

Unit 2: Waterwise ambassadors

Introduction

As the media bombard us with reports of huge problems that threaten dire consequences, we can tend to feel powerless. However, local action can have global consequences, even if it starts with something as commonplace as fixing a dripping tap.

Key concepts

- Water is a valuable resource that needs to be conserved in the home, at school and in the community.

Essential Learnings for this unit—By the end of Year 5

Ways of working	Knowledge and understanding
Science	
<p>Students are able to:</p> <ul style="list-style-type: none">pose and refine simple questions, and make predictions to be testedcollect and organise data, information and evidenceevaluate information and evidence to support data gathered from activities and investigationsdraw conclusions that are supported by evidence, reproducible data and established scientific conceptscommunicate scientific ideas, data and findings, using scientific terminology and formats appropriate to context and purposeidentify and apply safe practices.	<p>Science as a human endeavour Science is a part of everyday activities and experiences.</p> <ul style="list-style-type: none">Science can help to make natural, social and built environments sustainable and may influence personal human activities. <p>Natural and processed materials Properties, changes and uses of materials are related.</p> <ul style="list-style-type: none">Properties of materials are affected by processes of change.
Studies of Society and Environment	
<p>Place and space Environments are defined by physical and human dimensions</p> <ul style="list-style-type: none">Students know and understand that:<ul style="list-style-type: none">Sustainability of local natural, social and built environments can be influenced by positive and negative attitudes and behaviours.	<p>Students are able to:</p> <ul style="list-style-type: none">collect and organise information and evidencedraw and justify conclusion based on information and evidencecommunicate descriptions, decisions and conclusions, using text types selected to match audience and purpose.

❖ Assessment overview

The focus for assessment in this unit will be a student-initiated audit of water use practices in their school and in their homes. The findings from the audit will be presented as a report, which will outline problems, suggest solutions and draw conclusions.

❖ Essential Learnings for assessment—By the end of Year 5

Ways of working	Knowledge and understanding
Science	
<p>Science as a human endeavour Science is a part of everyday activities and experiences.</p> <ul style="list-style-type: none"> › Science can help to make natural, social and built environments sustainable and may influence personal human activities. 	<p>Students are able to:</p> <ul style="list-style-type: none"> › collect and organise data, information and evidence › communicate scientific ideas, data and findings, using scientific terminology and formats appropriate to context and purpose.
Studies of Society and Environment	
<p>Place and space Environments are defined by physical and human dimensions</p> <ul style="list-style-type: none"> › Students know and understand that: <ul style="list-style-type: none"> • Sustainability of local natural, social and built environments can be influenced by positive and negative attitudes and behaviours. 	<p>Students are able to:</p> <ul style="list-style-type: none"> › draw and justify conclusion based on information and evidence › communicate descriptions, decisions and conclusions, using text types selected to match audience and purpose.

❖ Assessable elements

» Science

- Knowledge and understanding
- Investigating
- Communicating

❖ Taking action

A school water audit is completed for consideration by the school administration. Students will also take steps to investigate and reduce their own and their families' water use.

❖ Linking locally

After learning how to conduct a water audit at school, the student leads their family in an examination of water usage in the home.

Unit 2 overview

Phase	Lesson
Engage	
To capture interest and discover what we think we know	<ul style="list-style-type: none"> › Lesson 1—Making a statement Students use prior knowledge to sort water facts and opinions.
Explore	
To have shared, hands-on experiences	<ul style="list-style-type: none"> › Lesson 2—Reading the meter Students learn how to locate and read a water meter. › Lesson 3—Water tickets, please! Students experience water rationing. › Lesson 4—The resource race Students explore the problems encountered when people compete for a limited resource.
Explain	
To demonstrate what we have learned by exploring	<ul style="list-style-type: none"> › Lesson 5—Water, water everywhere Students are shown the breakdown of the earth's total water.
Elaborate	
To build understanding through an investigation	<ul style="list-style-type: none"> › Lesson 6—Drip detectives Students investigate dripping taps. › Lesson 7—School water audit Students complete a report card on their school's water usage. (Assessment) › Lesson 8—Ready to report Students communicate the findings of their audit in a report. (Assessment)
Evaluate	
To review and reflect on learning	<ul style="list-style-type: none"> › Lesson 9—Teaching my family to audit Students review and reflect on their learnings as they lead their family in a home water audit. Students complete a follow-up home water audit two weeks later to evaluate their families' water conservation strategies.

... Student assessment task

Unit 2: Waterwise ambassadors

» Setting the scene

In this unit you will be investigating how water gets to, flows and is used within the school. You will conduct a school water audit and report your findings to your school's administration. From the school water audit results, you will choose three ways that water is wasted in the school and suggest ideas to reduce the water wasted in those areas. In your report, explain why you chose the three problems and justify the importance of your choices from the school water audit results to persuade the school administration to take the actions you recommend.

