AUSTRALIAN WATER ASSOCIATION

Science: Investigating our local waterway – for Years 6 and 7

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RESOURCE OVERVIEW

This resource presents three teaching ideas that support Australian Curriculum Years 6 and 7 Science in the context of investigating a local waterway.

1. Meet our local waterway

Investigates a local waterway ecosystem and its interactions.

2. A health check for our waterway

Uses various methods to assess and draw conclusions about the health of a local waterway.

3. Impacts on our waterway

Explores how natural factors and humans impact on waterways.

The first teaching idea explores food webs and classification using a local waterway as an example of an ecosystem. The second teaching idea applies the students' learning from the first activity plus field work to assess the health of the local waterway. The third teaching idea then examines the importance of water as a resource and how humans and natural factors impact on waterways. These teaching ideas help students in Years 6 and 7 learn about the science of waterways experientially by exploring their local waterway.

Ideally these teaching ideas would be used sequentially. They can be used at the start of the unit to provide a 'real world' setting or later in the unit to demonstrate how science concepts can be applied in their local area.

The teaching ideas offer students opportunities to:

- brainstorm, generate and discuss ideas
- create a classification key
- research different organisms and their roles
- create a mind map
- perform a 'real world' assessment of an ecosystem
- research and present on a water issue
- analyse video clips.

Prior to the lesson, select two contrasting sites for students to investigate on a local waterway (e.g. shaded and unshaded). Visit the waterway sites and take photos or a video. Ensure that the excursion and field work complies with your school's excursion and health and safety procedures and invite additional parents/carers or school staff to assist with supervision.

AUSTRALIAN CURRICULUM[1] YEAR 6 SCIENCE LINKS

Science Understanding

- Biological sciences

The growth and survival of living things are affected by the physical conditions of their environment (ACSSU094)

- Science as a Human Endeavour

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE100)

AUSTRALIAN CURRICULUM YEAR 7 SCIENCE LINKS

Science Understanding

- Biological sciences

Classification helps organise the diverse group of organisms (ACSSU111)

Interactions between organisms, including the effects of human activities can be represented by food chains and food webs (ACSSU112)

- Earth and space sciences

Some of Earth's resources are renewable, including water that cycles through the environment, but others are non-renewable (ACSSU116)

- Science as a Human Endeavour

Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE120)

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE121)

Aboriginal and Torres Strait Islander histories and cultures cross-curriculum priority

Sustainability cross-curriculum priority

TEACHING IDEAS

1. MEET OUR LOCAL WATERWAY

Students focus on ways that living things within an ecosystem (their local waterway) impact on each other and how they interact with their non-living environment. They explore aspects of the local waterway, including classification and food webs. Students then examine the different ways in which the health of a waterway can be assessed and prepare for waterway field work (ACSSU112; ACSSU094).

Activities

a. Interactions in our waterway

b. A recipe for a healthy waterway

1a. Interactions in our waterway

Students are introduced to a waterway in their local area. They consider the classification of organisms and how that can help them understand their waterway. Students also explore food webs and develop a mind map of the interactions they identify in their waterway.

1. Display a series of photographs and/or a video of your local waterway. Ask students to discuss where the photographs or videos were taken. Show the location of the waterway using Google Earth. Explain that students will visit it to carry out field work. Students identify what they can see in the photographs. Ask them to explain what a waterway is and suggest the organisms that might be found in their waterway. Compile a class list.
2. Discuss what classification is and why it is useful. Present slides 1 to 13 from the Classification (see footnote 2) classroom presentation (scroll down to find it). Working in pairs, brainstorm how different organisms in our waterway can be classified (e.g. living, non-living; plants, animals; mammals, reptiles). Ask students for their suggestions and compile a list on the board.

