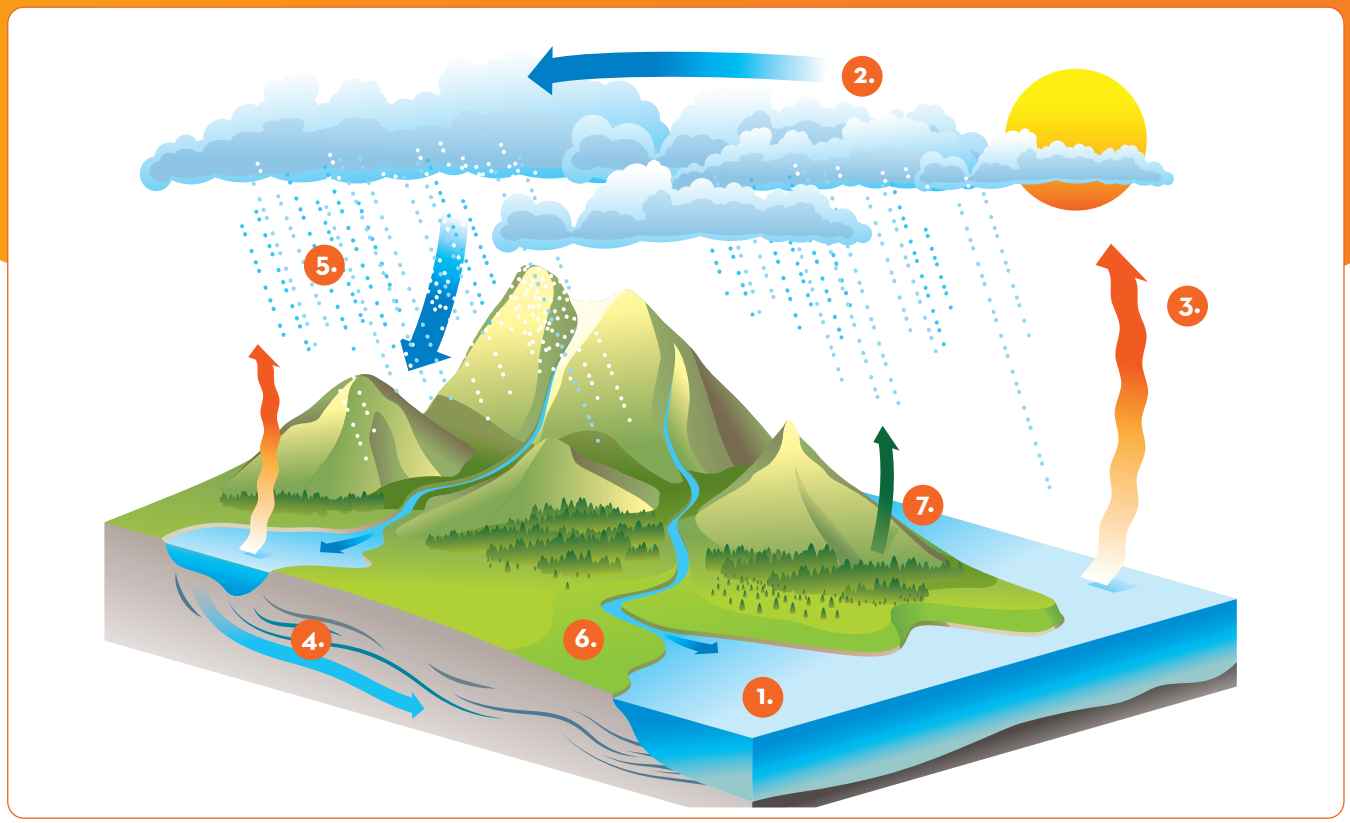
All water and weather on Earth is connected. Water is constantly flowing through rivers, oceans, the land, and the clouds. We call this the 'water cycle'. The water cycle is made up of many individual processes which occur simultaneously and are all linked together.

How does the water cycle affect weather?

Local weather patterns are influenced by the water cycle. Land masses such as high hills and mountains can influence where and when rain falls, by pushing clouds higher into colder air, causing more water to condense and rain to fall. Seasons can also affect the water cycle. Seasons with higher rainfall can lead to more surface run-off, causing swollen rivers and higher lakes. Conversely, drier, warmer seasons can lead to more evaporation and less precipitation in an area. The weather we experience everyday is therefore influenced by the water cycle as well as our local environment.

How is the water cycle important for renewable energy?

There are many different forms of renewable energy which rely on the water cycle. Hydropower, for example, relies on having enough surface water like rivers and lakes to move past turbines. Geothermal energy uses magma to heat groundwater which then rises to the surface.



Key language for the water cycle:

(1) Collection—Water drops which fall from the clouds as rain, snow, hail or sleet collects together to form bodies of water, either underground or on the surface.

