

Module 4: The water cycle

Time: 120 min

Aim

To develop students' understanding of how water moves through the water cycle. The suggested learning sequence will:

- explore how the natural water cycle works using multiple mediums
- identify the processes of the natural water cycle
- explore how we interact and manage the water cycle to meet our needs

Students will develop an awareness that all water on earth is recycled and continuously moving from the earth to the atmosphere and back again.

Key inquiry questions

- Does water disappear? Is there ever new water?
- What are the processes of the natural water cycle?
- What are some ways we interact or change the water cycle to meet our needs?

Background information

Does water really disappear? Is rain new water? How does water get in clouds? Water is a fascinating and critical part of Earth's processes called the natural water cycle.

The water we have today is all that we have. It's the same water that existed on earth billions of years ago. It is used and re-used as it continuously moves from the Earth to the atmosphere and back again.

During its journey through the cycle, water changes states as it falls as rain, snow, sleet or hail (precipitation). Water is heated by the sun, evaporates into the atmosphere as water vapour, condenses into tiny droplets and forms clouds (condensation). Eventually, it falls back to earth. Water seeps into the ground (infiltration) and moves slowly as groundwater (percolation) to nearby lakes, streams

or oceans. Some groundwater is taken up by plants, travels through plants and evaporates back into the atmosphere as water vapour (transpiration) and the journey begins again.

The urban water cycle is when we change and manage the natural water cycle. We change the cycle to capture, collect and store water. This means we can stay in one spot (our home) and have enough clean, safe water delivered every day. We also remove and clean our used water to re-use or return to the environment.

Together, the natural and urban water cycle can be called the water cycle.

In Australia, and in many countries too, freshwater can be scarce. To meet the challenges of growing vibrant cities with a secure water supply, we rely on a mix of water supply options such as dams, rivers, rainwater tanks and options which are less rainfall dependent including oceans, recycled water and groundwater.

Our used water is removed through pipes to treatment plants where it is cleaned for re-use or returned to the environment as part of the water cycle. Our used water is a valuable resource; by applying technology we are speeding up nature's cleaning process and using our precious water wisely.

Syllabus outcomes

Science

ST1-1WS-S – Observes, questions and collects data to communicate and compare ideas.

ST1-2DP-T – Uses materials, tools and equipment to develop solutions for a need or opportunity.

ST1-10ES-S – Recognises observable changes occurring in the sky and on the land and identifies Earth's resources.

English

EN1-UARL-01 – Understands and responds to literature by creating texts using similar structures, intentional language choices and features appropriate to audience and purpose.

Geography

GE1-1 – Describes features of places and the connections people have with places.

GE1-3 – Communicates geographical information and uses geographical tools for inquiry.

Creative arts

VAS3.2 – Makes artworks for different audiences assembling materials in a variety of ways.

MUS1.1 – Sings, plays and moves to a range of music, demonstrating an awareness of musical concepts.

Syllabus skills

Science

- Develop and apply skills in scientific inquiry through the process of working scientifically.

English

- Develop and apply skills in expressing themselves and their relationships with others and their world.

Geography

- Develop knowledge and understanding between people, places and environments.

Visual arts

- Makes artworks informed by their investigations of the world as a subject matter and use of expressive forms.

Music

- Performs music of different styles and from different times and cultures by singing, playing and moving using musical concepts.

Teaching and learning

Lesson 1: The natural water cycle (40 min)

Inquiry question: What are the processes of the natural water cycle?

Explore how water moves from the earth to the atmosphere and back again and the stages of the natural water cycle.

Vocabulary

Natural water cycle, recycle, liquid, gas, water vapour, water droplet, hail, snow, evaporation, condensation, precipitation, atmosphere, transpiration, run-off, infiltration and percolation.

Discussion notes

- Evaporation is when the sun shines on water and heats it, turning it into gas called water vapour which rises into the air.
- Transpiration is when the sun warms people, plants and animals and they release water vapour into the air.
- Condensation is when the water vapour in the air cools and turns back into a liquid, forming tiny water droplets in the sky.
- Precipitation is when water droplets fall from the sky as rain, snow or hail.
- Run-off is when water flows over the ground and into creeks, rivers and oceans.
- Infiltration is when water falls on the ground and soaks into the soil.