   Extension: Explain that the presentation uses the five-kingdom classification system. This is a traditional classification system that has been largely superseded by a more complicated three-domain system (see footnote 3). However, it still provides a useful starting point for students to learn about classification.
3. Working in groups or individually, students create a mind map (see footnote 4) showing the different types of organisms that might be found in the waterway and the interactions between them. They can record the mind map on a large sheet of paper or use a program or app such as Mindomo. The mind map will be further developed in subsequent activities. (Mindomo is available online or as an app. Teachers can register to use this program for free.)
4. Using the 'Construct a food chain' lesson ideas in Section 1.3 of the Understanding ecosystems (see footnote 5) resource as a guide, review the concept of the food chain and the feeding roles that different organisms play in an ecosystem. Briefly demonstrate food chains using the Food chains (see footnote 6) learning object.
5. Working in pairs or groups, students are allocated a macroinvertebrate. They use an A4 coloured copy of the Junior macroinvertebrate ID chart (see footnote 7) and 'Freshwater macro-invertebrates' notes (pages 52–53) of the Life in our waterways resource) (see footnote 8) to find out what eats their animal and what it eats. Students draw a large sketch of their animal on a piece of A3 paper and record the animal's name as well as a list of what it eats and what eats it. Using Blu Tack, string and the sheets of paper, ask students to construct a food web. You could do this in the school

2 Wildscreen Arkive <http://www.arkive.org/education/teaching-resources-11-14>

3 University of California (Berkeley) <http://www.ucmp.berkeley.edu/alllife/threedomains.html>

4 Wikihow <http://www.wikihow.com/Make-a-Mind-Map>

5 Natural Resources Adelaide and Mt Lofty Ranges (Best of catchment connections #2) <http://www.naturalresources.sa.gov.au/files/sharedassets/adelaide_and_mt_lofty_ranges/nrm_education/best-of-catchment-connections-f2-rep.pdf>

6 Scootle (Food chains) <http://www.scootle.edu.au/ec/viewing/L1144/index.html>

7 Natural Resources Adelaide and Mt Lofty Ranges (Junior macroinvertebrate ID chart) <http://www.naturalresources.sa.gov.au/adelaidemtloftyranges/about-us/our-regions-progress/monitoring-and-evaluation/schools#macroinvertebrates>

8 Waterwatch Victoria (Life in our waterways) <http://www.vic.waterwatch.org.au/file/inform/living_in_wetlands.pdf>

ground or in the classroom. Students add sheets of paper (e.g. for the sun and plants) as required to complete the food web. Using the food web they create as a guide, students then copy one food chain into their notebooks.

6. As a class, create a food web on the board or digital device by combining the food chains devised in Step 5). Identify the producers, primary, secondary and tertiary consumers and decomposers.

   Ask students:

   a) What would happen if certain parts of the food chain were removed?
   b) Which organisms would cope best with the loss of one food source?

7. Students suggest other organisms which might be in their local waterway and add them to their mind map.

1b. A recipe for a healthy waterway

Students explore how environmental conditions affect the health of a waterway and discover the indicators we use to assess the health of a waterway. They develop a classification system for macroinvertebrates to assist with their field work.

1. Watch the first two minutes of the video Critters: Where they wriggle [8:19] (see footnote 9) which gives students an introduction to the benefits of wetlands (a type of waterway). Working in pairs, students brainstorm some benefits of their local waterway and why it might be important.
2. Use the Water quality (see footnote 10) presentation in the Murray Darling Basin Authority lesson plans to find out the factors that indicate an unhealthy waterway and learn how to determine the health of the ecosystem. Students complete the first page of the student worksheet.
3. Explain why water quality tests are important and what they show about the health of a waterway. Demonstrate the correct method of collecting samples and performing the water quality tests as per the instructions in Freshwater water quality monitoring teacher information pack (see footnote 11). Students complete the 'Testing water quality worksheets' on pages 7 and 8.
4. Students watch the next segment [2:00–4:30 minutes] of the video Critters: Where they wriggle which introduces the different macroinvertebrates found in waterways. Working in pairs, students create a classification chart for identifying macroinvertebrates in the field by cutting from the Junior macroinvertebrate ID chart and pasting on to another sheet of paper.
5. Watch the final section [4:20–7:20 minutes] of the video Critters: Where they wriggle to preview how students will safely conduct their field work in teaching idea 2.
6. Ask students to suggest other organisms in their local waterway that could be added to their mind map.

2. A HEALTH CHECK FOR OUR WATERWAY

Students visit a local waterway and use what they have learnt about interactions in a waterway to assess its health.

Activities

a. Exploring our waterway

b. The health of our waterway

2a. Exploring our waterway

Students conduct the field tests introduced in previous lessons at two monitoring locations along the waterway.

