

Water... WOW!

STAGE 3 EDUCATION

Module 1: Water for Life

We need water to live! This module explains why water from our environment is essential to life.

In this module, students will:

- develop an understanding that water is essential to sustain life
- consider the various important uses of water by people
- collect data about personal and family water use
- prioritise daily activities that require water



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Module 1: Water for Life



Teacher Background

We Need Water to Live (GE3-2: Explains interactions and connections between people, places and environments)

Water from our environment is essential to supporting life as we know it! When astronomers search other planets for signs that they may be able to support life, they do not search for aliens, instead they search for water. Water has been discovered on planets other than Earth (e.g. Mars), although the search for life elsewhere continues.

Here on Earth, we have life owing to the availability of water and water is essential for our own survival. The amount of water in the human body ranges from 50% to 75% of body weight (the average for children is approximately 65%). People feel thirsty when they have lost around 2% to 3% of the water in their body. However, mental performance and physical coordination start becoming impaired even before we become thirsty, after loss of about 1% of water in the body. Water is lost through breathing, perspiration and going to the toilet. To replace the water and avoid dehydration, we should drink at least two litres of water each day (the exact amount for each person depends upon things like age, gender, amount of exercise and weather). Other than making us feel thirsty, common signs of dehydration include dry mouth, flushed skin, headaches, dizziness, constipation, fatigue or muscle cramps.



Water Properties Supporting Life

Branching is used as a linkage concept that will reappear throughout *Georges Riverkeeper Stage 3 Education Modules*, here in the context of blood vessels. Each time that branching is mentioned through the modules, ask students to reflect on how branching networks through which water-based substances flow contribute to carrying materials from one place to another. Repetition of this concept should reinforce the importance of the ability of water to carry substances through branched networks, which is one of the main reasons that water is so important for people.

Blood carries essential nutrients around our bodies through branched networks. So, we can take in food through our mouths and digest food in our stomachs, but from that food our whole body receives nutrients that are transported to where they are needed in blood. If blood did not distribute nutrients across our body, we couldn't function. Branched networks are very important for distribution of nutrients and other materials via blood vessels that pervade our entire body. In each person, there are 100,000 kilometres of blood vessels, which if laid end-to-end could go around the Earth two and a half times! That is a lot of tubing and water is essential for carrying materials through the tubing.

Human blood is almost 80% water. The majority of blood is blood plasma (which is yellow, not red), which carries red blood cells and other essential materials around the body. Blood plasma is 95% water. Water is such a large and important component of blood, because it is very good at carrying materials both in suspension (mainly red blood cells, as well as other materials such as white blood cells) and in solution (e.g. sugars, proteins, electrolytes, hormones), which are essential for keeping people alive and fuelling all of people's activities. Those substance in suspension depend upon water moving to stay in suspension and settle out of suspension if water is kept still, whereas substances in solution stay in solution even when water is still.

As well as carrying useful materials, water is also essential for carrying away wastes. Human urine (i.e. wee) is over 90% water. If we couldn't urinate, our body would build up toxins that would have disastrous consequences. For example, if urea builds up in the body it can interfere with metabolism, the ability to maintain internal balance that supports life and the ability to transport oxygen around our bodies.

Important functions of water in our bodies:

- Water is the primary building block of all the trillions of cells in our body.
- It acts as an insulator, regulating both internal body temperature and external body temperature (through sweating).
- Water is the primary component of saliva, used to aid digestion and swallowing of food.
- Water lubricates our joints.
- Water insulates our brain, spinal cord and organs, acting as a shock absorber.
- Water is used to flush waste and toxins from our body.
- Water is the principal solvent in our body. It carries dissolved minerals, soluble vitamins and certain nutrients to where they are needed.
- Water carries oxygen to cells and carbon dioxide away from cells in our body.

We could not live without water!

Bathing is another essential day-to-day use of water by people. If we neglected to wash our bodies for an extended period, bacteria, dead skin and sweat would build up to produce a potent stench. Skin would become oily or dry and become infected with fungi, yeasts and bacteria. If there were a cut or abrasion to the skin, the built up bacteria would have a high likelihood of causing infection. Dandruff (dead skin) accumulating on the scalp would cause a very itchy head, fungus would start growing between toes, dirt would become lodged under nails and both pimples and rashes would pop up across the body. We use water to wash dishes, cutlery, pots and pans to avoid the stink, decay and associated illness that comes if food scraps are not cleaned away. We use water to wash dirt, sweat and other smelly substances from our clothes. Water carries away our wastes when we flush the toilet.

Water keeps us from becoming dirty and sick!

