Year 7 Lesson 1 Where water comes from

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Learning Objectives

Students will be able to:

- Observe and undertake experiments that demonstrate process associated with the water cycle.
- Make and test predictions associated with experiments and provide explanations for observations using appropriate scientific terminology.

Learning outcomes

Outcomes Subject	Strand & Content Descriptors
Science	Science Understanding • Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques (ACSSU113) • Water is an important resource that cycles through the environment (ACSSU222) Science as a Human Endeavour • Science knowledge can develop through collaboration and connecting ideas across the disciplines of science (ACSHE223) • Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations (ACSHE120) • Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management (ACSHE121) Science Inquiry Skills • Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124) • Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate (ACSIS133)

Focus Questions

- What natural processes affect the water cycle?
- How can we replicate key aspects of the water cycle in a safe and practical manner?
- What happens to water when it is evaporated? What happens to the salt in seawater when water is evaporated?
- Where is condensation observed in daily life? What role does condensation play in the water cycle?

Lesson Plan

This lesson incorporates five activities that enable students to investigate processes that demonstrate how water cycles through the environment, including the processes of condensation and evaporation. The additional activity – Make a Terrarium – is a great way to culminate your study of the water cycle.

Prior to the investigations undertake a review of the processes associated with the water cycle. Using the natural water cycle image in this lesson plan ask students to identify and name key processes of the water cycle (evaporation, precipitation, transpiration) as well as key physical components such as clouds, the ocean, trees etc. Reinforce key facts associated with the water cycle; e.g. the amount of water on Earth is fixed and is in a constant process of recycling, changing from liquid, to gas to solid.

Ask students to consider natural influences on the water cycle, and how these may influence the key process of evaporation, precipitation and infiltration. For example: the rate and level of infiltration will be influenced by the physical character of the soil, the soil cover, rainfall intensity and the weather content of the soil. Evaporation rates will be influenced by temperature (sunlight intensity; ocean temperature), the characteristics of the water body (e.g. depth) or the physical character of the soil and its influence on infiltration; while precipitation rates will be affected by prevailing winds.

Activity 1 - Evaporation and Condensation

The experiment demonstrates the water cycle and how water can change its form when exposed to high and low temperatures. A water cycle is created in the classroom using an electric frypan and sheet of glass.

1. Heat up the frypan and seat the students around it.

2. Encourage students to predict what will happen when the water is poured onto the hot frypan. They may discuss, illustrate or write a short sentence about the predictions.

3. Place several tablespoons of water onto the hot pan. It will sizzle and evaporate within several seconds.

4. Ask, “Where has the water gone?” The water may seem to have been drawn into the pan.

5. Place a sheet of glass or glass lid over the pan and repeat the procedure. Water will evaporate and condensate onto the glass.

6. Ask the students to describe and explain observations by writing, illustrating a diagram or flow chart, discussing the basic principles of a water cycle.

Extension - Activity 1

Set up a bowl with hot water and blue food colouring, and cover with plastic film.
Ask students to predict what will happen when warm vapour from the coloured water hits the plastic. What colour will the drops be?

Activity 2 - Where's the salt?

This simple experiment demonstrates distillation and illustrates the process of evaporation from salt water.

1. Heat up the frypan and seat the students around it.
2. Place a large tablespoon of salt into a container of 150ml of water; stir.
3. Encourage students to predict what will happen when the water is poured into and heated in the frypan; what will happen to the salt. They may discuss, illustrate or write a short sentence about the predictions.
4. Pour the water into the pan and bring to the boil.
5. Place a sheet of glass or glass lid over the pan. As condensation forms on the lid carefully pour it into a container. Continue until all water in the pan has evaporated. Cool and taste the water.
6. Ask the students to describe and explain observations by writing, illustrating a diagram or flow chart, discussing the basic principles of a water cycle.

Activity 3 – Disappearing puddles

This activity involves observation and measurement of puddles to strengthen understanding of evaporation.

1. Find or make a puddle in the playground.
2. Define the boundary of the puddle by drawing or placing a string border around it (sticks in ground provide a sufficient marker system).
3. Measure the changes in size of the puddle.
4. Make observations over a day or week, re-marking the boundaries.
5. Watch what happens over time and describe these in a simple table.

Time	Size	Record observation (what changes did you see?)

Follow Up Questions

- How quickly did the puddles disappear?
- What was causing the changes? Where did the water go?
- Would the same thing happen if…?

Ask students to predict what might happen if the puddle was on a different surface, in the shade, or deeper.

Extension – Activity 3

1. Make puddles using the same small amount of water for each puddle. Pour water gently onto a level surface. Use three different surfaces - grass, bare dirt or sand, and bitumen. Choose places in full sun.

2. Make puddles on bitumen, with one in the shade and the other in the sun.

3. Make puddles shallow, deeper, same depth as before.

4. Ask students to make predictions and record observations.

Activity 4 – Sweating Glass

Winter is usually cold outside. You get into a car at night and look out the window. Soon they are covered with condensation. People who wear glasses can relate to this. Their glasses ‘fog up’. You can examine how condensation happens.