» Purpose of the task

For you to show how well you can:

- › gather, analyse and evaluate data from your water audit
- › use information and evidence to make decisions and draw conclusions
- › plan, draft and edit a persuasive report.

» Products to be completed

By the end of this unit you will be assessed on your ability to plan and write a report about the ways that water is wasted in the school and suggest effective solutions to these problems.

Resource 1 (continued)



❖ Stages in the learning journey	Checklist	
	Student	Teacher
Lesson 1—Students sort out some water statements.		
Lesson 2—Students read a water meter.		
Lesson 2—Students graph water meter readings.		
Lesson 3—Students play the water ticket game.		
Lesson 3—Students create a graph from their water tickets.		
Lesson 4—Students participate in the resource race activity and make a conclusion based on evidence.		
Lesson 5—Students work out where the earth's water is stored.		
Lesson 6—Students complete a drippy investigation.		
Lesson 7—Students conduct a school water audit.		
Lesson 8—Students plan and review a report on the audit.		
Lesson 8—Students complete final drafts of their report for the school administration.		
Lesson 9—Students involve their families in conducting a home water audit.		



Student assessment grid

Name.....

Resource 1 (continued)

Unit 2: Waterwise ambassadors

Criteria	Descriptors		
<p>Report</p> <ul style="list-style-type: none"> ➤ Has an introduction that includes the main idea and shows why water conservation is important. ➤ Has a body with three problems from the audit, evidence about them, and possible solutions. ➤ Has a conclusion that includes the main idea and is persuasive. ➤ Includes photographs as evidence. ➤ Has no presentation errors (spelling, punctuation or grammar). 	<p>My report:</p> <ul style="list-style-type: none"> ➤ Has an introduction with a main idea that clearly shows my understanding of why water conservation is important. ➤ Has a body that describes three problems from my audit, clear evidence (including photographs), and logical solutions. ➤ Has a conclusion that restates the main idea and helps to convince the reader to take some action. ➤ Has no presentation errors (spelling, punctuation or grammar). 	<p>My report:</p> <ul style="list-style-type: none"> ➤ Has an introduction with a main idea that shows my understanding of why water conservation is important. ➤ Has a body that describes three problems from my audit, some evidence (including photographs), and some solutions. ➤ Has a conclusion that restates the main idea or helps to convince the reader to take some action. ➤ Has few presentation errors (spelling, punctuation or grammar). 	<p>My report:</p> <ul style="list-style-type: none"> ➤ Has an introduction that mentions why water conservation is important. ➤ Has a body with some problems, evidence (might include photographs), and some solutions. ➤ Has a conclusion. ➤ Has presentation errors (spelling, punctuation or grammar).

Making a statement

» Lesson overview

The focus of this lesson is on engaging students' interest, and finding out what they already know about water, including their misconceptions.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- consider the processes involved in conducting an investigation
- be informed about the learning journey, including the assessment task for this unit
- categorise statements about water using prior knowledge.

» Opportunities for assessment

This lesson will provide a record of some of the students' understanding and misconceptions about water, which can be taken into account when planning future learning experiences. The student ideas can be revisited at the end of the unit.

» Equipment

For the class

- an enlarged copy of the water statements cut into individual statement strips (Resource 2)
- a display space with the headings 'True', 'False' and '?'

For each student

- individual copy of the water statements
- scissors
- student journal

» Lesson steps

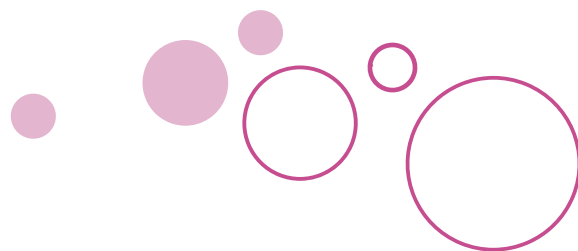
1. Write the word 'Detectives' on the board and explain to the students that in this unit of work, they are going to be detectives. Ask the students what they think detectives do and write their suggestions on the board around the word 'Detectives'. Encourage responses such as: investigate, look for clues, solve crimes, question, observe, look for evidence, listen, photograph and report back.
2. Explain to the students that they are going to be water detectives, on the trail of water waste. Ask the students to suggest which of the words on the board might apply to their role as water detectives. Circle those words.
3. Show the students the 'Student assessment task' sheet (Resource 1). Point out that in this unit, they will collect data from a school water audit and write a report for the school administration. Discuss this with the students if necessary. Guide the students through the steps in the learning journey and explain that step 1 will be completed at the end of the lesson when it will be checked off.
4. Explain that you are going to begin the unit by discovering some of the things the students already know about water. Show the students the water statements sheet (Resource 2). Ask students to cut out the headings and statements and to glue the statements under the headings in their journals, working alone or in pairs.
5. Reinforce that this lesson is about discovering what we think we know, rather than recording the 'right' or 'wrong' answers. As a class, categorise the enlarged 'True or false' statements (Resource 2) under the three headings on the display space, using a majority vote when there are disagreements.
6. As other questions about water arise, write them out and put them under the '?' heading.