(2) Condensation—The process where water vapour is changed into liquid water. In the water cycle, this usually happens when warm water vapour meets cooler air high in the atmosphere, condensing to form water droplets that turn into larger clouds.

(3) Evaporation—The process where heat from the Sun changes liquid water into water vapour by warming it up. Warm water vapour then rises into the atmosphere, where it condenses to form clouds.

(4) Groundwater—Water that soaks into the ground, and travels slowly underground until it meets a larger body of water like a river or lake.

(5) Precipitation—Water falling from clouds as rain, snow, hail or sleet.

(6) Surface run-off—When water travels along the surface of the ground. You can see this after heavy rain.

(7) Transpiration—The process where groundwater is taken up by plants from the soil, and eventually released into the air from the leaves. From there, the water vapour can evaporate or condense depending on the air temperature.

(8) Water vapour—Water in gas form. Water vapour is invisible, and is one way that water can travel.

Do

Build a model of the **water cycle** and use it to investigate the processes of evaporation, condensation, and precipitation.

Materials:

- A large glass bowl or heatproof container
- A smaller bowl which fits inside the larger one
- Food wrap or recycled soft plastic packaging (large enough to over your larger container)
- Scissors
- Tape
- A felt tip pen
- Something small and heavy as a weight (e.g. bluetack, pebble)
- Salt
- Spoon
- Warm tap water (not boiling)

Instructions:

1. Start with a class discussion bringing in their prior knowledge about rain, clouds and oceans. Has anyone tasted seawater or rainwater before—how are they different? Does anyone live in a house with a rainwater tank? Your class should know that seawater is salty, while rainwater is fresh.
2. Pour warm water into the larger container until it is just a few centimeters deep.
3. Add salt to the water, and stir it in until it's all dissolved. This represents the ocean. You'll need 1–3 tablespoons of salt, depending on how much water you have in the container.
4. A volunteer student can now dip their finger or a spoon in the salt water and taste it—it should be salty like the ocean.
5. Place the smaller container in the middle of the larger one. This will be an island in the middle of the ocean, like New Zealand. Ensure that there is no water inside this smaller container.

6. Cover the top of the container with plastic food wrap. You may need to tape the edges down to ensure that no steam or water can escape from around the edge. The food wrap represents the sky.
7. Any steam rising from the warm water should hit the food wrap and condense, forming a cloudy layer that your students can observe. This represents the processes of evaporation and condensation in the atmosphere.
8. Place a small weight in the centre of the food wrap, directly over the smaller container. This weight will encourage the condensation to form larger water droplets and then drip into the smaller bowl, by giving the droplets a direction to run in.
9. Use the pen to draw some cloud shapes on the food wrap.
10. Wait 10–30 minutes and you should be able to see that the condensation on the underside of the plastic food wrap has clumped together into larger water droplets. These are like the large grey rainclouds that we can see before it starts to rain.
11. Over time, some of the droplets will drip into the small bowl. This represents precipitation or rain.
12. Once your class has had a chance to observe the condensation on the food wrap and any drips into the smaller bowl, carefully remove the food wrap. The water should now be cool, and the smaller bowl should have a little water in it.
13. Another student volunteer can now dip their finger into the water in the smaller bowl and taste it—this water should be fresh, not salty.

Why is the rainwater in the smaller bowl fresh?

Just like in the ocean, when the water in your larger bowl evaporated, it left the salt behind. If we could taste clouds, they would not taste salty, even if the water had come from the ocean. So the water in your smaller bowl does not contain any salt, meaning that it tastes fresh like drinking water. This is why we can collect and drink rainwater.

Extension activities

- Investigate the warmest or sunniest places around the school—these should be good places to leave this water cycle model for a few hours, to see whether heat from the Sun will produce more evaporation and condensation.
- Discuss where the rain goes once it has fallen. After heavy rainfall, does your class notice puddles, muddy fields, or rivers that are higher than normal?
- Think about rain patterns in your local environment. Research how the rainfall in your area compares to the rest of New Zealand. Why do you think this is?
- Discuss other contexts where you can see condensation, and how these are all caused by hot and cold materials meeting. For example—condensation on the outside of a glass of cold water, or on the windows of a bathroom after a hot shower.
- Discuss water vapour in more detail to ensure that your students understand what it is. Can your students explain what happens when laundry dries on the line in terms of what happens to the water in the clothes?

Extra resources

Build a hydropower turbine with your class:
https://www.schoolgen.co.nz/for-teachers/resources/hydro-turbine

Try this simple water cycle assessment with your students:
https://arbs.nzcer.org.nz/node/6605

Watch this video from Bay of Plenty Regional Council about mātauranga Māori and the water cycle:
https://www.youtube.com/watch?v=6bEwne5GWxw

Watch Nanogirl build her water cycle model:
https://www.youtube.com/watch?v=FDxbruaovgk

We hope you have enjoyed this educational STEM resource.
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