Module 3: Water on Earth

Time: 120 min

Aim

To build students' understanding of water on Earth, it's limited availability and that there are different types of water and usable amounts. The suggested learning sequence will:

- investigate the distribution and location of water on a range of scales on Earth, describing Australia's location in relation to the world
- explore the difference between water sources – freshwater, saltwater and the useable amounts on Earth
- recognise that drinking water can come from a mix of water supply sources
- engage and connect students with their local waterways.

Students will appreciate that all the water on Earth is all that we have. Water is precious. This will build a foundation for understanding the water cycle, water saving behaviours and caring for water.

Key inquiry questions

- Where is water on Earth?
- How much water is on Earth?
- Is all water the same?
- Where is water in Australia? Is water near me?

Background information

The Earth's surface is made up of 7 continents and 5 oceans. Amazingly, water covers most of Earth.

In fact, almost three-quarters, or 71%, of Earth's surface is covered in water.

On Earth, water comes in a variety of forms, but most of it is salty. 96% of Earth's water is found in seas and oceans. The rest is freshwater, with most of it frozen, under the ground, or in the atmosphere, and hard to reach. Less than 1% of freshwater is available

in surface sources such as lakes, rivers and swamps. It's surprising how little freshwater we can access and use for drinking, cleaning and growing things.

Many cities get their drinking water from the ocean because it's less affected by rainfall patterns, making it more reliable. Desalination technology is used to remove salt from seawater to produce high quality drinking water. It is a way to make sure people have enough water when cities:

- do not have easily accessible rivers
- rainfall is low, infrequent or affected by drought
- populations grow faster than existing water supplies.

Desalination is used across the world including Sydney, Melbourne and Perth. It's just one of many ways we can produce high quality drinking water.

Syllabus outcomes

English

EN1-CWT-01 – Plans, creates and revises texts written for different purposes, including paragraphs, using knowledge of vocabulary, text features and sentence structure.

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

Mathematics

MA1-GM-01 – Measures, records, compares and estimates lengths and distances using uniform informal units, as well as metres and centimetres.

MA1-3DS-02 – Measures, records, compares and estimates internal volumes (capacities) and volumes using uniform informal units.

Geography

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

GE1-2 – Identifies ways in which people interact with and care for places.

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

Science

ST1-4LW – Describes observable features of living things and their environments.

ST1-11LW – Describes ways that different places in the environment provide for the needs of living things.

Visual arts

VAS1.2 – Uses the forms to make artworks according to varying requirements.

Syllabus skills

English

- Develop knowledge, understanding and skills in order to: communicate through speaking, listening, reading, writing, viewing and representing.
- Express themselves and their relationships with others and their world.

Mathematics

- Know that the larger area has more units.
- Solve problems involving addition or subtraction by using number sentences.

Geography

- Develop skills to acquire, process and communicate geographical information.

Science

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

Visual arts

Apply skills and understanding in making artworks informed by their investigations of the world as a subject matter and use of expressive forms.

Teaching and learning

Lesson 1: Water on Earth

40 min

Inquiry question: Where is water on Earth? How much water is on Earth?

Students explore the Earth's surface and are introduced to the continents and oceans. Students will apply skills and understanding in making 2D or 3D artworks informed by their explorations of the world.

Vocabulary

Earth, globe, glacier, ice, snow, lakes, rivers, creeks, oceans, seas, groundwater, continents, Australia, Pacific Ocean.

Activity 1: Wondering about water (10 min)

Preparation: worksheets and PowerPoint.

Using a wonder wall and the Using water well PowerPoint, get students thinking, questioning and sharing to understand their level of knowledge and interests. Pause on slide 3 and let students reflect on the following questions:

- Is water everywhere?
- Why is Earth called the blue planet?
- Does Earth have more water or land? Where is most of the water?
- Can we drink any water?

Resources

Wondering about water – Module 3
Water on Earth

- Water on Earth lesson plans
- Water on Earth PowerPoint
- Water on Earth worksheets

Other resources

- Google Earth google.com/earth/index.html
- Google Maps google.com/maps

Materials

Scissors, poster paper, blank cards, sticky tack or tape, markers, pencils, crayons or paint, assortment of craft items, tissue paper, colour paper, glue stick or craft glue, world map outline.

- Does ice count as water?

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: Where in the world is water? (15 min)

Using the PowerPoint, Google Earth or a world globe explore where water is on Earth. Identify features such as the 7 major continents and 5 oceans. Find examples of lakes, rivers, snow and glacial ice and consider what does Google Earth or a world globe show/represent? It's a map of Earth's surface.