» Curriculum links

English, ICT

Create a puzzle with water facts and terms using <<http://puzzlemaker.com>>.

Resource 2



❖ True or false

True	False	?
1. All living things need water to live.		
2. Clouds are made of water.		
3. Only one per cent (1%) of the world's water is drinkable.		
4. Ocean water is salty.		
5. Humans can drink sea water.		
6. Plants can be watered with polluted water.		
7. When polluted water gets into a river, the river can clean itself.		
8. The ocean is so large that polluted water put into it disappears.		
9. Rainwater in a big city is pure and healthy.		
10. Clouds make water.		
11. Humans can live without water but not food.		
12. Plants release water into the air.		
13. A dripping tap wastes very little water.		



Reading the meter

» Lesson overview

In the previous lesson, students identified what they thought they knew about water. In this lesson, students investigate the amount of water used in the school by locating and reading the school's water meter.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- locate and read the school's water meter
- calculate water usage and time elapsed
- catch a water-use graph being modelled
- predict school water uses.

» Opportunities for assessment

The assessment focus in this lesson is monitoring, and providing feedback on, the students' ability to read a water meter and draw conclusions from the data.

» Equipment

For each student

- student journal
- *Optional:* a dictionary

» Preparation

Locate the school water meter and familiarise yourself with it. Refer to instructions opposite.

» Lesson steps

1. Review the ideas that the students recorded in their journals in the previous lesson. Explain to the students that in this lesson they will investigate how much water is used by their school.
2. Write the words 'speedometer, pedometer, water meter, thermometer and hygrometer' on a board. Discuss or research the word meanings to discover their similarity. (All are measurement devices: speedometer measures speed, pedometer measures steps, water meter measures water volume, thermometer measures heat and hygrometer measures humidity).
3. Explain that the class is going to find and read the school's water meter, discuss why a school would need to measure water volume, and predict whether the number will be large or small.
4. Walk to the meter and take a reading.



Your water meter might look like this. Black numbers on the meter measure kilolitres (thousands of litres). Red numbers measure fractions of kilolitres.

0	1	3	2	6	6	1
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The reading on this meter is 132.661 kilolitres, or 132 661 litres.

As you return to the classroom, point out the places in the school grounds where water is used. Ask students to write in their journals the water meter reading, and the time and date it was read.

5. Return to the meter later in the day, or the next day, and take another reading. Ask students to calculate and record in their journals the time elapsed between readings, and the amount of water used. Below this, students list the ways in which they predict the water may have been used.
6. Read the meter at the same time of day for a week; model graphing the results. Check off steps 2 and 3 in the learning journey.

» Curriculum links

SOSE

Research water-use figures from third world countries.

English

Survey other students about the ways they use water at school.

Water tickets please!

» Lesson overview

In the previous lesson, students learned to read the water meter at the school. The focus of this lesson is on exploring student decisions about water use in a game.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- predict and then track their personal uses of water during one day
- communicate the results as a bar graph
- categorise some essential and non-essential water uses
- draw evidence-based conclusions.

» Opportunities for assessment

The assessment focus in this lesson is on monitoring, and providing feedback on, the students' growing awareness of their water usage and of essential and non-essential uses of water.

» Equipment

For the class

- box to collect tickets
- bar graph to collate results

For each student

- one sheet of water tickets (Resource 3)
- peg, clip or bag to store unused tickets
- student journal

» Lesson steps

Organisational note: This lesson goes over one school day and needs to begin in the morning and be revisited at regular intervals.

❖ Session 1

1. Review the water meter reading activity in the previous lesson and discuss how the students' use of water would affect the reading.
2. Explain to the students that they are going to play a game that will give them a picture of how they use water at school. Give the students their water tickets and the bags, clips or pegs the students will use to store their unused tickets. Ask them to put an identifying mark on every ticket (name or initials), cut them into single tickets, then collect them together using the bag, peg or clip.
3. Show the class the collection box; explain that every time students use water, they are to circle on a ticket what they used the water for, and put it in the box.
4. Emphasise that this is not a competition to see who can use the most or least water; it is a way of gathering information. Explain that the students should use water as normal, and stress that it is especially important that they continue to drink regularly through the day. Explain that additional tickets can be issued if required.
5. Ask students to write in their journals a prediction of which water use will appear on most of their tickets. Share these predictions orally around the class.

6. Ask students to fill out tickets for any water used between their arrival at school and now. As water is used, and after each break, they are to fill out tickets showing what the water was used for, and put them in the class collection box.

