AUSTRALIAN WATER ASSOCIATION

Science: Using science and technology to solve Australia's water problems

This PDF is interactive. Click on underlined words and sentences to be directed to online resources.

RESOURCE OVERVIEW

This resource presents two teaching ideas that support Australian Curriculum Year 7 Science in the context of solving contemporary water supply issues:

1. Water Careers

Investigates how people in the water industry use science in their day-to-day work and to solve water management problems.

2. Solving Water Problems

Explores the role science plays in solving water problems such as water conservation, drinking water supply and urban stormwater management.

These teaching ideas do not need to 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 are applied in problem-solving situations.

The teaching ideas offer students opportunities to:

- brainstorm, generate and discuss ideas using strategies such as think-pair-share
- research innovations and inventions
- play a simulation game
- analyse video clips.

AUSTRALIAN CURRICULUM YEAR 7 SCIENCE LINKS

Science Understanding

- 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/ ACSHE136)

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE223)

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

TEACHING IDEAS

1. WATER CAREERS

Students explore a number of water careers and how people working in the water industry use science understanding and skills in their work (ACSHE121). They view videos about jobs in the water industry and analyse how the water professionals featured use science in their roles. Students also learn how Traditional Owners in a Central Australian Aboriginal community use traditional knowledge and science to manage their local water resources to 'maintain their special connection to and responsibility for Country'.

Activities

a. Water careers

b. Working with Traditional Owners

1a. Water careers

Students view short videos featuring water industry professionals to appreciate the range of careers and the way that science is used in these careers.

A. Ask students to think about where their drinking water comes from and list the jobs they think might be involved in supplying safe reliable drinking water.

B. Divide students into groups. This activity could be structured as a jigsaw activity. For instructions about running a jigsaw activity, access the Scootle resource (TLF ID R11915) (see footnote 1) developed by the Australian Academy of Science 'Science by Doing' Program.

Teachers need to register to access this free resource: www.scootle.edu.au

C. Each group chooses a different water career to research using a video vignette. Possible careers could include:

a) hydrographer, water treatment technician, operations and maintenance technician, wastewater treatment plant operator—from the H2Oz website (see footnote 2). Select the 'Testimonials' tab to access the videos.

These videos are hosted by Youtube so check that you can access them via your school network.

b) civil engineer—from the ABC Ace Day Jobs web page (see footnote 3).

D. Each group views their video and records the answers to the following questions:

a) What tasks are involved in this job?

b) What science understanding and skills are used in this job?

E. Each group shares their ideas with the class. In the class discussion, highlight the range of knowledge and skills that each water professional needs to do their job.

1b. Working with Traditional Owners

Students view a video about the partnership between an aquatic ecologist and Traditional Owners to manage the health of Hayes Creek Springs on the edge of the Simpson Desert. It also provides insights into the work of the aquatic ecologist.

1 Education Services Australia (Scootle) <http://www.scootle.edu.au/ec/search?q=r11915&field=title&field=text.all&field=topic>

2 Australian Water Association (H2Oz careers in water) <http://www.h2oz.org.au/>

3 ABC (Ace Day Jobs) <http://www.abc.net.au/acedayjobs/cooljobs/profiles/s2599723.htm>

The Hayes Creek Springs video [4:16] was produced by the Australian Academy of Science 'Science by Doing' Program and can be accessed from Scootle by downloading the 'Enough Water Fit for Drinking: Student digital activities' (M014121). The video is found in Part 3: 'Where does the water we use come from and where does it go?' Activity 3.5 'Meet an aquatic ecologist working with Traditional Owners'.

Teachers need to register to access this free resource: www.scootle.edu.au

Students view the Hayes Creek Springs video and answer the following questions:

A. What knowledge and skills does Jayne need to do her job as an aquatic ecologist in Central Australia?

B. How are the Traditional Owners managing the water quality and biodiversity of the springs?

C. How is science used to sustainably manage the Hayes Creek Springs system? What science understanding and skills are used to manage the springs?

D. How does traditional knowledge about the Hayes Creek Springs help the ecologists to manage the springs?

2. SOLVING WATER PROBLEMS

Students explore how people use science and technology to solve water-related problems (ACSHE120). They research how innovative ideas such as raingardens use science and technology to solve the problem of water wastage. Students play a simple water supply simulation game and make decisions about building climate-independent water supply infrastructure.