Resources

Wondering about water – Module 4 The water cycle

- The water cycle lesson plans
- The water cycle PowerPoint
- The water cycle worksheets
 - Natural water cycle worksheet
 - Water cycle song
- Sydney Water Cycle Animation youtu.be/OrNzBF1BfZA
- Water cycle adventure play script – Enchanted Learning enchantedlearning.com/rt/weather/watercycle.shtml

Materials

Scissors, poster paper, blank cards, sticky tack or tape, markers, colouring pencils.

- Percolation is when water seeps deeper into tiny spaces in the soil and rock.

Activity 1: Wondering about water (10 min)

Preparation: worksheets and PowerPoint.

Using a wonder wall and The water cycle PowerPoint, get students thinking, questioning and sharing to understand their level of knowledge and interests. Ask students, if they have ever wondered:

- Does water disappear? Have you ever seen a puddle dry? Where did the water go?
- How are clouds made? How does water get in clouds?
- Is rain new water?
- How does water move from the Earth to the clouds and back?

Either the teacher or students record statements and questions on cards and place on the wonder wall.

Throughout the lessons, encourage students to reflect, ask questions and look for questions that have been answered. Use a word wall to capture any new vocabulary.

Activity 2: What is the natural water cycle? (30 min)

Using the PowerPoint and background information introduce and explore the natural water cycle and capture the vocabulary on the word wall.

Prior learning: water can change states and exist as liquid, solid or gas.

Sing and act out the Water Cycle Song by Monica Sheba. This song is based on the traditional folk song 'She'll be coming 'round the mountain'. The song can be repeated throughout the lessons.

Watch the Sydney Water Cycle Animation (<https://youtu.be/OrNzBF1BfZA>).

Students complete the Natural water cycle worksheet.

Optional: The water cycle adventure play

View the Water cycle adventure play script (<https://www.enchantedlearning.com/rt/weather/watercycle.shtml>). The play follows the adventures of two water drops as they pass through the water cycle. Make copies of the play, assign roles and read the play in class. After reading the play, students could illustrate the journey of the water drops through the water cycle.

Lesson 2: Water cycle experiments (40 min)

Inquiry question: Does water disappear? Is there ever new water?

Use a hands-on practical investigation to investigate processes in the natural water cycle. Explore how clouds are made and how water evaporates.

Activity 1: Demonstration – can you make a cloud? (20 min)

Preparation: Watch the Make a cloud experiment video (youtu.be/bZ3O17hEgNE) to see how it's done and prepare your materials for a class demonstration.

Using the PowerPoint as a prompt, ask students to discuss as a class or in pairs:

- What are clouds? How are they made? What are they made of? Why does rain fall from clouds?
- Can you make a cloud?

Recall the water cycle by singing the water cycle song.

Perform the demonstration with your students.

Students use the See, think, wonder worksheet to record their thoughts. Ask students prompting questions:

- What happened? Why?
- Why did we warm the water? What makes water warm on Earth?
- Why did we use ice cubes?
- Why did we see condensation, a cloud?

Watch the Make a cloud experiment video (youtu.be/bZ3O17hEgNE) and use the PowerPoint and discussion notes to help answer some of their questions and describe what happened. Students can revise their worksheet if needed.

Resources

- The water cycle PowerPoint
- Water cycle song
- Make a cloud experiment video youtu.be/bZ3O17hEgNE
- See think, wonder worksheet
- Water evaporation experiment video youtu.be/kmmEV4ohSDA
- Plan and investigation template
- Measure and compare worksheet

Optional

- Make a water cycle model instruction sheet.
- Water cycle and terrarium experiment video youtu.be/JaJf2UrKe9A

Materials

Make a cloud demonstration: a large glass jar with a metal lid, boiling water, blue food colouring, ice cubes, matches

Water evaporation experiment per group: 4 glass jars, 2 lids (or foil or plastic wrap), permanent marker, ruler, blue food colouring, jug of water.

Activity 2: Practical investigation – does water disappear? (20 min)

Preparation: Watch the Water evaporation experiment video (youtu.be/kmmEV4ohSDA) to see how it's done and prepare your materials for two sets or more. Note: The results of this experiment will take a few days.

Watch the Water evaporation experiment video. Ask students to reflect on these questions:

- Does water disappear?
- Why does one jar have a lid and one doesn't have a lid?
- What changes will we see? How can we compare the differences?