❖ Session 2

1. Return individual tickets and ask the students to tally the tickets according to the water use. Record their results in their journal. Ask the students to form teams and add their tallies to form a team tally of different uses of water.
2. Explain that they are going to make a bar graph from these tickets. Ask the students to suggest what they will need to make a bar graph (two lines that meet as axes, a title, tickets glued into columns, numbers, labels on the columns).
3. Come together as a whole class and use tally marks to collate the water uses of the whole class. Encourage the students to think about essential and non-essential uses of water. For instance, you could ask: 'If the school water supply was halved for the day due to council works, how might we modify our usage?'
4. Refer students to their predictions they made in Session 1. Ask students whether they were accurate or inaccurate. Ask the students to draw a conclusion from this activity based on evidence. For instance, if students identified the evidence: 'We used up a lot of water tickets flushing toilets', the conclusion would be: 'Flushing toilets

uses a lot of water in this school'. Ask them to suggest other factors they might need to consider, such as how much water is used for each activity. Write their conclusions and evidence in journals.

5. Ask the students to make suggestions about how the water usage could be reduced. For example, the amount of water used in toilet flushing could be reduced by installing dual-flush toilets. Refer to the *Background Information for Teachers* for more ideas, available at http://www.derm.qld.gov.au/waterwise/education/units/teacher_background.html.
6. The students could use the internet to source additional water-saving hints. Discuss the usefulness of these ideas in a school context.

» Curriculum links

SOSE

Research wartime rationing using ration tickets.

Maths

Express the results as fractions.

Resource 3

Water tickets

<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other 	<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other 	<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other 	<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other
<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other 	<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other 	<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other 	<p>Water ticket</p> <p>Name:</p> <p>Used for: (Please circle)</p> <ul style="list-style-type: none"> › Drinking › Washing › Flushing › Watering › Cooking › Other
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The resource race

» Lesson overview

In the previous lesson, students investigated their water use in the school. In this lesson, students explore the problems encountered when people compete for a limited resource.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- be introduced to the term ‘natural resource’
- play a game requiring cooperative team work
- take part in a dramatic representation of competition for resources in order to increase understanding of the associated issues
- gain fresh understanding of water as a precious resource
- write an opinion or conclusion supported by evidence.

» Opportunities for assessment

The assessment focus in this lesson is on monitoring, and providing feedback on, the students’ ability to identify issues in competition for limited resources and write evidence-based conclusions.

» Equipment

For the class

- five or six buckets
- a dozen cups

For each student

- student journal

» Lesson steps

1. Revisit student ideas about the availability of water for all our needs. Ask them to think about what it would be like to have a limited supply of water. Have any of your students been in a situation in which their water has been limited such as camping in the desert? Ask them to share their experiences. Discuss the water saving strategies they used.
2. Explain to the students that they are going to take part in an activity called a resource race. Point out that water is referred to as a 'natural resource' because it is something we use which is not man-made. Ask the students to identify other natural resources such as soil, minerals, oceans and forests.
3. Explain that the students are going to be formed into three teams: the homeowners, the industrialists and the farmers. Write these words on the blackboard and ask the students to brainstorm the uses each group would have for water.
4. Ask one or two students to play the part of a water source such as a river and group the other students into three teams. Move outside into an area which will not become slippery when wet (preferably grassed) and give each group one cup and a bucket which is placed an equal distance from a common bucket placed centrally.
5. Ask teams to form lines extending from the common bucket (which is full of water) to their team bucket. Explain that the purpose of the game is for each team to get their bucket as full as possible by scooping water from the common bucket into the cup, then passing the cup down the team line. The last person in the line empties the cup into the team bucket, runs to the head of the line, fills the cup from the common bucket then gives it to the next person in line to pass to the next person, and so on. The students who are playing the part of the river continually top up the common bucket with water from the other bucket. Explain that this top-up bucket represents the rain that fills up the water source (the common bucket).
6. Begin the game, then start reducing the water supply by decreasing the rate at which the 'river' students refill the main supply (common) bucket. Allow the teams to compete for water for a short time, then stop the activity.
7. Ask the students to verbalise the problem—for example, 'When we have less water we fight to get our share'. 'Everyone gets less water.' 'It isn't fair.'
8. Ask students to come up with ways to solve or improve the problem such as smaller cups or allocated amounts. Ask students to discuss what less available water might mean for their group and share ideas with the whole class. Ask the students to consider the water that might be needed in the environment. What animals and plants are also dependent on water from the water source? How can water be allocated for these environmental needs?
9. Decide on a responsible way to use any water remaining in the buckets and return to the classroom. Ask the students to reflect on the activity and write an opinion or a conclusion in their journals supported by evidence. These statements could be:
 - 'In my opinion, farmers need to have first priority when water is being allocated (Opinion) because they grow the food that feeds us and this is vital.' (Evidence)
 - 'All households should be fitted with rainwater tanks and water recycling systems (Conclusion) because the farmers and industrialists could use the water that would be saved to grow and build the things we need.' (Evidence)

Curriculum links

English

Design a Resource Race board game.

SOSE

Research the amounts of water used by homes, industry and farms in Australia.