1. Put the bottle or glass into the refrigerator for at least an hour.

2. Take the glass or the bottle out of the fridge.

3. Watch the surface of the glass.

4. What happens? Write down your observations.

5. Try to explain why the glass was covered with condensation.

Activity 5 – Freezing the Ocean

Can the ocean freeze? What type of water – fresh, salt or sugar will freeze faster? This lesson expands student understanding of the water cycle by investigating the influence on freezing of salt and sugar.

1. Prepare 3 containers and fill each with the same volume of tap water.

2. To one of the containers add 1 tablespoon of salt; mix well and label. To another container add 1 tablespoon of sugar; mix well and label. Label the remaining container.

3. Inform students that the containers will be placed in a freezer for 90 minutes; they will be checked every 30 minutes. Students are encouraged to predict which container will freeze fastest and why.

Ask the students to describe and explain observations by writing, illustrating a diagram or flow chart.

Sample	Time	Record observation (what changes did you see?)
Fresh water	30 minutes	
	60 minutes	
	90 minutes	
Salt water	30 minutes	
	60 minutes	
	90 minutes	
Sugar water	30 minutes	
	60 minutes	
	90 minutes	

Resource Requirements

Activity 1	Activity 2	Activity 4	Activity 5
Electric frypan Sheet of glass or glass lid Glass of water Spoon Bowl Cling film Blue colouring	Electric frypan Sheet of glass or glass lid Salt Water	1 clean, dry empty bottle or one clean, dry empty glass Refrigerator	3 containers Sugar Salt Tap Water Freezer

Additional Activities – Build a Terrarium

A terrarium is a miniature garden grown inside a covered glass or plastic container. It is a low maintenance way to incorporate plants into your classroom and excellent for teaching about the water cycle because it demonstrates evaporation, condensation and precipitation. In the presence of light and heat, water evaporates from the plants and soil through transpiration. When enough water accumulates or the temperature drops, the condensation precipitates down the sides of the container into the soil.

Resource Requirements

- Potting soil - good quality works better. (Potting mix has been linked to Legionnaires' disease. Always follow the manufacturer's instruction and wear a mask and gloves).
- A packet of seeds such as marigold or pea.
- A container for pouring water.
- A plastic container such as a two litre soft drink bottle with the lid cut off (keep the lid).
- A small amount of gravel.

Discussion questions prior to building the terrarium: How do the parts of the water cycle fit together? What would happen if one part was left out?

1. Cut the mouthpiece off the two-litre bottle (students may do this at home)

2. Clean the container using soapy water and rinse well. Dry completely.

3. Cover the bottom of the container with one to two centimetres of gravel for drainage. This mimics the bedrock found under our soils and allows excess water to drain.

4. Fill the container one-third to one-half full with moist potting mix. The amount of soil you put in will depend on the size of the container (you need to have enough room for plant roots).

5. Pour the soil into a bowl or tub and mix with water until the soil is moist and clings in a ball when pressed into the hand. If water drips from the soil, it is too wet so add more dry potting soil. Once you find the perfect balance, place the soil in your container. Try to avoid getting soil particles stuck on the sides of the container above the soil level (it's a good idea to wear gloves).

6. Add the seeds. Push your finger into the soil down to the first knuckle. Make four or five holes. Put a seed in each hole and cover loosely with soil.

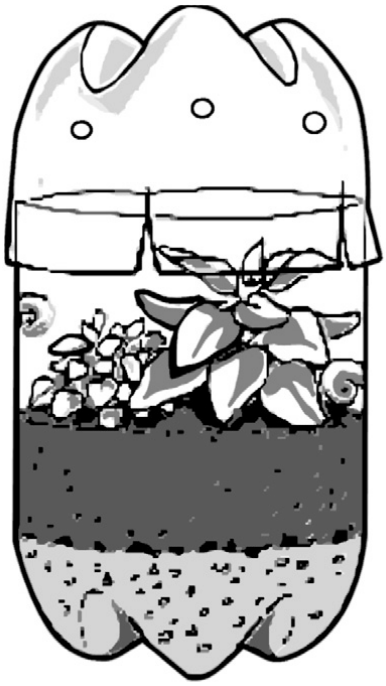
7. You can add other objects to create mini landscape scenes. For instance, decorative rocks, small animal figurines, small bridges or mirrors to look like mini ponds.

8. After planting, attach the container lid, or cover with plastic. Place the terrarium on a windowsill with indirect light or under grow lights. Do not place in direct sunlight or water will evaporate too quickly and plants may not grow.

9. Observe the terrarium closely for the first few days to monitor the correct moisture level. If the sides and top get misty with water droplets in bright light, the moisture level is good. No moisture along the sides, means add some water. As the seeds grow into plants, keep monitoring the water on the inside of the bottle. If the sides are always very wet and it is hard to see the plants, there's too much water and you should remove the top for a few hours and allow the excess water to evaporate.

10. Check your terrarium each day and monitor the growth of the seeds.

Diagram of completed Terrarium



The natural water cycle