Display the Plan an investigation template in the PowerPoint to help students think and work like a scientist.

Record students' predictions, materials, risks and safe choices to conduct the investigation.

Set up a set of jars or multiple sets, placing one set in a windowsill with sunlight and one set in the shade. This will help with the concept of heat or sunlight driving evaporation.

Ask students to predict which one they think will evaporate most.

Use the Measure and compare worksheet for students to record observations over several days.

Discuss their findings in the Measure and compare worksheet.

Graph the class data to visualise how much water each jar lost and how fast (optional).

Record students' observations, conclusions and questions in the Plan an investigation template.

An alternative experiment is to pour a small amount of water on pavement, some in the shade and some in direct sunlight. Draw a chalk line around each puddle and measure and record how quickly the water evaporates over time.

Optional: Make a water cycle model

Using the Make a water cycle model instruction sheet each student, or in groups, can create their own water cycle in a plastic sandwich bag.

Optional – Water cycle terrarium

Make a mini-earth and discover the water cycle in action using the Water cycle and terrarium experiment video (youtu.be/JaJf2UrKe9A).

Lesson 3: The urban water cycle model (40 mins)

Inquiry question: What are some ways humans interact or change the water cycle?

Explore why we modify and manage the water cycle to meet our needs.

Vocabulary

Urban, urban water cycle, natural environment, built environment, pipes, drinking water, wastewater, stormwater, store, dam, source, recycled water.

Activity 1: What is the urban water cycle? (20 min)

Using the PowerPoint and background notes explore how we change our environment to suit our needs. Ask students to consider:

- Do we change our environment?
- Why do we change our environment?
- Where does our water come from?
- Is the water that comes to us clean? How does it get to our homes?
- Can we drink it straight from our taps?
- Where does our used water go? Does our used water get cleaned?
- Where does water outside our homes go?

Resources

- The water cycle PowerPoint
- My urban water cycle activity sheet

Materials

Scissors, glue, colour pencils or markers.

Optional

3D diorama (per group)

1 x large cardboard box cut with 3 faces (2 sides and a base), a collection of recycled materials such as food packaging or natural materials, scissors, glue, markers or poster paint, modelling clay, toy building blocks.

Activity 2: What's my urban water cycle? (20 min)

Find out where your school's drinking water comes from. Your local council might be a good place to start.

Show students where they can highlight or circle which of the sources are relevant for your school on their worksheet.

Using the My urban water cycle activity sheet students can build their own urban water cycle.

Optional: 3D water cycle diorama

Split the students into small groups. Students are to create a 3D diorama the water cycle. They might like to make a model of their own local features or learn about how it's done in another town or city. It could feature:

- clouds and rain, water flowing into tanks, rivers, into a dam or ocean
- pipes leading from the dam or ocean to a water filtration plant then to peoples' houses, schools or other buildings. Rainwater tanks might lead directly to buildings.
- pipes leaving houses, schools or other buildings going to a water recycling plant then going to creeks, ocean and recycled.

Homework task

Water cycle game

Test students' understanding of the water cycle by playing the Natural water cycle game (educationsoutheastwater.com.au/resources/natural-water-cycle-game) and Urban water cycle interactive (educationsoutheastwater.com.au/resources/melbourne-water-cycle-interactive). Write or draw what happened in the game in a presentation.

Extension activity: Write a new water cycle song or dance

Challenge students to write their own water cycle song or come up with new dance to teach other how the water cycle works.

Summary task: What I learned about water (15 min)

- Direct students to write or draw their answer to one of the inquiry questions on a water droplet template.
- Droplets can be attached to a ribbon or string and hung from the ceiling, wall, or across the room.
- The water droplets can be used towards assessment.

Reflection (10 min)

Revisit the wonder wall and reflect on concepts covered in the lesson. Allow students time to share with each other and compare thoughts and questions. As a group, look for questions that have been answered and adjust on the wonder wall. Either the teacher or students record new statements and questions and place on the wall.

Teacher reflection/evaluation

Consider what worked, what didn't and changes for future delivery.

- Cultures of Thinking (Harvard): pz.harvard.edu/projects/cultures-of-thinking
- Bloom's Taxonomy: bloomstaxonomy.net/