9 Natural Resources Adelaide and Mt Lofty Ranges (Critters: Where they wriggle) <http://www.teachertube.com/video/critters-where-they-wriggle-117005>

10 Murray Darling Basin Authority (Lesson plans—Water quality) <http://www.mdba.gov.au/education/teachers/lesson-plans>

11 Natural Resources Adelaide and Mt Lofty Ranges (Freshwater water quality monitoring teacher information pack) <http://www.naturalresources.sa.gov.au/files/sharedassets/adelaide_and_mt_lofty_ranges/monitoring_and_evaluation/schools/amlr-me-schools-fresh-water-quality-teacher-resource-pack-gen.pdf>

Each group will need a clipboard, pen/pencils, the macroinvertebrate ID chart created in the previous lesson, Aquatic macroinvertebrate record sheet (see footnote 12), Freshwater results data sheet (Water quality monitoring – Freshwater) (see footnote 13), spare paper to record observations, equipment (such as a turbidity tube, pH test strips, salinity meter, nets, buckets, pipettes, petri dishes, a spoon, ice cube trays and shallow flat trays) for macroinvertebrate and water quality sampling, and a digital camera to document their field work.

a. Working in groups, students follow the instructions in the Freshwater water quality monitoring teacher information pack to test water quality and complete the Freshwater results data sheet for both monitoring locations.

b. Students sample the macroinvertebrates at one of the monitoring locations as per the Aquatic macroinvertebrates teacher information pack (see footnote 14) and record their results in the Macroinvertebrate results data sheet. Students use the macroinvertebrate classification chart they created in Activity 1b to identify the macroinvertebrates they collect.

c. Students draw a simple 'mud map' of the waterway and mark the location of their monitoring sites. They can include things they observe in it and take photos to illustrate their observations.

d. Students assess the health of the waterway using the Waterways health check (see footnote 15).

2b. The health of our waterway

Back at school, students collate and analyse their findings from the field visit to assess the health of the waterway. They compare the results of the two monitoring sites and draw conclusions about the relative health of the waterway at both sites.

a. Working in their field work groups, students create a presentation to show the key features of the waterway, their conclusions about the health of the waterway (at both monitoring sites) and the reasons they came to those conclusions. They can present their findings to the class using visual aids such as props, photographs, a short video or a PowerPoint presentation.

b. Ask the students to compare their group results with those of other groups. If there are differences, discuss some possible explanations (e.g. equipment error, human error, water was stirred up by the number of people at the sites). Explore what they would need to do to gain reliable data on the health of a particular waterway over time (i.e. repeat the tests, choose more monitoring locations and perform tests at different times of the year). What factors could affect their results (e.g. rainfall, drought, pollution, seasons, etc.)?

3. IMPACTS ON OUR WATERWAY

Students explore water as a critical resource, discover how much is in the environment in forms we can use and find out whether it is a renewable or non-renewable resource. They examine the different aspects which impact on the health of waterway ecosystems. Students draw ideas from the first two activities to show how understanding our waterways can help us to care for them (ACSSU094; ACSSU112; ACSSU116; ASCHE120; ASCHE121).

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12 Natural Resources Adelaide and Mt Lofty Ranges (Aquatic macroinvertebrate record sheet) <http://www.naturalresources.sa.gov.au/files/sharedassets/adelaide_and_mt_lofty_ranges/monitoring_and_evaluation/schools/amlr-me-schools-aquatic-macros-record-work.pdf>

13 Natural Resources Adelaide and Mt Lofty Ranges (Water Quality Monitoring – Freshwater) <http://www.naturalresources.sa.gov.au/files/sharedassets/adelaide_and_mt_lofty_ranges/monitoring_and_evaluation/schools/amlr-me-schools-freshwater-datasheet-work.pdf>

14 Natural Resources Adelaide and Mt Lofty Ranges (Aquatic macroinvertebrates teacher information pack) <http://www.naturalresources.sa.gov.au/files/sharedassets/adelaide_and_mt_lofty_ranges/monitoring_and_evaluation/schools/amlr-me-schools-aquatic-macros-teacher-pack-gen.pdf>

15 Waterwatch Australia (A waterway health check) <http://nrmonline.nrm.gov.au/catalog/mql:2879>

Activities

a. Water: the resource

b. Impacts on waterways

c. Water resource management

3a. Water: the resource

Students watch a demonstration and learn about the different sources of useable water and their relative abundance. They also discuss whether water is a renewable or non-renewable resource.