Activities

a. Water innovation

b. Raingardens

c. Managing the water supply on Water Island

2a. Water innovation

Students research the range of water-related innovations and inventions designed to minimise water wastage.

A. Prepare water innovation cards using the worksheet provided in the 'Water innovation' activity from Water – learn it. live it. Volume 2 Water in the urban environment pages 63-64. The 'Water innovation' activity can be downloaded from the Water – learn it. live it. website (see footnote 4).

B. Students view the Poop and paddle video [4:02] (see footnote 5) published by Science Friday which features a floating toilet and sewage treatment system built by inventor Adam Katzman. Using a think-pair-share strategy, ask students to suggest what problem this device aims to solve. Ask students to decide if this device is an invention or an innovation.

Compare the terms: invention and innovation. Explain that one interpretation from the Idea Lab (see footnote 6) is that 'invention can be defined as the creation of a product or introduction of a process for the first time' while 'innovation occurs if someone improvises on or makes a significant contribution to an existing product'. Students research other definitions of these terms and discuss why the definitions may differ depending on context: for instance, if you are working in a business or a science field. Highlight the idea that one thing inventions and innovations have in common is that they aim to solve a problem.

C. Students pick a 'Water innovation' card from a hat and predict whether the product or idea on their card is an innovation or an invention.

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4 Water – learn it. Live it. <http://www.yvw.com.au/Home/Inyourcommunity/Education/WaterLearnitLiveitprogram/index.htm>

5 Science Friday (Poop and paddle) <https://www.youtube.com/watch?v=sjvN2vt3kbg>

6 Mediashift (The difference between 'Invention' and 'Innovation' <http://mediashift.org/2012/03/the-difference-between-invention-and-innovation086/> Accessed 24 July 2016

D. Students research the water innovation/invention described on the card. They can devise their own focus questions or answer the focus questions provided on page 63. You could add the following focus questions:

1. What water problem does this innovation/invention solve?

2. What are the positive and negative impacts of this innovation/invention?

E. Students share their findings with the class. Discuss how science and technology contribute to finding solutions to the problem of ensuring a reliable water supply.

F. Students reflect on their initial prediction about whether their product or idea is an innovation or an invention.

G. To complete the activity, students watch the Youtube video Drinking water: a daily challenge [3:09] (see footnote 7) published by water technology company Suez Environnement. The video highlights the challenges of providing safe drinking water and the ongoing role that technology plays in responding to emerging issues. While watching the video, students note the problems and solutions covered and then discuss with the class.

2b. Raingardens

Students explore the issue of urban stormwater contamination of waterways, wetlands and coastal ecosystems. Raingardens are innovative gardens that intercept and filter polluted stormwater, reducing its impact on downstream waterways.

A. Ask students what they already know about how stormwater flows through their suburb. Where does the stormwater come from? Where does it go? What pollutants does it pick up as it moves through the urban landscape?

B. Students view the 10,000 raingardens—helping tackle stormwater pollution in Melbourne video [2:14] (see footnote 8) that explains what stormwater is and how stormwater pollution can impact on the environment. It shows how raingardens can reduce the pollution in urban run-off. You may need to scroll down the web page to find the video.

C. Discuss how urban stormwater can affect the health of waterways and how raingardens reduce the impact of stormwater pollution.

D. Working in groups, students consider whether raingardens could be built at your school. The class can suggest a series of questions to evaluate the idea.

2c. Managing the water supply on Water Island

Students play a game in which they manage the water supply of an island with a growing population. Water Island (see footnote 9) is an online game published by Seqwater that provides a simple introduction to water supply topics such as dams, water treatment, water recycling, desalination and the urban water cycle.

A. Read the introduction to the students

B. While the students play the game, ask them to take notes about the problems encountered and the scientific and technological solutions provided.

C. After they complete the interactive, students collate a class list of the problems and scientific and technological solutions addressed in the game. What additional strategies can the water managers of Water Island use to ensure there is sufficient water supply (e.g. devise a Waterwise campaign to encourage residents to limit their water use)?

D. Discuss the positive and negative impacts these solutions may have and what ethical issues need to be considered.

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7 Suez Environnement (Drinking water: a daily challenge) <https://www.youtube.com/watch?v=rIeyFc9S_bg>

8 Melbourne Water (10,000 raingardens) <https://www.youtube.com/watch?v=4pz8vHuGEHs>

9 Seqwater(Water Island) <http://www.seqwater.com.au/education/water-island-game>