- What does the blue on the Earth represent? What represents the continents?
- Where do you find water? Ocean, lake, river, glacier.
- Where is most of the water on the planet? Is it oceans, lakes or rivers?
- Is snow or ice water too?
- Is all water on the Earth's surface? Do you think water can be underground?
- Are there places with no or very little water?
- Is there more water or land? In fact, ¾ Earth surface is covered in water – that's a lot of water.

Activity 3: Can you create an Earth artwork? (15 min)

Create a 2D poster. Provide students with a world map outline to cut out and paste to their poster. Colour or fill in the oceans and continents with different textures such as tissue or crepe paper, craft sand or cotton wool. Students might like to identify the Pacific Ocean, Australia and where they live.

Optional: create a 3D Earth artwork

Alternatively, create a 3D paper mache or Styrofoam model Earth. Paint or colour continent shapes from a world map outline. Cut and paste to the model Earth and have students identify the Pacific Ocean, Australia and where they live.

Lesson 2: Types of water on Earth (40 min)

Inquiry question: Is all water the same?

Students explore and answer questions through a guided investigation about the different types of water. They use their observational skills to describe and estimate volumes of water and differences between types of water.

Vocabulary

Predict, observe, similar, different, freshwater, saltwater, ground water, drinkable, desalination, distillation, limited, abundant, data, pie chart, bar chart, amount, represents, percent.

Discussion notes

Distillation is one of the ways we can separate and collect freshwater from saltwater. The process involves:

- heating liquid water and turning it into water vapour, a gas (evaporation). This leaves behind the salt.
- cooling the water vapour so it turns back into a liquid again (condensation).
- collecting the liquid that we evaporated and condensed, called the distillate. This is now freshwater.

We can use other technologies in desalination plants that are faster and more effective at producing large amounts of high-quality drinking water.

Resources

- Water on Earth PowerPoint
- Match the water worksheet
- Water on Earth video: youtu.be/bW2kFQzlu5o
- Is it salty or fresh? worksheet
- Plan an investigation template
- Water on Earth chart activity

Materials

For the demonstration: a standard bucket (about 9L), 2 x clear 250ml measuring cups, eye dropper or small pipette, water, blue food colouring (optional).

For the practical investigation: 1x large clear container (bin or food storage container), 1 x smaller clear container (jar or cup), 1 x large sheet of clear plastic film, green food colouring, tape or large elastic, weight (coin, rocks), water, table salt.

Activity 1: is all water the same? (10min)

Using the PowerPoint, discuss the different types of water on Earth.

Using Google Earth explore and identify different types of water. Working in pairs, guide students through the Match the water worksheet.

Watch the Water on Earth video (youtu.be/bW2kFQzlu5o) at reduced playback speed (adjust the YouTube settings) then visually demonstrate the concept in Activity 2.

Using the Is it salty or fresh? worksheet, ask student to decide which source of water is fresh or salty.

Activity 2: Demonstration – can we measure water on Earth? (40min)

Prepare the following items for a class demonstration with selected volunteers.

1. Fill a bucket with water.
2. Add some blue food colouring to help see the water (optional).
3. Set up two clear 250mL measuring cups and a dropper or pipette.

Demonstration

1. One bucket of water represents all the water on Earth.
2. Scoop one cup of water from the bucket. This represents all the freshwater on Earth. The remaining water in the bucket represents saltwater in the oceans and seas.
3. Pour a third of the cup into the second cup. The first cup, now two-thirds full, represents freshwater locked in ice, glaciers and snow and the second cup, now one-third of a cup, represents groundwater.
4. Using an eye dropper or pipette, take a few drops of water from a cup to represent the amount of freshwater available in rivers, lakes and streams.
5. Use the Water on Earth chart activity to record and compare the volumes of water. This worksheet helps students visually represent the same data in various ways (bar, number, and pie charts).

Representing water on Earth

1 bucket represents all water on Earth.

1 cup represents all freshwater on Earth.

This cup is made up of:

- 2/3 cup represents ice caps and glaciers
- 1/3 cup represents groundwater
- a few drops represent rivers and lakes.

The remaining water in the bucket represents saltwater on Earth (oceans and seas).

6. As a class, discuss that freshwater is limited, but there is plenty of saltwater. Try a test as a class of with volunteers. Offer a student a glass of tap water and a glass of tap water with added table salt. Can we drink saltwater? Why not? Are there ways we can remove the salt?

Optional – practical investigation: can we make freshwater from saltwater?

Students discovered that there is a limited amount of freshwater on Earth and a lot of saltwater. Not everyone has access to freshwater, but did you know we can make freshwater water from saltwater?

Investigate one of the many ways we can do this: distillation.