Water is also an essential component of popular recreational activities such as swimming, fishing, boating, surfing, etc.

We can have lots of fun in water!

Sequence for Module 1: Water for Life

Syllabus Outcomes	<p>GE3-2 Explains interactions and connections between people, places and environments.</p> <p>MA3-2WM Selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations.</p> <p>MA3-11MG Selects and uses the appropriate unit to estimate, measure and calculate volumes and capacities, and converts between units of capacity.</p>
Learning Intentions	<p>For students to:</p> <ul style="list-style-type: none"> ◆ develop an understanding that water is essential to sustain life ◆ consider the various important uses of water by people ◆ collect data about personal and family water use ◆ list how water is used daily in their lives ◆ prioritise daily activities that require water
Teaching & Learning Activities	<p><u>Inquiry Question</u>: <i>How important is water in our daily lives?</i></p> <ul style="list-style-type: none"> ◆ Astronomers constantly search for water on other planets. Why? <p>View video https://www.youtube.com/watch?v=gksddX9N26w (more scientific) OR https://www.brainpop.com/science/space/mars/ [from 2:50 onwards] (less scientific) to trigger discussion that water on Mars is an indicator of the planet's potential to support life.</p> <ul style="list-style-type: none"> ◆ How is water essential for our own survival? The 'Playground fact' (provided below) about the amount of water that different animals drink can be used to reinforce the key message that we need to drink water every day of our lives. There are many ways that humans need water. Use the example of our branching blood vessels carrying water-based blood that carries nutrients around our body. ◆ Water is readily available whenever we turn on the tap. Ask students to brainstorm & list all the ways water is used daily (e.g. drinking, cooking, washing clothes, brushing teeth, showering, watering gardens, etc.). GE3-2 ◆ How valuable is water? In groups, prioritise activities needing water. What's the most essential water use? If given only 10 litres of water a day for personal use, how would you prioritise the most vital uses from your brainstormed list? What is your justification for allocating water to each use? Is 10 litres of water sufficient to get through your day? GE3-2, MA3-11MG ◆ Compare the way students allocated water to the average allocations for different uses shown at https://southeastwater.com.au/CurrentProjects/Programs/Pages/Water-efficiency.aspx?rd=why ◆ How much water do students think they use each day? Create a table with a column for the ways that students use water and the amounts of water (in litres) they think that they need for

	<p>each use, to record student answers. Compare your results to the typical daily water usage per person in Sydney, which is 200 to 300 L and discuss comparisons. MA3-2WM</p> <p>◆ Students discuss or debate - Do we use too much water? GE3-2</p>
Resources	<p>> Life on Mars videos: https://www.youtube.com/watch?v=gksddX9N26w https://www.brainpop.com/science/space/mars/ [from 2:50 onwards]</p> <p>> Branching blood vessels image https://ispyphysiology.com/2016/07/20/not-in-the-same-vein/</p> <p>> Moving blood animation video https://www.youtube.com/watch?v=bXZiUgZpt08</p> <p>> Household water usage image https://southeastwater.com.au/CurrentProjects/Programs/Pages/Water-efficiency.aspx?rd=why</p>
Feedback	<p>Your feedback is important to us. Please complete this quick online survey: http://bit.ly/ModulesFeedback</p>

Playground fact:

People can survive for about three weeks without food, but only a few days without water. Camels famously can forgo drinking water for extended periods: up to 15 days, then can make up for it by consuming over 40 litres at one drinking session. But, the kangaroo rat from the Californian desert can go even longer without drinking water. It gets its moisture from the seeds that it eats and can survive through a lifetime of up to 5 years without ever drinking any water.



Biographies of authors

Dr David Reid

David is a scientist who studies waterways for his work at Georges Riverkeeper in southern Sydney. He grew up near Lake Macquarie and the beaches south of Newcastle, where he spent much time swimming, surfing, exploring the life in water and generally enjoying being close to water. After finishing school, he went to university and his studies eventually led to completion of a PhD on waterbugs and food webs in farmland streams. Gaining those qualifications has allowed him to do research and monitoring work in waterways around the world, including those in New South Wales, Victoria, South Australia, New Zealand and New York City (see https://www.researchgate.net/profile/David_Reid15). He still enjoys having fun in water too!

Antonina Fieni

Antonina loves rivers. She is often seen paddling up rivers and creeks looking for Eastern water dragons or sacred kingfishers. When not paddling, Antonina is teaching environmental science and geography at the Georges River Environmental Education Centre and at the Field Study Centre at Sydney Olympic Park. Her qualifications include a Bachelor of Education and a Graduate Diploma in Environment.

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with collective responsibility for the Georges
River and its catchment.

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