Water, water, everywhere

» Lesson overview

In the previous lesson, students experienced what it was like to compete for a limited resource. In this lesson, students participate in an activity to illustrate how limited the earth's freshwater resources are.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- estimate the fraction of the earth's area that is covered in water
- take part in a graphic illustration of the proportions of fresh, frozen and salt water
- write an evidence-based opinion
- become familiar with the concept of water justice
- gain fresh understanding of water as a precious resource.

» Opportunities for assessment

The assessment focus in this lesson is on monitoring, and providing feedback on, students' ability to identify drinkable water as a rare and precious resource.

» Equipment

For the class

- globe or world map

For each group of three students

- student journals
- one 1 litre container full of water
- three 1 litre containers labelled '1', '2' and '3'
- one measuring tablespoon (20 mL)
- labels: 'Salt water', 'Available fresh water' and 'Frozen fresh water'

»Lesson steps

1. Review students' ideas about the resource race in the previous lesson. Explain that in this lesson they will investigate how water is distributed on earth.
 2. Look at a map or globe of the world and estimate what fraction of the earth's surface is covered with water.
 3. Inform students that all the water on earth is estimated at 1386 million billion litres. Show them a one litre container of water and explain that, for the purpose of a demonstration, the class is to imagine that all the water on earth could fit into a one-litre container.
- 75% of the earth's surface is covered by water.**

 - › 97% is salt water in the oceans
 - › 2.25% is frozen water in icecaps and glaciers
 - › 0.15% of the earth's water is potential freshwater supply
 - › the majority of the earth's freshwater supply is found underground.
4. Ask students to form groups of three and to collect a one-litre container full of water, three numbered one-litre containers, a set of labels and a tablespoon.
 5. Direct the students to use the tablespoon to transfer 20 mL of water into container 2, 10 mL of water into container 3, and the rest of the water into container 1. Discuss how the students can estimate 10 mL using the 20 mL tablespoon.
 6. Explain to students that if all the water on earth could fit into a one-litre container, the water in containers 1, 2 and 3 would represent the proportion which was salt water, available fresh water and frozen fresh water. It should be noted that not all freshwater is available for human use.
 7. Ask groups to discuss and decide where the labels should go. Individual students should record their predictions in their journals as an opinion backed by evidence—for example, 'I think that container 1 (970 mL) represents all the water in the oceans and seas because when I look at the world map I can see that oceans and seas cover a much bigger area than the ice caps or rivers and lakes.'
 8. Ask groups to explain their decisions to the class; keep a record of each group's decisions on the board.
 9. Explain that container 1 represents salt water, container 2 represents frozen fresh water, and container 3 represents fresh water. Discuss the implications of this information. How can we conserve this precious resource?
 10. Pose the question, how do we ensure members of the community have fair supply, access to and use of water? Ask students to brainstorm ideas. For instance, should people be allowed to use fresh water for recreation like water skiing on dams/weirs, freshwater fishing, private swimming pools or white-water rafting? Record student's ideas for possible fair and just allocation and use of water.
 11. Lead students through the process of creating in their science journals a scientific diagram of the three containers that illustrates the distribution of earth's water supply.

»Curriculum links

SOSE

Research water use in countries which are drier than Australia. You could start with internet sites such as the UK-based WaterAid site, which contains games and information aimed at under-eleven year olds.

Go to <www.wateraid.org/uk/learn_zone/pupils_under_11>.

Drip detectives

» Lesson overview

In the previous lessons, students gained an understanding that fresh water is a natural resource that can be in very short supply. In this lesson, students plan and undertake an investigation into dripping taps.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- consider the effect of water wastage
- suggest water conservation strategies
- consider variables when planning an investigation
- calculate results
- become familiar with report writing
- use the school water meter data as evidence
- reinforce their understanding that small changes can make a big difference.

Greywater is water from the:

- › bathroom—shower, bath, internal spa bath, wash basin
- › laundry—washing machine, washing tub.

Greywater sourced from the kitchen cannot be used in sewered areas.

Elaborate

» Opportunities for assessment

In this lesson, you are looking at the extent to which students can pose questions and follow processes to undertake an investigation and draw conclusions from data.

» Equipment

For the class

- enlarged copy of 'Drip detective: Investigation planner' (Resource 4)
- enlarged copy of 'School water audit report planner' (Resource 6)

For the team

- stopwatch or clock with second hand
- calculator
- measuring jug
- copy of 'Drip detective: Investigation planner' (Resource 4)