To prepare, fill a jug with water, add a few drops of green food colouring and dissolve several spoons full of table salt. Add salt until it no longer dissolves, and you can see the salt. You can continue to add more salt to increase visibility.

Practical investigation:

1. Use the background notes to support introductory discussions.
2. Use the PowerPoint and Plan an investigation template to help students investigate and think like a scientist.
3. Record students' predictions, materials, risks and safe choices to conduct the investigation.
4. Place a small container (shorter than the walls of the larger container) in the middle of the large container.
5. Fill up the large container with some of the prepared saltwater. Be careful not to get saltwater in the small container.
6. Wrap the top of the large container with clear plastic film and seal with tape.
7. Place a weight on the plastic film directly over but not touching the small container.
8. Mark the saltwater level on the large container.
9. Place the container in a sunny spot.
10. Observe, compare and record students' observations, conclusions and questions in the Plan an investigation template. Consider:
    - What happened to the saltwater when it is placed in the sun?
    - What collected in the small container and how did it look?
    - Are there other ways of getting rid of salt?

Lesson 3: Water in Australia (40 mins)

Inquiry question: Where is water in Australia. Is water near me?

Students explore water bodies in and around Australia and identify ways in which people interact and connect with and care for water – build connections with places. Students will apply skills and understanding by making illustrations informed by their findings.

Vocabulary

Waterway, compare, grid, place, location, features, built features, landmarks, build and natural environment.

Resources

- Water on Earth PowerPoint
- Watery walking guide template
- Count and compare worksheet

Other resources

- Google Earth google.com/earth/index.html
- Google Maps google.com/maps
- Bluey: The Beach read aloud by Julia Gillard youtu.be/q_A2jR3xC30

Materials

Transparent film sheet with a grid

Activity 1: Where is water in Australia? (10 min)

Using the PowerPoint and Google Earth explore Australia's oceans and some of the major river systems.

Compare water bodies near the coast and inland. Explore some of the major water bodies around where they live.

Activity 2: Can you create a walking guide? (30 min)

Using the PowerPoint, Google Earth or Google Maps and the Watery walking guide template ask students to create their own walking guide and map based on a chosen waterway. Identifying how to get there, things to see and do.

Follow its path to the ocean and identify different geographical features. Consider:

- What does it pass along the way?
- Are there built features or landmarks? Schools, homes, towns, cities?
- What kind of activities can be enjoyed near the waterway? Are there bike and walking paths, playgrounds and picnic areas?

- What animals might live in or close by and use the water?
- How do you think the waterway was used in the past?
- How can we care for the waterway?

Activity 3: Can you count and compare?

Using the PowerPoint and Count and compare worksheet find the proportion of water in a map by counting the grids.

To create your own grid, place a transparent grid over a selected waterway or go to Google Earth → select "Map Style " "→ Turn on "Gridlines".

Optional – creative writing story about your water walk

Visit your local waterway with your walking guide and map. Write or draw a story about your experience.

Extension activity - Practical investigation: is there a difference between saltwater and freshwater?

Preparation

Using the PowerPoint, Test the difference instructions and Plan an investigation template, help students investigate questions and predictions about the differences between freshwater and saltwater. Encourage students to consider that, while they may look the same, they are different. We can test the difference.

Record students' predictions, materials, risks and safe choices in the Plan an investigation template.

Set out table salt, three raw eggs and a tablespoon.

Fill 3 clear cups halfway with water.

Resources

- Water on Earth PowerPoint
- Test the difference instructions
- Plan an investigation template

Materials

Per group: 3 x raw eggs, water, table salt and tablespoon, 3 x clear containers or cups, tablespoon with long handle.

Method:

1. Place an egg in the first cup and observe. Does the egg sink or float?
2. Add two tablespoons of salt to the 2nd and 3rd cups. Stir until it dissolves.
3. Place the eggs in both cups. Do the eggs sink or float? Gradually stir in more salt until both eggs float.
4. Gently pour more water into the 3rd cup (careful not to mix the saltwater and freshwater) until it is nearly full and see what happens.
5. Observe and compare the positions of the eggs and record students' observations, conclusions and questions in the Plan an investigation template.
6. Use the discussion notes to explain what is happening and why.

Discussion notes

When salt is added to tap water, the salty water becomes 'heavier' (denser) and sinks. The egg is less dense (lighter) than the salty water and is lifted or floats. This is why it's easy for people to float in the Dead Sea!

Freshwater is 'lighter' (less dense) than the egg, so the egg sinks down easily.

When freshwater is added to saltwater without mixing, the denser saltwater creates a layer at the bottom, and the freshwater remains at the top. The egg stays in the middle because it's lighter than saltwater but heavier than freshwater.

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/