

Module 2: What makes water water?

Time: 120 min

Aim

To develop students' observation skills to identify and explain the characteristics and properties of water. The suggested learning sequence will:

- use physical senses to explore and discover the characteristics of water
- develop observation and communication skills to describe water
- explore water's unique properties that dissolve substances
- discover the three states of water.

Students will explore and develop an appreciation for water's unique qualities. This module provides context to build a deeper understanding of concepts such as the water cycle, types of water and water treatment.

Key inquiry questions

- What are some characteristics or properties of water?
- What are the three states of water?
- What can water dissolve?

Background information

Water is the most common substance found on earth and is an important resource we depend on every day. But have you ever thought about what water really is? What makes water water?

We can describe water by its characteristics and properties. Characteristics are features that distinguishes one thing from another, for example, hair and eye colour. To describe characteristics of water we look at many things like colour, odour, taste and clarity.

Water can also do some amazing things. It has properties which include:

- being the only substance that naturally exists in three different forms – solid (ice), liquid (water) and gas (water vapour)
- holding and transferring heat, which is great for maintaining temperature
- ability to stick together and onto other surfaces

- being an amazing solvent. This means it dissolves things. It dissolves soaps to clean with, seasonings that flavour our food and even makes our favourite cup of cordial, tea or coffee.
- ability, like many materials, to change when combined or mixed for a particular purpose.

Without water's amazing properties we couldn't do the simplest things like cook, clean or even breathe.

Water in its purest form is colourless, clear, odorless, and tasteless. Wherever it travels, water dissolves and carries chemicals, minerals and nutrients with it. This means water is more than what we can see and not all water is safe to drink.

The characteristics of drinking water are checked all the time from the source to our taps and throughout the water cycle. Drinking water is checked for characteristics like taste, clarity, odour and colour to ensure it's safe to drink straight from the tap and meets strict national standards.

Syllabus outcomes

Science

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

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

ST1-6MW-S – Identifies that materials can be changed or combined.

English

EN1-OLC-01 – Communicates effectively by using interpersonal conventions and language to extend and elaborate ideas for social and learning interactions.

Syllabus skills

Science

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

English

- Communicate through speaking, listening, reading, writing, viewing and representing.

Teaching and learning

Lesson 1: Characteristics of water (40 min)

Inquiry question: What are some characteristics of water? How can we describe characteristics of water?

Students explore and answer questions through a guided scientific investigation using their senses. They will use their observation skills to describe and record water's key characteristics.

Vocabulary

See, clear, colour, smell, hear, sounds, feel, temperature, taste.

Activity 1: Wondering about water (10 min)

Using a wonder wall and the What makes water water 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:

- Have you ever tried to describe water? What is it? What makes water water?
- What does it feel like or look like?
- Does water change or is it always the same?
- Can you drink any water?

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

Resources

Wondering about water – Module 2 What makes water water

- What makes water water lesson plans
- What makes water water PowerPoint
- What makes water water worksheets
 - Water senses
 - Think, pair, share
- Plan an investigation template

Materials

Scissors, poster paper, blank cards, sticky tack or tape, markers, cups for each student, tap water.

Activity 2: Practical investigation – what are the characteristics of drinking water? (20 min)

Using the PowerPoint, Plan an investigation template and Water senses worksheet encourage students to consider how we experience and describe water's characteristics using our five senses.

Safety first: remind students that not all clear liquids are safe and they should ask before drinking.

Use the PowerPoint to help explain the term characteristics and explore words to describe water. Display the Plan an investigation template in the PowerPoint to help students think and work like a scientist.

Using a show of hands, ask students prompting questions to predict what their 5 senses will tell them about tap water.

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

Hand out cups of tap water to selected volunteers or each student.

Using the PowerPoint and Water sense worksheet, step through the 5 senses to help students identify and draw or describe water's characteristics.

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

Additional questions:

- What do you want your drinking water to be like? Clear or cloudy? With or without colour? What should it smell or taste like?
- Do people have different preferences? Who likes water warm, cool or ice cold?

Optional – how would you describe your perfect drinking water? (10 min)

Using the Think, pair, share worksheet ask students to describe, share and compare with a partner. Working in pairs, each student takes a turn, listens and write or draw the other's thoughts. Each student then compares and records what is similar and what is different. As a class, students share their share findings.

Lesson 2: Discover a property of water (45 min)

Inquiry question: What are some properties of water? What can water dissolve?

Students discover, through a guided investigation into one of water's unique properties, its ability to dissolve and carry substances.

Vocabulary

Mix, combine, change, dissolve, observe, predict.

Optional – material, mixture, solution, property.

Discussion notes

Simplified definitions:

- dissolve: when something melts or disappears and mixes into a liquid to form a solution
- solution: a liquid with two or more substances that stays evenly mixed
- mixture: when you mix or combine two or more things together and each part remains unchanged just mixed and is often easy to separate.

Activity 1: Practical investigation - what can water dissolve? (30 min)

Prepare the following items as a class demonstration or in groups.

1. Fill up 5 clear cups halfway with water, and label each 'water only', 'water + oil', 'water + salt', 'water + colour', 'water + sand'.
2. Set out containers with oil, salt, sand, and small food colouring bottles with plastic droppers.
3. Place teaspoons with each of the items.