» Lesson steps

1. Revisit the students' scientific diagrams from Lesson 5. Ask the students what was learned about water from the previous lesson and record suggestions. Ideas could include:
 - 'Most of the water in the world is salty.'
 - 'Lots of the fresh water is frozen.'
 - 'There is not enough fresh water to waste any.'
2. Discuss and list some water conservation strategies such as taking shorter showers, turning off taps while brushing teeth, filling dishwashers and washing machines to capacity before use, installing dual-flush toilets, using composting toilets, and fitting greywater systems and rainwater tanks. Explain that outdoor water restrictions are the single most effective measure to reduce water use in an urban setting. Tell students that they are going to investigate one water-saving strategy: to stop taps from leaking.
3. Ask students to predict how much water a dripping tap could waste in an hour. Encourage them to see that variable factors like the rate of dripping would affect the outcome. Have them write a prediction in their journal, such as 'I think a slowly dripping tap would waste about one litre in an hour.'
4. Explain to the students that they are going to plan an investigation to show how much water a dripping tap would waste in a day. Talk about the different places in the school where taps that could be investigated would be found. Discuss the safety and hygiene rules for this activity. If the school doesn't have a dripping or leaking tap students have access to you may need to simulate a dripping tap for the

As dwellers on the world's driest inhabited continent, Australians are coming to realise we must:

- › use and conserve water wisely
- › reduce pollution of waterways
- › develop ways to harvest rain efficiently and store water safely
- › develop climate-independent sources of water.

purpose of calculating the water loss or waste. Don't forget to recycle the water, e.g. pour onto trees or garden plants, when the simulation is finished.

5. Divide the class into teams of three and explain, using the enlarged sheet, how the 'Drip detective: Investigation planner' (Resource 4) works. Decide on a team definition for a 'slow' leak; it could be fewer than 10 drips per minute. A medium leak could be between 10 and 30 drips a minute, and a fast leak could be between 30 and 60 drips a minute. A partly completed example of the investigation planner worksheet is provided in the 'Drip detective (example): Investigation planner' (Resource 5).
6. Teams complete their plans and carry out their investigations.
7. Bring the class back together to compare the teams' results. Guide students through the calculations necessary to work out the water wasted from their dripping tap in one year.
8. Show students the enlarged 'School water audit report planner' (Resource 6). Remind students that this report is an assessment task. Ask students whether they think the dripping taps they discover in their audit may be a problem. Work collaboratively with students to show them how to write a 'body' paragraph for their report about dripping taps under the heading, 'Body: Problems and solutions'.
9. Check the school water meter at the end of the day and first thing in the morning to determine whether the school has any water leaks. Note that final use of water within the school may be when After Hours School Care leaves for the evening, which could be up to 7 pm. Can students identify where these leaks are? What ideas can students suggest to reduce water loss?

» Curriculum links

English

Read and write detective stories.

Maths

Create graphs from the investigation findings.

Resource 4

❖ Drip detective

Investigation planner

What are we going to investigate?


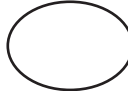

What will we measure?

How will we measure?

What will we keep the same?

- >
- >
- >

How much water do we predict will be wasted in one day?

> Slow drip	> Medium drip	> Fast drip
Test 1—Slow drip	Test 2—Medium drip	Test 3—Fast drip
 millilitres	 millilitres	 millilitres

Use a calculator to work out the water wasted in a day.

Drip speed	Water wasted in one minute	Water wasted in one hour (hint: x 60)	Water wasted in one day (hint: x 24)
Slow			
Medium			
Fast			

Resource 5

❖ Drip detective (example)

Investigation planner

What are we going to investigate?

The amount of water a dripping tap can waste in a day.

What will we measure?

The amount of water wasted by three dripping taps.

How will we measure?

In millilitres using a jug.

What will we keep the same?

- › The tap
- › The measuring jug
- › The time (1 minute)

How much water do we predict will be wasted in one day?

› Slow drip 1 litre	› Medium drip 2 litre	› Fast drip 3 litre
Test 1—Slow drip	Test 2—Medium drip	Test 3—Fast drip

Use a calculator to work out the water wasted in a day.

Drip speed	Water wasted in one minute	Water wasted in one hour (hint: x 60)	Water wasted in one day (hint: x 24)
Slow			
Medium			
Fast			

Resource 6

❖ School water audit report planner

Name:		Date:	
Staging		Planning	
Introduction			
What is the report about?		›	
Why is this important?		›	
Body: Problems and solutions			
› What is a problem?		›	
What evidence can you give?		›	
What is a possible solution?		›	
› What is another problem?		›	
What evidence can you give?		›	
What is a possible solution?		›	
› What is a final problem?		›	
What evidence can you give?		›	
What is a possible solution?		›	
Conclusion			
What was the main idea of the report?		›	
What do you want people to think or do or feel after reading the report?		›	
What can you say at the end to make them want to act on your report?		›	

School water audit

» Lesson overview

In the previous lesson, students investigated one example of water wastage in the school: dripping taps. In this lesson, students complete a report card on their school's water usage and identify other examples of water wastage in the school. They will also identify examples of water efficiency around the school.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- conduct a water audit
- draw conclusions about water wastage or efficiency
- identify and photograph evidence of water wastage or efficiency
- describe their findings
- reinforce their understanding that small changes can make a big difference.