a. Using the 'Where in the world is water' activity (pages 43–46 of Water – learn it. live it (see footnote 16) Volume 1: Water in the Natural Environment), explain the different water sources and the fact that we have a limited amount of freshwater available to use.

b. Discuss the idea that geologists believe that all liquid water we have on the Earth now has been here for about 4.4 billion years. Ask students to suggest whether water is a renewable or non-renewable resource. Compare their ideas with the following definition (see footnote 17) of renewable resources which states that:

Renewable resources are those that are typically replenished at time scales of years to decades and include harvestable resources (for example, water, biota and some energy resources) and services (for example, ecosystem services)'.

Ask students to discuss why we consider water to be a precious resource.

3b. Impacts on water ways

Students explore the natural water cycle, human impacts on the water cycle and, in particular, impacts on their local waterway.

a. Watch The Water Cycle video [6:46] (see footnote 18). This video was published by the National Science Foundation. Discuss the names of water movements and storages. Ask students how the natural water cycle has been changed by humans. Students draw a water cycle diagram of their local waterway.

b. Conduct the 'Danny the Drip' activity found in the Danny the Drip (see footnote 19) story pack and the Danny the Drip teacher's notes. The resources can be found under the 'Freshwater quality' heading. Students answer the questions in 'Step 2: Follow up discussion' and participate in 'Step 3: Clean up'.

c. Ask students to identify any other natural or human impacts on waterways.

d. Watch the Aboriginal burning of Kakadu wetlands video [7:36] (see footnote 20) and discuss the impact of fire on wetlands.

3c. Water resource management

Students research a water issue and report their findings to the class.

a. Working in pairs or groups, students research the water issues listed below (a different one for each group). They define the issue, find out the human and

16 Water. Learn it. Live it. (Volume 1: Water in the natural environment) <http://www.yvw.com.au/yvw/groups/public/documents/document/waterliliresourcevol1.pdf>

17 Australian Curriculum, Assessment and Reporting Authority Senior Secondary Curriculum v7.5 F-10 Curriculum (Earth and Environmental Science). <http://v7-5.australiancurriculum.edu.au/seniorsecondary/science/earth-and-environmental-science/curriculum/seniorsecondary#page=3> Accessed 6 August 2016

18 National Science Foundation (The Water Cycle) <https://www.youtube.com/watch?v=al-do-HGuIk>

19 Natural Resources Adelaide and Mt Lofty Ranges (Danny the Drip) <http://www.naturalresources.sa.gov.au/adelaidemtloftyranges/about-us/our-regions-progress/monitoring-and-evaluation/schools>

20 CSIRO (Aboriginal wetland burning in Kakadu) <https://www.youtube.com/watch?v=AXG_2JSW0FA>

natural impacts and propose solutions. They present the results visually (e.g. in a poster, story, illustration, comic strip, short video, song, role play, PowerPoint presentation etc.) with a brief explanation to the class.

- Water needs
- Stormwater
- Wastewater
- Ocean pollution
- Water regulation
- Droughts and floods
- Erosion

Some guiding questions could include:

- What does your term mean?
- What does your issue have to do with water?
- What are some ways that humans impact on...?
- What are the natural impacts (weather, rainfall)?
- If you were in charge, what would you do to make sure most people, and the environment, were happy with the solution?

SUGGESTED RESOURCES

Search the internet for resources from your local water business, Waterwatch and other natural resource and environmental departments/providers. Some examples include:

Lesson Plans, Murray Darling Basin Authority (see footnote 21)

The Best of Catchment Connections, Natural Resources—Adelaide and Mt Lofty Ranges (see footnote 22)

Turning on the Tap, Greater Wellington Regional Council (see footnote 23)

21 Murray Darling Basin Authority (Lesson plans) <http://www.mdba.gov.au/education/teachers/lesson-plans>

22 Natural Resources Adelaide and Mt Lofty Ranges (For educators – Water) <http://www.naturalresources.sa.gov.au/adelaidemtloftyranges/education/for-educators/water>

23 Greater Wellington Regional Council (Turning on the tap) <http://www.gw.govt.nz/assets/Our-Environment/Water-Supply/PDFs/Turning-on-the-tap/2013-update/Turning-on-the-Tap-complete-booklet-9.4-MB.pdf>