Using the PowerPoint and discussion notes explore the concepts of properties of water and what it means to dissolve substances in water.

Resources

- What makes water water PowerPoint
- Plan an investigation template
- See, think, wonder worksheet

Materials

Water, oil, salt, sand, food colouring, dropper or pipettes, cups, biodegradable straws.

Ask students to reflect on these questions:

- What dissolves and what doesn't? How do we observe this change?
- Can we think of other things that do and don't dissolve in water?

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

Choose one substance to complete the worksheet. Using a show of hands prompt students to predict what will happen before each substance is added. Will it dissolve or not?

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

Stir one or two spoons of each substance or a drop of the colouring into the labelled cups.

Complete the Plan an investigation template and record students' conclusion and any further questions.

Using the PowerPoint as a prompt, consider other things that dissolve in water and the benefits.

Use the See, think, wonder worksheet for individual reflection on the investigation.

Optional – demonstration

What happens if we mix water, oil and food colouring together? Create 'Water fireworks' as a fun class demonstration.

- Reuse the 'water + oil' cup. Pour enough oil to create a layer at least 1 cm thick.
- Ask students to predict if the food colouring will dissolve or not in the mixture.
- Add multiple red and yellow food colouring drops on top of the oil. Watch it sink and dissolve into water.

Water colour art

Hand each student their own paper and biodegradable straw. Hand out cups of coloured water and droppers. Ask students to draw a cup on the paper and recreate what they observed. Use droppers to squeeze coloured water onto the paper and blow with their straws. Ask them to share what they learnt and display their work.

Clean up tips: did you know that you shouldn't pour oil down sinks or drains? This can form fatbergs and block pipes. Pour oil on compost or put in the bin.

Lesson 3: States of water (40 mins)

Inquiry question: What are some properties of water? What are the 3 states of water?

Students explore and discover another one of water's unique properties: its ability to exist in 3 different states.

Vocabulary

Matter, states, change, solid, liquid, gas, water vapour, ice, steam, cool, heat, melt, freeze.

Discussion notes

Everything we can see is made of matter. Matter is something that takes up space. Matter can have different 'states' such as solid, liquid or gas. These states of matter have different physical characteristics in how they fill and react with space. Water can exist in three states – liquid, gas and solid. Water can change physically by changing the temperature. When we cool water enough it freezes, turning to solid ice and heat changes liquid water into to a gas (water vapour).

Simplified definitions:

- Solids: matter that keeps or holds their shape.
- Liquids: matter that likes to stick together and takes the shape of a container.
- Gases: are like air and can spread, move around freely, and don't have to stick together.

Water continuously changes states as it moves through the water cycle.

Activity 1: Demonstration – what are the states of matter? (10 min)

Explain the words 'matter' and 'states'. Use the discussion notes to help with the definition.

Resources

- What makes water water PowerPoint
- Plan an investigation template
- See, think, wonder worksheet

Materials

Household items to represent states of matter- solid, liquid and gas. Clear plastic containers with lids. Water and ice cubes.

Using the PowerPoint and everyday objects describe the characteristics that define each state – solid, liquid, gas (save water for the practical investigation).

- Solids – a wooden block or toy, keeps and holds their shape.
- Liquids – oil, syrup, soap or sanitizer takes the shape of their container.
- Gases – blow up a balloon, bubbles or light a match or an incense stick (consider allergies) to see smoke spread and move around freely.

Activity 2: Are ice and steam water? (10 min)

Using the PowerPoint, discussion notes and Think, pair, share worksheet, discuss the different forms (states) of water.

Water isn't always 'wet', sometimes it's frozen into ice or snow. Other times its can be invisible and float away as water vapour. They're all water, but they're different from each other. Water is an amazing substance. It can exist in all 3 states on earth. This makes water quite special!

Activity 3: Practical investigation – what are the states of water? (20 min)

Prepare the following for a class demonstration or in groups.

- Fill one container halfway with water and secure the lid.
- Fill a second container halfway with ice cubes and secure the lid.
- Place a lid on the third empty container.

Use the demonstration to identify the different states and how each state fills and react with space.

- Pass the containers around the class. Ask students to consider: do all the containers contain water? Decide which contains solid, liquid or gas.
- Ask for volunteers to place the containers on a table from solid (left), liquid (middle) to gas (right) and the class vote on the correct order. This could serve as a quick assessment.
- In this order, students draw or describe why they classified the containers as a particular state or using See, think, wonder worksheet to scaffold their discussion. In pairs or as a class, discuss, share and compare.

- Using the PowerPoint explore how water can exist in three different states and discuss how the empty container represents water too. Optional: show water is in the air using a kettle or breathing onto a mirror.

Additional questions:

- What happens when water is poured into different containers?
- How does water change states? Water changes forms depending on temperature changes.
- Can other object change states? Most things stay as a solid, liquid or gas naturally.

Extension activities

Find those watery words

Use vocabulary words from the word wall to create your own word search, crossword, or word snake.

Make your own delicious infusions

How can water dissolving things change the characteristics of water? Try the Water infusion recipe card for a healthy and hydrating drink. Using the Water senses worksheet record how the water has changed and see if you can smell and taste the difference.

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/