» Opportunities for assessment

In this lesson you are looking for evidence of the extent to which students can undertake an investigation and draw conclusions from data as assessed on the 'Guide to making judgements' (Resource 8).

» Equipment

For the class

- digital camera(s)
- enlarged copy of the 'School water audit report planner' (Resource 6)
- butcher's paper or large sheets of paper

For each team

- a copy of the appropriate page from the 'Every drop counts in schools' school water audit worksheets (see 'Preparation')

For each student

- a copy of the 'School water audit report planner' (Resource 6) from previous lesson

» Preparation

The Sydney Water ‘Every drop counts in schools’ resource contains information and worksheets from pages 28–60 about conducting a school water audit. Print and copy the relevant worksheets for the students.

This resource can be downloaded from www.sydneywater.com.au/Publications/Factsheets/EveryDropCountsInSchools.pdf#Page=1.

» Lesson steps

1. Review the investigation into the cumulative effect of dripping taps from the previous lesson. Ask the students if they discovered any dripping taps at home after the lesson and what, if any, actions were taken.
2. Explain to the class that they are going to conduct an audit or an examination of the school’s water use to find any areas where water savings can be made.
3. Divide the class into teams best suited to the area to be audited. In large schools, audit areas may have to be allocated. In small schools the whole school can probably be audited by each student. Discuss the safety and hygiene rules for this activity.
4. Remind students not to run in wet areas and to avoid hot water. Provide cameras and instruction in their use wherever possible so that evidence of water wastage or efficiency can be photographed. Ask the students to begin their audits.
5. When the teams return to the classroom, ask them to describe their findings and collate these on a master list. Record the collated class results on butcher’s paper or large sheets of paper.
6. Discuss results on the master list and refer to the enlarged copy of the report planner. Ask the students to report orally. For instance, you could ask:
 - ‘Can you see any problems?’
 - ‘What evidence do we have?’
 - ‘What could be a possible solution?’
 - ‘What do you think would be the main idea of a report about this audit?’
 - ‘What do you want people to think or do or feel after reading it?’
 - ‘What could be a final persuasive comment?’
7. If the students have identified more than three problems, discuss how they might choose the three problems to discuss in their report. Talk about how the students might justify their choices.

» Curriculum links

SOSE

Draw a map of the school and annotate it with the audit results.

English

Draw an annotated plan for a new water-saving invention.

Ready to report

» Lesson overview

In the previous lesson, students conducted a school water audit. In this lesson students communicate the results of their audit in a report suitable for presentation to the school administration.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- plan a report to communicate the results of their water audit
- review their report plan using an assessment grid
- create a final copy of the water audit report for presentation to the school's administration
- reinforce their understanding that small changes can make a big difference.

» Opportunities for assessment

In this lesson, you are looking for evidence that the student communicates their findings using a report format, which will be assessed using the 'Guide to making judgements' (Resource 8).

» Equipment

For the class

- enlarged copy 'School water audit report planner' (Resource 6)
- collated data from the school audit
- photographs taken in previous lesson

For each student

- science report planner
- one copy of the 'Student assessment task' sheet (Resource 1)

» Preparation

Organise access to a computer with a word processor program (optional).

» Lesson steps

1. Explain to the students that they will plan their school water audit report plan in this lesson. Draw their attention to the enlarged report planner (Resource 6) and explain that they will write key words and main ideas on their planner. They will then write these main ideas and key words in full sentences in the 'School water audit report'. Ask the students to identify three main problems raised by the evidence in their school audit and to suggest effective solutions to these problems.
2. Remind the students that the intended audience for the report is the school administration and that they will need to meet the needs of their audience. Explain that they can do this by using evidence to back up opinions, correct spelling and punctuation, and neat presentation.
3. Discuss the purpose of images in a report. Ask students which images would be appropriate in their report. Refer the students to the photographs taken during the audit and ask them to include them in the report if appropriate.
4. Ask the students to use the planners to gather their ideas about the report. They may need access to research materials to find the most appropriate solutions to problems. Students may require assistance to complete this activity.
5. When the planners are complete, ask students to write their ideas in full sentences to create their first draft. Students can then form pairs to exchange positive and constructive feedback. Remind students that feedback should be given in the spirit of helpfulness and that they should use the assessment task sheet (Resource 1) as a guide.
6. Ask the students to make any necessary improvements to their report and to complete their final draft. Organise a time for this to be presented to the school administration. Ask the students to suggest creative ways to present their reports that highlight the importance of saving water in the school.
7. Review the questions in Resource 2 that students first answered in Lesson 1. Compare their answers now with their answers at the start of the unit. Have students record in their journal three important new ideas that they learned in this unit.

» Curriculum links

ICT

Publish these reports on the school website.

The Arts

Design a play to promote responsible water use in the school.

Teaching my family to audit

» Lesson overview

The focus of this lesson is on students reviewing and reflecting on their learning as they lead their family in a home water audit.

The installation and use of an internally plumbed home rainwater tank can save up to 70 000 L per household per year.

» Lesson objectives

By the end of this lesson, students will have had the opportunity to:

- communicate the water audit process to others
- reinforce their understanding that small changes can make a big difference
- draw conclusions based on evidence
- reflect on their learning.

» Opportunities for assessment

In this lesson you are looking for evidence that the student can undertake investigations and draw conclusions about the sustainability of practices in the home.

» Equipment

For the class

- enlarged copy of the 'Home water audit' sheet (Resource 7)

For each student

- 'Home water audit' sheet (Resource 7)
- calculator
- letter of explanation to be sent home (see below)
- student journal

» Preparation

Prepare a letter to go home with the audits explaining the background and process.

» Lesson steps

❖ Session 1

1. Ask students to list some positive outcomes from the school water audit process, such as: having the leaking bubbler fixed; planning a Waterwise garden; installing dual-flush toilets in the Prep building. Explain that the biggest water savings in the school are probably gained from turning off automatic-flush urinals over weekends and holidays, and using more efficient irrigation of sporting fields.
2. Ask the students to suggest some other organisations that could benefit from a water audit. Explain to the students that they are going to share what they have learned by teaching their family how to conduct a home water audit.
3. Display and discuss the enlarged copy of the 'Home water audit' sheet (Resource 7) and answer any questions. Hand out the letters of explanation for parents/carers and the individual home water audit sheets. Explain to students that they could also take water meter readings at home to measure actual water use. They can compare their actual water consumption with the estimated water use as recorded on the home water audit.
4. After students complete and return the home water audit, discuss their results as a class.
5. Refer students to the statements they categorised in Lesson 1, and give them time to reflect on what they have learned and how they have learned it. Challenge students to suggest further topics they wish to explore to improve their understanding of water conservation and how to promote it.
6. Explain that they will conduct another home water audit in two weeks to monitor changes in their home water usage.

❖ Session 2

After two weeks, revisit the ideas for saving water in the home. Ask the students to conduct their home water audit again. Has the water usage changed? What was the change in their water meter readings? What factors might have affected the change in usage? What suggestions can the student make about how to reduce their family water usage?

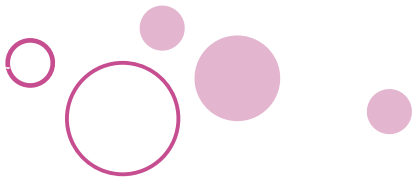
Resource 7

••• Home water audit

Name:		Date:		
Water use	Water quantity	Number of times/ mins a day	Working column	Daily total
Flushing toilet				
Single flush	11 L per flush			
Dual flush—half	3 L per flush			
Dual flush—full	6 L per flush			
Showering				
Water-efficient head	6 L per min			
Non water-efficient head	11 L per min			
Bath				
Full	150 L per bath			
Half	100 L per bath			
Cleaning teeth				
Tap running	3 L per min			
Tap off	0.5 L per brush			
Washing hands	3 L per min			
Washing dishes				
Sink	15 L per wash			
Dishwasher	15 L per load			
Washing clothes				
Top loader	120 L per wash			
Front loader	70 L per wash			
Cooking a meal	10 L per meal			
Drinking	0.25 L per glass			
Washing cars				
Hose	15 L per min			
Bucket	9 L per bucket			



Resource 7 (continued)



Water use	Water quantity	Number of times/ mins a day	Working column	Daily total
Washing pets				
Hose	15 L per min			
Bucket	9 L per bucket			
Watering garden				
Hose	15 L per min			
Bucket	9 L per bucket			
Dripping tap or dripping shower	15 L per tap or shower per day			
			Total water usage	

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Your family's
daily total

Number of family
members

Water use per person
per day

Possible problem areas	Possible solutions
1.	
2.	
3.	

Guide to making judgements—Waterwise ambassadors Student

Assessable elements	Task-specific descriptors				
	A	B	C	D	E
<p>Task-specific assessable elements</p> <p>Science <i>Knowledge and understanding</i> <i>Communicating</i> <i>Investigating</i></p> <p>Explains the importance of using water resources sustainably. Collects and organises data to identify water management problems in the school and possible solutions.</p>	<p>A</p> <p>Comprehensively explains the importance of managing water sustainably. Organises data with discernment to identify three well-justified problems. Suggests three significant solutions to the problems.</p>	<p>B</p> <p>Coherently explains the importance of managing water sustainably. Organises data to identify three logical problems. Suggests three informed solutions to the problems.</p>	<p>C</p> <p>Competently explains the importance of managing water sustainably. Organises data to identify at least one relevant problem. Suggests at least one appropriate solution to the problem.</p>	<p>D</p> <p>Superficially explains the importance of managing water sustainably. Identifies one superficial problem and a narrow solution to the problem.</p>	<p>E</p> <p>Vaguely explains the importance of managing water sustainably.</p>

Feedback.....